FACTOR PRICE DISTORTIONS, UNDERUTILISATION OF CAPACITY AND EMPLOYMENT IN THE LARGE-SCALE MANUFACTURING SECTOR OF PAKISTAN

by

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I dedicate this thesis to my husband Kalim and my son Shahrukh.

CONTENTS

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ABSTRACT

This study endeavours to consider ways of removing impediments to increased employment in the large-scale manufacturing sector of Pakistan. The analysis has been carried out mainly in terms of the technological aspect of employment.

Factor price distortions and underutilisation of capital are seen as the two major factors affecting employment in the large-scale manufacturing sector of Pakistan. Various forms of government policies have been seen as a source of distortions in relative factor prices which in turn not only encouraged the use of capital-intensive techniques but also created excess capacity in the manufacturing sector.

The effect of removing distortions in factor prices on employment depends on the magnitude of the elasticity of substitution. A statistically significant elasticity of substitution between capital and labour was found using the CES production function. The magnitude of the elasticity of substitution between capital and labour is found to be low in overall manufacturing sector but it varies in inter-industry estimates. Some industries show a great potential of increased employment opportunities with respect to real wage rate reductions. On the basis of our statistical results we reject the null hypothesis that factor prices do not play a substantial role in affecting choice of techniques in the large-scale manufacturing sector of Pakistan.

Utilisation of capacity to its full maximum can increase employment opportunities in the sector. A large proportion of industries are not utilising their capacity to the full maximum. Our statistical results and the survey analysis support many hypotheses related to the causes of underutilisation of

capacity in the large-scale manufacturing sector of Pakistan. We have found the shortage of electricity as one of the major factor affecting capacity utilisation. Overall, supply factors are dominant in affecting the rate of capacity utilisation in Pakistan.

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CHAPTER 1

INTRODUCTION

At present lack of employment opportunities in the large-scale manufacturing sector[1] of Pakistan is a major issue. Given rapid population growth, coupled with the persistence of unemployment and underemployment in Pakistan, it is desirable to consider ways of removing impediments to increased employment in the most strategic sector of the economy. The importance of generating employment opportunities lies in the fact that unemployment generates not only social and political tension but also a tragic waste of resources in the economy. The objectives of social equality, reduction in poverty and promotion of national cohesion cannot be realised without a coherent employment strategy.

Given this background the aim of this study is to explore the potential to increase employment in the large-scale manufacturing sector of Pakistan. It is generally believed that this sector is characterised by high capital intensity which limits employment opportunities. Thus our analysis is concerned mainly with the technological aspects of production and the factors which have influenced the adoption of different techniques of production and hence the level of employment. Given the specific features of Pakistan's economy, factor price distortions and underutilisation of the capital stock are seen as the two main factors contributing to the employment problem in the large-scale manufacturing sector. The study is not on a macro-basis, rather the study is an effort to find out the employment potential in different industries on a disaggregated basis.

The main arguments which will be tested in the thesis are:

(a) Government policies have distorted relative factor prices and caused high capital intensity in the industrial sector.

(b) Removal of factor price distortions cannot generate employment opportunities in the large-scale manufacturing sector. This contradicts the hypothesis that techniques of production are flexible and that factor price distortions have an important role in generating employment opportunities.

(c) Both employment and output can be raised by increasing the rate of capacity utilisation. However, in practice there may be many practical difficulties in achieving this through multiple shift working.

Our empirical analysis uses cross-sectional data. To estimate the elasticity of substitution between capital and labour, we have used the Constant Elasticity of Substitution (CES) production function for 144 industries at the five-digit level of industrial classifications both on an aggregate as well as a disaggregated basis.

An alternative technique to investigate substitution possibilities between capital and labour could be a direct survey of plants. However, survey results are difficult to generalise. Moreover, cultural constraints ruled out this approach. With our statistical analysis it is possible to obtain information on the employment potential of different industries at the same time. Moreover, we are also interested in testing some other hypotheses relating to economies of scale, the change in the elasticity parameter over time, and the efficiency differentials in industries etc. which is not possible with the survey method. A few earlier studies have estimated the elasticity of substitution in the manufacturing sector of Pakistan but all related to the period of the 1960s when it was the deliberate policy of the government to distort factor prices. Our empirical estimation is for the latest period (1984-85) on which data is available and this period relates to the era when the government policies had changed to achieve the basic aims of improved social equality, the provision of employment opportunities and the creation of social justice in the economy.

With regard to the underutilisation of capital our analysis considers the issue in the light of the present situation of the economy. We have discussed electricity shortages and investigate whether these may be another important obstacle to increasing the rate of capacity utilisation in the industrial sector of Pakistan. Our model of capacity utilisation is also accompanied by a survey of different industries which helps to capture directly industrialists' views of the factors restricting capacity utilisation. Our survey of industries which covers the period of 1980s is a major contribution to the earlier studies.

The major source of data in this study is the Census of Manufacturing Industries (CMI) of Pakistan and other government's publications. At the same time data provided by the international agencies such as by the United Nations and the ILO have been also utilised.

The thesis is contained in 8 chapters. Chapter 2 considers the overall employment situation in developing countries in general and Pakistan in particular. Definitional and measurement problems of unemployment in developing countries have been discussed and an empirical analysis has been made of the magnitude of the unemployment problem in developing countries. The main focus, however, has been given to the large-scale manufacturing sector in terms of its contribution to output, employment and productivity.

Chapter 3 provides a theoretical discussion of the causes of low employment in the manufacturing sector. The basic objective is to find out the reasons for high capital intensity in the manufacturing sector. The discussion is mainly centred around the effect of relative factor prices on techniques of production and the underutilisation of capital on output and employment. The neoclassical approach has been discussed along with its limitations. Nevertheless, alternative views relating to technology are discussed. Finally, underutilisation of the idle stock of capital is reviewed as another potential cause of low output and employment. Some explanations are provided for the existence of underutilised capacity. Possibilities for increasing the rate of capacity utilisation are discussed.

Chapter 4 is related to the measurement of capital intensity in the large-scale manufacturing sector of Pakistan. The basic objective is to investigate the degree of capital intensity and how much it has increased over time in the large-scale manufacturing sector of Pakistan. In this context different indicators have been used in an attempt to measure capital intensity in different industries. The impact of capital intensity on employment is also calculated.

Chapter 5 analyses the role of government policies in distorting relative factor prices. A chronological review of the various trade, industrial and labour policies of the government of Pakistan is undertaken to see how government policy intervened in capital and labour markets and distorted relative factor prices. The costs of capital and labour are calculated to establish the trend in relative factor prices. The chapter finally discusses the practical applicability of the removal of factor price distortions.

Chapter 6 develops a model to estimate the elasticity of substitution between capital and labour for the large-scale manufacturing sector of Pakistan.

Chapter 7 highlights underutilisation of idle capacity as another problem hindering employment in the large-scale manufacturing sector. Different factors are discussed which may cause underutilisation of existing capacity. A model is developed to determine the ex post determinants of utilisation of the idle stock of capital Certain hypotheses relating to the determinants of capacity utilisation are tested by using the published data. A survey of industries is also conducted to investigate the industrialist' views of factors affecting the rate of capacity utilisation.

Chapter 8 finally summarizes the major finding of the thesis and offers some conclusions.

Notes and References to Chapter 1

1 The large-scale manufacturing sector covers those industries which employ 20 or more workers on only day during the years and use power in their manufacturing operation or where a manufacturing process is carried on or is ordinarily carried on whether with or without the use of power whenever 10 or more workers are working therein or have worked there one any day of the 12 months immediately preceding. see Pakistan Statistical Year Book, 1989.

CHAPTER 2

THE EMPLOYMENT PROBLEM IN THE MANUFACTURING SECTOR OF DEVELOPING COUNTRIES

2.1 Introduction

Given the high rate of growth of population and labour force in developing countries, it is imperative to create productive job1 opportunities in different sectors. However, the poor contribution of the manufacturing sector towards employment generation is a common phenomenon in almost all developing countries. The aim of this chapter is to lay a basic framework for the subsequent analysis of employment in the manufacturing sector of Pakistan.

The questions to be examined in this chapter are: What is meant by the employment problem in developing countries? What are the difficulties in the measurement of the employment problem? What is the nature and magnitude of employment problem? How do different sectors of the economy contribute to employment? Finally, what is the pattern of employment in the manufacturing sector?

2.2 The Nature and Magnitude of the Employment Problem

Employment normally means working for an employer for wages, while unemployment is defined as the active seeking of employment, at the ruling wage rate (Stewart 1977, p.32). The International Conference of Labour Statisticians in 1954 provided a very restrictive standard definition of unemployment. According to this definition "unemployed" covered all persons above a specified age, on the specified day or for a specified week who were under the categories of (a)"without work" and (b) "seeking work".[2] This type of definition was more applicable to developed countries than developing countries because in the former employment provides the majority with the main means of livelihood and, in the absence of state subventions, lack of employment is a major source of poverty. In the latter employment in the modern sector is a source of livelihood for only a minority of population. Many more work in traditional modes, such as working directly for themselves in subsistence activities, being self employed in marketing activities, and working for others on a traditional rather than wage-employed-basis, such as share cropping.[3] So the categories of unemployed given by the standard definition are difficult to sustain in developing countries. Sen (1975) raised critical issues on the measurement of unemployment by the standard definition. Under the three aspects of employment (income, production and recognition) he fully explained the underestimation of the problem. For example, the income aspect of employment is concerned with that part of one's income which is received on condition that one works. If one shares in a joint family income whether one works or not, then the share is not covered by the income aspect of employment. The production aspect covers all those people as employed who produce something. It may be possible that a person working in a family enterprise leaves for town but after his departure total output remains unchnaged. That person was employed from the production aspect of employment because he was producing something but in fact it is the case of disguised unemployment in the sense of the family output being unaffected by his departure. Similarly, the recognition aspect suggests that in assessing whether a person is `employed' or not, his own views on the subject have to be given some weight. It is quite possible that an employed person may recognise himself as unemployed because he is not satisfied with his job (for details see Sen, 1975, pp. 5-9).

In developing countries in the absence of a social security system, most people cannot afford to be "not working" and "seeking work". Most of those who seek work have to find some way of keeping themselves alive which may place them outside the ranks of the unemployed on the standard definition (Godfrey 1986, p.7). They are not either fully employed or wholly unemployed rather they are "underemployed" (Mouly and Costa, 1974, pp.31-32). In these circumstances more appropriate concepts of unemployment are `underemployment' or `disguised unemployment'.[4]

Underemployment can be sub-divided into visible and invisible underemployment. Visible underemployment includes all persons in paid or self-employment whether at work or not at work, involuntarily working less than the normal duration of work determined for the activity, who are seeking or available for additional work during the `reference period' (see Mouly and Costa 1974, p.31). Invisible underemployment covers those who are working a full normal week while desperately looking for a `real' job. The characteristic symptoms of invisible underemployment "might be low income, under-utilisation of skill, and low productivity".[5]

Realising the difficulties of applying the standard definition of unemployment in developing counties, the 13th International Labour Conference of Statisticians in Geneva in 1983 relaxed the "conventional means of seeking work criterion"[6] so that more coverage of unemployment has become possible.[7] However, in the absence of any clear or standard definition of underemployment which would remove measurement difficulties, the statistical records of unemployment of developing countries are still related only to visible unemployment "which is more associated with formal sector, higher remuneration opportunities, and urban areas"(Colman and Nixon, 1986, p.113). But we think that even in urban areas, hidden underemployment in the informal sector[8] means that the severity of the unemployment problem is seriously underestimated.[9]

In the rural areas measurement problems are even more difficult. For example, a clear delineation between consumption and production activities cannot be made.[10] The phenomenon of discouraged workers or concealed unemployment also poses difficult measurement problems.[11]

These definitional and measurement problems have to be borne in mind when considering the data on total (open) unemployment rates in selected developing countries during the 1980s (Table 2.1). These data ignore the concept of "underemployment" and the definitions applied to the work force also vary in different countries.[12] By current Western European Standards, the levels of unemployment shown in Table 2.1 are low to moderate.

According to Table 2.1, unemployment rates have increased in almost all countries during 1980-1985 whereas, after 1985 there is a slight decline in unemployment rates in Costa Rica, Mexico, Pakistan, and Singapore. In Latin America, unemployment rates are higher than Asia of which Puerto Rico contributes the highest rates.

In Table 2.1 an open unemployment rate of 3.1% (4.6% urban and 2.6% rural; see Appendix Table 2.1) in Pakistan is misleading because the "underemployed" are defined as "employed" (Javaid, Malhi and Zeeuw, 1989). Unpaid family members and self employed are the kind of "visible underemployed" which are considered as "fully employed" in the compilation of employment statistics of Pakistan.[13] Moreover, no minimum time period has been taken into account for "fully employed".[14] These definitions influence the true nature and severity of underutilisation of labour and the employment problem in the country. According to the Seventh Five Year Plan (1988-93), if a more strict criteria for full-time employment is applied, then roughly one-quarter to one-third of the labour force needs more regular or additional work in Pakistan (p.168).

Table 2.1: Total Unemployment Rates in Some selected Developing Countries during 1980-1988

(percentage)

Country	1980	1985	1988
Low income countries[5]			
China	4.9	1.8	2.0
Ghana	1.2	0.4	-
Indonesia[4]	1.7	2.1	2.8
Mauritius[1]	-	1.1	1.1
Nigeria[2]	-	1.9	2.3
Pakistan	**3.1**	**3.7**	**3.1**
Sri Lanka[3]	17.9	14.1	14.0
Middle income countries[6]			
Argentina	2.3	5.3	5.9
Brazil	-	3.4	3.9
Chile	10.4	12.1	5.6
Costa Rica	5.9	6.8	5.5
Mexico	4.5	4.4	3.6
Puerto Rico	17.1	21.8	15.0
Venezuela	6.2	13.1	7.3
Hong Kong	3.8	3.2	1.4
Korea Republic of	5.2	4.0	2.5
Philippines	4.8	6.1	8.3
Singapore	3.0	4.1	3.3
Thailand	0.8	2.6	3.1

1 Figures of Mauritius are for 1984 and 1991 respectively.
2 Figures of Nigeria are for 1983 and 1986 respectively.
3 Figures for Sri Lanka are for 1981 and 1990 respectively
4 In 1988 Indonesia entered in the group of middle income countries
5 Low income countries are defined by the World Development Report as those having per capita incomes of $545 or less in 1988.
6 The middle income countries are defined as those having per capita incomes of $546 to $999 (World Development Report 1989-90) pp.228-238.
Source: ILO, Year book of Labour Statistics (Various years) and World Development Report 1989-90.

Nevertheless, we should not rely on these statistical records because they distort the true picture of the employment problem not only of Pakistan but almost of all other developing countries. We think that in the light of the 1983 ILO definition of unemployment there is need to change the compilation method to include "underemployment".

In the case of Pakistan Javaid, Malhi and Zeeuw (1989) have estimated underemployed persons (on the basis of working less than 35 hours criterion during a week) as accounting for 10.4% of the total employed labour force. If these are added to open unemployed the unemployment rates will quadruple to 13.5% (Table 2.2).

Robinson and Abbasi (1979) made an earlier attempt to measure the degree of underemployment for the periods of 1968-69 to 1974-75 through direct and indirect approaches in Pakistan. In the direct approach, persons working for less than 35 hours per week were considered to be underemployed while in the indirect approach, estimates of productivity per worker were used to determine underemployment. In the direct approach total underemployed accounted for 13.1% (9.5% rural and 26.1% urban) of total employed in 1968-69 and 4.3% (5.0% rural and 2.2% urban) in 1974-75.

In the indirect approach the modern sector experienced rising labour productivity with increases in output since 1965, while the agriculture sector showed static output per worker since 1970 (Robinson and Abbasi, 1979, p.328).

Table 2.2: Employed Persons of 10 Years Age and Above by Hours Worked by Major Activities (1988)

(000)

Major Activities	Total Employed	Not Worked[1]	Working Hours				Total unemployed	
			5-9	10-14	15-24	25-34	Absolute	%
1	2	3	4	5	6	7	8	9
Total	30400	119	58	231	1429	1335	3172	10.4
Agriculture	14969	18	43	179	1137	997	2374	15.8
Mining & quarrying	70	3	0	0	0	0	3	4.4
Manufacturing	4256	36	0	12	82	134	264	6.2
Electricity Gas & Water	222	6	0	0	3	9	18	8.2
Construction	1827	12	6	0	46	52	116	6.3
Wholesale, Retail trade	3663	18	0	21	61	49	149	4.1
Transport,Storage & Communication	1596	9	0	0	15	18	43	2.7
Financing, Insurance, Real Estate etc.	234	0	0	0	0	3	3	1.3
Community,Social & personal Services	3490	18	6	15	88	70	198	5.7

1 The category of "not worked" i.e., 119,000 workers (column 3) is different from "open unemployed" (about 1 million) and is considered by the authors a kind of "underemployed" enumerated by the officials records as "employed", but no further explanation has been provided on this category.

Note: Column 8 has been derived by adding columns 3 to 7.

Source: Javaid, Malhi and Zeeuw (1989), Annex 3.3 p. 41.

Some efforts have been made to estimate underemployment in other developing countries using different approaches such as productivity, and time, income and willingness to work criteria (for details of these approaches see Krishna, 1973; Rath, 1983). On the basis of these approaches the seriousness and the magnitude of employment problem in developing countries becomes apparent and the statistical unemployment rates jump to a high figure.[15]

Nevertheless, these rates are still low and may be underestimated because there are certain activities which cannot be quantified, for example, the phenomenon of discouraged workers or concealed unemployment in urban areas.

Statistical records of unemployment rates in Pakistan (Table 2.1) however, do not discard the idea that there is no unemployment problem in Pakistan. According to Javaid, Malhi, and Zeeuw (1989), if the projected overall employment elasticity of 0.4 with respect to GDP for the period of 1988-93 (given by the Seventh Five Year Plan,1988-93) is taken into account, the real growth rate of GDP should be 7.8% to absorb all the unemployed (i.e 3.1/0.4=7.8). Considering that the average annual real growth rate of GDP has been 5 to 6%, there is not only additional new workers but also a backlog of unemployment to catch up with (Javaid, Malhi, and Zeeuw,1989, p.15). If the projected overall employment elasticity is true, then the statistical records of unemployment rates should have shown an upward trend. In the absence of any upward trend in unemployment rates (see Appendix Table 2.2) we can only get a crude idea (which is also confirmed by the two studies earlier mentioned)[16] that with the passage of time underutilisation of labour force is increasing as people have to do some work for their survival. In reality however, the projected employment elasticity given by the Seventh Five Year Plan (1988-93) is related to the "formal employment" and any change in the considered definitions of employment or unemployment will change it significantly implying very different results.[17]

2.3 Population Labour Force and Urbanisation

We have seen in the above analysis that there are difficulties in the measurement of underemployment and by looking at the open unemployment rates one cannot appreciate the intensity of the employment problem. However, the high rates of growth of population and labour force in developing countries indicate the pressure to create more productive job opportunities. According to World Bank projections (Appendix Tables 2.3 & 2.4), the population and labour force growth rates are both predicted to remain at 2% per annum over the period 1990-2000 implying 22 per cent growth over the decade. The urban labour force is likely to grow much more rapidly (Appendix Table 2.5) due to a higher birth rate coupled with rural-urban migration.

On a disaggregated basis we have selected 20 developing countries to examine the rate of growth of population, labour force and urbanisation (Tables 2.3 and 2.4). As might be expected average population growth rates are higher in low income countries than in middle income countries. Among low income countries, Pakistan comes under the category of the highest population growth economies (Table 2.3). The urbanisation growth rate is also very high in all countries, though in some countries these have slightly declined in 1980-88 as compared to 1965-80 (Table 2.3).

Table 2.3: Population, and Urbanization Growth Rates in Developing Countries

(Annual Average Growth)

	Population		Urbanization	
	1965-80	1980-88	1965 80	1980-88
Low Income Economies[1]				
Bangladesh	2.7	2.8	6.4	5.6
Ethiopia	2.7	2.9	4.9	5.2
Ghana	2.2	3.4	3.2	4.2
India	2.2	2.2	3.9	4.0
Kenya	3.6	3.8	8.1	8.2
Malawi	2.9	3.4	7.5	7.9
Nepal	2.4	2.6	6.4	7.4
Nigeria	2.5	3.3	5.7	6.3
Pakistan	**3.1**	**3.2**	**4.3**	**4.5**
Tanzania	3.3	3.5	11.7	11.6
Middle Income Economies[2]				
Argentina	1.6	1.4	2.2	1.8
Brazil	2.4	2.2	4.5	3.6
Egypt	2.1	2.6	2.8	3.5
Indonesia	2.4	2.1	4.8	4.8
Korea Rep. of	2.0	1.2	5.8	3.7
Malaysia	2.5	2.6	4.5	4.9
Mauritania	2.3	2.6	9.5	7.8
Philippines	2.9	2.5	4.1	3.7
Thailand	2.9	1.9	5.1	4.7
Venezuela	3.5	2.8	4.8	2.6

1 Low income economies are those whose per capita GNP is $545 or less in 1988.

2 Middle income economies are those having per capita incomes of $546 to $5999.

Source: World Development Report (1990) pp. 228, 238.

Table 2.4: Growth of Labour Force in Developing Countries[1]
(Average Annual Growth %)

Countries	1965-73	1973-83	(Projection) 1980-2000
Low Income Economies[2]			
Bangladesh	2.3	2.8	2.9
Ethiopia	2.2	1.4	2.2
Ghana	1.6	2.0	3.8
India	1.8	2.1	2.1
Kenya	3.2	2.9	4.0
Malawi	2.4	2.8	2.8
Nepal	1.6	2.3	2.5
Pakistan	**2.3**	**3.2**	**2.7**
Sri Lanka	2.0	2.1	2.2
Tanzania	2.5	2.5	3.1
Middle Income Economies[3]			
Argentina	1.4	1.0	1.4
Brazil	2.5	3.1	2.4
Egypt	2.2	2.4	2.3
Indonesia	1.9	2.3	2.4
Korea Rep. of	2.9	2.7	1.9
Mauritania	1.9	2.4	2.0
Nigeria	1.8	2.0	3.3
Philippines	2.1	3.0	2.5
Thailand	2.4	3.1	2.1
Venezuela	3.7	4.1	3.4

1 Selection of countries depends upon the availability of data.
2 Low income economies are of having per capital income GNP of $400 or less in 1983.
3 Middle income economies with 1983 GNP per capita of $400 or more.
Source:World Development Report (1985), p. 214.

The growth of the labour force in developing countries is also very high (Table 2.4). The projection of the growth of the labour force for 1980-2000 shows in near future it will remain quite high. In the case of Pakistan the projection by the World Bank shows that the growth of labour force will decline marginally during the period 1980-2000 (Table 2.4).

The estimated labour force[18] (Appendix Table 2.2) in absolute terms in Pakistan is 32.8 million (23.9 million rural and 8.9 million urban) in 1990-91, and at a growth rate of 2.7% per annum (projected by the World Bank) this will rise to around 44 million by the year 2000.

2.4 Sectoral Distribution of Labour Force

Considering the distribution of labour force among different sectors, Table 2.5 shows that in South Asian countries the share of industrial employment has remained almost stagnant. The service sector is a larger source of employment than the industrial sector. The more worrying situation is the kind of jobs undertaken in the services sector. Bhalla (1973) argues that unlike the situation in advanced nations where service employment is largely induced by demand, supply considerations tend to predominate in developing countries. People take any kind of job which they can find in services. The natural outcome is an enormous rising number of the so-called `marginal men'(Grant, 1972, pp.11-12).

Like other developing countries, the sectoral distribution of labour force in Pakistan (Table 2.6) shows that agriculture is still the main absorber (51%) of the labour force. The trade and all other sectors together account for 25% of the employed labour force in 1988. The share of the manufacturing sector declined from 14 per cent in 1975 to 13 per cent in 1985 and after that remained stagnant. Thus, contrary to the expectations of Kuznet's (1966) pattern, and the Lewis model of growth (1954), and despite its high growth rate, industry's share of total employment in Pakistan appears to have declined. According to Chenery and Syrquin (1975), with the increase in per capita income, the share of industry in employment will continue to rise though this increase would be less than that in the service sector.

Table 2.5: Distribution of Economically Active Population in the Agriculture, Industry and Services[1] (1965, 1975, 1985)

(Percentage)[2]

Country	Agriculture 1965	Agriculture 1975	Agriculture 1985	Industry 1965	Industry 1975	Industry 1985	Services 1965	Services 1975	Services 1985
World	58	53	49	19	20	22	24	27	30
Less developed countries	73	68	63	11	14	16	16	18	21
Africa	76	72	66	9	11	13	15	18	21
North Africa	56	46	37	16	21	27	28	33	36
Sub-Saharan Africa[3]	82	78	73	6	8	9	11	14	17
Asia and the Pacific	76	71	66	10	13	16	14	16	18
South Asia	73	70	68	12	12	13	15	17	19
South-East Asia & the Pacific	69	60	52	11	14	18	21	25	31
China	81	76	72	8	12	16	11	12	12
West Asia	62	50	39	17	21	25	22	29	37
Latin America the Caribbean	44	36	28	22	25	27	34	39	45
South America	41	33	25	23	25	27	36	41	48
Central America	52	43	36	20	24	29	28	33	35
Caribbean	47	39	32	19	21	21	34	40	46

1 Region-wise data has been taken because prior to 1980, no uniform data on country-basis is available.
2 May not total to 100 per cent because of rounding
3 Excluding South Africa.
Source: ILO (1988) World Employment Review, Table A.2, p.53.

Table 2.6: Sectoral Distribution of Employed Labour Force in Pakistan

(Percentage)

	1964	1975	1985	1988
Total	100	100	100	100
Agriculture	60	55	53	51
Manufacturing	14	14	13	13
Construction	1	4	5	6
Transport	2	5	5	5
Trade	8	11	12	12
All others	15	11	13	13

Note: May not be equal to 100 because of rounding.
Source: Economic Survey (1988-89).

Within the manufacturing sector, a major portion of employed labour force is absorbed by the small-scale manufacturing sector (Table 2.7).

However, the share of this sector to total manufacturing output and to GDP has been very low over the years (See Appendix Tables 2.6 & 2.7). For instance, the contribution of about 13% of the total labour force in the small-scale manufacturing sector was only 5% of GDP in 1988 (Appendix Table 2.7), implying a very low productivity in the sector. On the other hand, about 2% of the labour force in the large-scale manufacturing sector was contributing 15% of GDP in 1988 (Appendix Table 2.7) thus reflecting a high productivity in large-scale manufacturing sector. A major reason for low contribution of the small-scale sector to total manufacturing output and GDP is reflected in its low share of total manufacturing investment over time (See Appendix Table 2.8). In fact Pakistan's industrial development was confined mainly to the large-scale manufacturing sector for which reliable statistics are also available and which showed high growth rates in the economy (see Appendix Table 2.9).[19]

Table 2.7: Employed Labour Force in the Manufacturing Sector of Pakistan

(Millions)

	1969-70	1978-79	1984-85	1986-87
1.Total Manufacturing[1]	2.8	3.4	3.7	4.1
2.Large-Scale[2]	0.4	0.4	0.5	0.5
3.Small-Scale (1-2)	2.4	3.0	3.2	3.6
4.Large-Scale Manufacturing				
% of total manufacturing	14.3	11.8	13.5	12.2
% of total employed labour force	2.2	1.7	1.9	1.7
5.Small-Scale Manufacturing				
% of total manufacturing	85.7	88.2	86.5	87.8
% of total employed labour force	13.5	12.7	11.9	12.5

Note: The selection of the latest year is subject to the availability of data.

1 As no employment data is available on the small-scale manufacturing sector. The calculations have been made by dividing the total share of manufacturing employment (taken from Statatistical year book (1989) to total employed labour force (see Appendix Table 2.2).

2 Figures have been taken from the Economic Survey (1991-92).

Source: Economic Survey (1991-92), Pakistan Statistical Year Book (1989), and Appendix Table 2.5.

It is a pity that very little information is available on the small-scale manufacturing sector. Moreover, non-reliability of data makes it extremely difficult to provide any useful systematic information on this sector.[20]

Given the importance of the large-scale manufacturing sector in the economy in terms of its high share in GDP as compared to the small-scale manufacturing sector (Appendix Table 2.7) and due to the difficulties in getting reliable data on the latter, further discussion will be confined to the large-scale manufacturing sector. The employment data on the manufacturing sector in Pakistan available from the international agencies is also related to the three digit international standard industrial classification (ISIC) industries mostly known as the large-scale manufacturing sector.[21]

Comparing the employment absorption in manufacturing sector of Pakistan with some other developing countries, we can see that the share of large-scale manufacturing sector of Pakistan to the total employed labour force in 1980 was only 2%. This was the lowest along with two other countries; Kenya and Tanzania (Table 2.8).

Table 2.8: The Contribution of Manufacturing Employment as Share of Total Labour Force in Some Selected Countries: (1970-80)

(Percentage)

Country	1970	1980
Korea, Republic of	7	14
Malaysia	9	16
Indonesia	6	9
Brazil	7	10
Thailand	5	7
Colombia	5	6
India	2	3
Zambia	3	3
Kenya	2	2
Tanzania	1	1
Pakistan	2	2
Argentina	17	13

Source: World Development Report (1990), p. 63.

Contrary to the contribution of manufacturing to total employment, the growth rates of output and productivity in the sector are quite high (Table 2.9). It is evident from Table 2.9 that the growth rate of employment in manufacturing was much lower on average in most countries during the period 1980-85 than 1975-80 (Bangladesh being an exception). For example, employment in manufacturing grew very slowly (about 1% annually) in Thailand, Pakistan and India. It declined in Philippines, Hong Kong and Sri Lanka. The rate of decline in Sri Lanka is more than 3% a year. However, Malaysia and Republic of Korea registered a respectable average growth rate of 3% per annum.

Table 2.9: Production, Employment and Productivity in Manufacturing during 1975-85 in Some Developing Countries: Average Annual Changes

(Percentage)

Country	Production		Employment		Productivity	
	1975-80	1980-85	1975-80	1980-85	1975-80	1980-85
Bangladesh	6.1	4.2	2.9	4.2	3.1	0.0
Hong Kong	8.7[2]	7.0	8.4	-0.4	2.2	7.4
India	4.7	5.4	3.0	0.7[3]	1.7	4.7
Korea Rep. of	16.6	10.8	6.2	3.3	9.8	7.3
Malaysia	10.9	5.6[2]	10.9	3.1	0.0	2.4
Pakistan	**7.1[1]**	**10.3**	**2.8**	**1.1**	**4.2**	**9.1**
Philippines	5.2	-1.4[2]	3.5	-0.5	1.8	-1.0
Singapore	12.0	2.1	8.2	1.5	3.5	0.6
Sri Lanka	1.5[2]	4.1[2]	-0.9	-3.4[4]	1.9	7.8
Thailand	11.5	5.6	5.6[1]	1.0	5.6	4.6

1 1976-80 2 estimated from value added data 3 1980-84
4 1980-83.
Source: ILO,(1988), World Employment Review (Table A.6 p.56).

These statistics (Table 2.9) show that the slow growth of employment in the manufacturing sector is reflected in the high growth rate of productivity. In Pakistan we have noticed that the growth of output in the manufacturing was 10.3% in 1980-85 while the average annual growth rate of employment was only 1.1% during 1980-85 (Table 2.9). At a disaggregate level almost all major groups of industries at the three digit level of Pakistan Industrial Standard Classification (PISC) also showed a high growth rates in value added and productivity during 1970-85 (See Table 2.10). This is frequently attributed to the use of capital-intensive techniques which have raised labour productivity and affected the growth of employment in the sector.[22]

Given the rapid growth rate of the population and labour force and the behaviour of the large-scale manufacturing sector towards output and employment it is useful to place in perspective the possibilities of creating employment opportunities in the large-scale manufacturing sector. Its immediate impact on overall employment problem in Pakistan may not be very high in the short-run[23] but it may have a strong and positive effect via income redistribution[24] and its multiplier effect on the demand for labour-intensive products in the long-run[25] subject to some other limitations.[26]

Table 2.10: Growth in Value-Added, Employment and Productivity in Major Group of Industries in Pakistan (1970-85)[1]

(Annual Average Growth % Per Annum)

INDUSTRIES	VA	EMP	Productivity
Total Industries	6.4	1.1	5.3
Consumer Goods Industries	4.8	0.3	4.5
1 Food manufacturing	7.8	4.3	3.5
2 Beverage	16.4	6.3	10.1
3 Tobacco	9.1	-0.6	9.7
4 Textiles	1.5	-0.8	2.2
5 Wearing apparel (except footwer)	-	-	-
6 Leather & leather products	1.0	0.0	1.0
7 Footwear(except rubber and plastic)	-11.2	12.2	-1.0
8 Ginning, pressing & baling of fibres	-	-	-
9 Wood & Cork products	15.4	4.7	10.7
10 Furniture and fixtures	7.8	0.0	7.8
11 Paper & paper products	4.8	1.9	2.9
12 Printing & pressing	4.4	0.0	4.4
13 Pottery China	-	-	-
14 Miscellaneous	-12.1	-12.2	0.0
Intermediate Goods	9.6	4.8	4.8
15 Drugs & Pharmaceutical	-	-	-
16 Industrial Chemicals	-	-	-
17 Other chemicals	-0.8	-6.5	-5.8
18 Products of petroleum & coal	-11.3	-4.5	-6.8
19 Rubber products	-	8.4	-
20 Plastic products	4.3	-	-
21 Glass & glass products	-	-	-
22 Non-metallic minerals	9.0	0.4	8.6
23 Iron & steel	17.4	7.2	10.2
Capital Goods	7.8	0.3	7.4
24 Fabricated metal	2.5	-4.5	7.0
25 Machinery non-elec.	11.6	2.2	9.4
26 Electrical machinery	5.8	0.8	5.0
27 Transport equipment	10.9	0.7	10.2
28 Professional goods	-	-	-

1 Growth rate is calculated by using the end points.
Notes: VA = Value-added; EMP = Employment.
Value added is at constant market price of 1975-76.
Source: Annex Tables A-1 & A-2.

2.5 Conclusion

From the preceding discussion we can conclude that the employment problem of developing countries is severe. "Underemployment" or "disguised unemployment", is difficult to measure and statistical records of open unemployment are very low and do not show the true magnitude of the employment problem.

High growth rates of population and labour force in developing countries, including Pakistan, however indicate a need to create productive job opportunities in different sectors of the economy.

The sectoral distribution of labour force in Pakistan shows that agriculture is still the main provider of jobs. The share of services sector (trade + all others) is also high. However, the share of manufacturing in total employment remained almost stagnant.

Within the manufacturing sector the contribution of small-scale sector to employment is very high. However, its small contribution to GDP reflects very low productivity in the sector. We have seen that its share in total manufacturing investment is very low as compared to the large-scale manufacturing sector. Non-reliability and scanty data on small-scale sector severely limits the presentation of a true picture of it.

Unlike the small-scale manufacturing sector the contribution of large-scale manufacturing to GDP is very high but its employment share is very low which implies high labour productivity in the sector.

In view of the fact that in the labour-surplus less developed economy, modern large-scale industry has failed to provide sufficient employment opportunities, it is interesting and useful to explore the employment potential in one of the most strategic sector of the economy i.e., in the large-scale manufacturing sector. The main reason for the slow growth of manufacturing employment over time may attributed to the steady rise in capital labour ratios in the sector (which will be discussed later). The immediate question is thus related to the possibilities of augmenting employment opportunities without reducing total output in the large-scale manufacturing sector. A number of theoretical arguments which will be discussed in the next chapter can be tested in this regard.

Notes and References to Chapter 2

1 By "productive job" we mean the efficient use of the labour force in the light of the underemployment or low-utilisation of labour force in developing countries. Simply it implies that an increase in employment in one sector will not reduce total output in the economy.

2 "Not working" means not in paid employment during the reference period and "seeking work" means that "had taken some steps to seek employment" i.e., getting registered at a public or private employment exchange, giving applications to employers, checking at worksites, farms, factory gates, or other assembly places etc. For the full text of the definitions of employment and unemployment, see Bulletin of Labour Statistics, Geneva, ILO, (1983), Series A. No. 3, pp.157-165, which extends the previous version of the definitions.

3 For details see Stewart (1977), p.34, Sen (1975), chapter 1 & 4).

4 For a lucid discussion on "underemployment" and "disguised unemployment"see Sen (1969, 1975); Mouly and Costa (1974); and Godfrey (1986).

5 It is similar to the term used by Robinson (1937) to describe the situation of unemployment in Britain in the 1930s, it is concerned with those individuals whose incomes, productivity and degree of skill utilisation were lower than they had been prior to the onset of the depression.

6 Conventional means of "seeking work criterion" (as earlier mentioned) covered specified steps in order to seek paid employment such as, to get registered at a public or private exchange, giving applications to employers, checking at worksites, farms etc. For details see ILO (1983), Bulletin of Statistics.

7 Godfrey (1986) shows how the total unemployment rates more than doubled in the case of Malaysia by defining two types of unemployed persons see p. 13, Table 1.5.

8 The concept of informal or non-wage sector was fully developed by ILO (1972) in its study report on Kenya. Generally it covers heterogeneous types of activities such as petty traders, street hawkers, gardening, shoeshiners etc in urban sector. For full details of the concept see ILO (1972), and Weeks (1975). Practically it is difficult to observe all such kinds of activities to measure underemployment.

9 The underestimation of unemployment also occurs partly due to the ambiguity in the concept of informal sector. Moreover non-availability of jobs in the formal (wage-based) sector forces people to take any kind of job in the informal sector. Sometimes with the belief that no jobs are available they do not search for jobs and continue their present low-paid work, see Robinson and Abbasi (1979) who have observed this phenomenon in their analysis of underemployment in the case of Pakistan.

10 Difficulties in the measurement of unemployment have been well

explained by Sen (1975) in his analysis of Indian city of Calcutta. Sen (1975) finds that the standard definition of unemployment overlaps between the categories of `not working and `seeking work' (see p.121), for overall discussion see chapters 1 and 4.

11 Concealed unemployment or discouraged workers is related to the phenomenon of workers not seeking jobs actively by assuming that no jobs are available as already mentioned in footnotes (9).

12 Some countries consider 15 years of age as the entry date to the labour force and some 10 years of age, This can be observed in the ILO, statistical year book of any year.

13 It has been explained in the Labour Force Survey 1986-87, which is the most systematic official record of employment and unemployment in Pakistan.

14 The normal practice is to take minimum 35 working hours during the reference period for the estimation of underemployed in developing countries, for example studies by Robinson and Abbasi (1979), and Javaid Malhi and Zeeuw (1989) in the case of Pakistan took 35 hours as minimum criteria for the estimation of underemployed. In the case of Colombia, at least minimum 32 hours have been considered for underemployment, see Squire (1981), p.72. No minimum time period for the estimation of "fully employed" is taken into account in the official records of Pakistan. For example all "unpaid family members (a kind of underemployed) are enumerated as "fully employed" irrespective of any time period consideration, which may seriously affect the underestimation of "unemployment"rates.

15 For example, Tokman (1983) gives an estimates of underemployment for Latin America on the basis of the proportion of the economically active population represented by the self-employed and unpaid family members at 41% in 1950 and 36% in 1970 (p.154). Hopkins' estimates of underemployment show that the total number of 448 million exists in developing countries in 1982 (51%) of the total labour force (for details of his definition of underemployed see Hopkins (1983), p.473.

16 According to Robinson and Abbasi (1979) the underemployment rate was 4.3% in 1974-75 and Javaid and Malhi and Zeeuw (1989) give an underemployment rate of 10.4% in 1988. As both these studies have taken the minimum criteria of 35 hours during a week for the analysis of underemployment, comparing the results one can say that underemployment or "underutilisation" has increased with the passage of time.

17 For example, if all underemployed are taken into account and are added to the "open unemployed" it will affect both the "formal employment" and "open unemployment" rates implying a significant change in the employment elasticity.

18 The Labour Force Survey of Pakistan includes all persons of 10 year of age in the labour force.

19 The growth rates in the large-scale manufacturing sector were very high up to the 1970s. During the 1970s, a significant change in government policy towards the large-scale industries affected the growth rate in the sector. However, in the late seventies, efforts were

made to boost production in industrial sector. See for details, Papanek (1967), Lewis (1969), Ahmed and Amjad (1984) especially chapters 13 & 14, and Noman (1988).

20 Scarcity of data makes it extremely difficult to provide a full picture of the small-scale manufacturing sector. As these are fragmented unregistered firms both in rural and urban areas, no reliable data of value-added in this sector are available. However, the Central Statistical Office, proxied the growth rate in this sector by the rate of growth of population up to the 1970s. Later on, Small Manufacturing and Household Industries Surveys (SMHI) were conducted to estimate the value-added in the sector. Because of the heterogeneous activities in rural areas and the difficulties of counting them, the estimates by the surveys are not also considered reliable; For the details of the difficulties and non-reliability of the data see Naseem (1986), pp. 77-82.

21 We have compared the statistical records of the large-scale manufacturing sector published by Government of Pakistan (1990) with the World Bank Reports of different years, there is no difference in terms of growth rates. Comparison of Tables 2.7 and 2.8 in the text also confirms this phenomenon.

22 See for instance, Hussain (1974), Ahmed and Amjad (1984), Kazi et al (1976), Naseem (1986), Planning Commission (1987) etc. in the case of Pakistan.

23 If more labour is absorbed in the large-scale manufacturing sector, their increase in the total share in income may increase the demand for labour-intensive products which may in turn generate demand for further labour. Morawetz (1974), has discussed how the bias in favour of businessmen in terms of their higher share in income in industries has affected the demand for labour-intensive products see pp. 491-542.

24 For the income redistribution effect on the demand for labour see Cline (1972), Nirgis et al (1972), Ho (1975), Paukert et al (1976), and Cheema and Malik (1985).

25 The term multiplier has been used to express the chain link between the increase in the demand for labour-intensive products due to income redistribution in favour of labourers and further generation of demand for labour and so on. It is in fact a long run phenomenon.

26 Sometimes skilled labour is not available to reach to the required standard/quality of the product.

APPENDIX TO CHAPTER 2

Appendix Table 2.1: Urban and Rural Unemployment Rates in Pakistan

(Percentage)

	1969-70	1986-87	1987-88	1988-89
Total Unemployment	2.0	3.1	3.1	3.1
Rural	1.8	2.5	2.6	2.6
Urban	2.4	4.5	4.6	4.6

Source: Economic Survey (1988-89), p.117.

Appendix Table 2.2: Labour Force / Employment

(Millions)

Year	Total Labour Force	Employed Labour Force	Unemployed Labour Force	Unemployment Rate (% of L.F.)
1963-64	16.4	16.2	0.2	0.9
1964-65	16.7	16.5	0.2	1.1
1965-66	16.9	16.8	0.2	1.2
1966-67	17.2	16.9	0.3	1.4
1967-68	17.4	17.2	0.2	1.6
1968-69	17.7	17.4	0.3	1.8
1969-70	18.1	17.8	0.3	2.0
1970-71	18.8	18.4	0.4	1.8
1971-72	18.9	18.6	0.3	2.1
1972-73	19.6	19.4	0.4	1.9
1973-74	20.1	19.8	0.4	1.8
1974-75	20.6	20.3	0.3	1.7
1975-76	21.5	21.1	0.5	2.1
1976-77	22.5	21.9	0.6	2.6
1977-78	23.5	22.7	0.8	3.1
1978-79	24.5	23.6	0.9	3.6
1979-80	25.1	24.2	0.9	3.7
1980-81	25.7	24.7	1.0	3.7
1981-82	26.3	25.3	1.0	3.3
1982-83	26.9	25.9	1.0	3.9
1983-84	27.5	26.4	1.1	3.8
1984-85	28.0	27.0	1.0	3.7
1985-86	28.1	27.9	1.0	3.6
1986-87	29.6	28.7	0.9	3.1
1987-88	29.9	29.0	0.9	3.1
1988-89	30.9	30.0	0.9	3.1
1989-90	31.8	30.8	1.0	3.1
1990-91	32.8	31.8	1.0	3.1

Source: Economic Survey (1991-92).

Appendix Table 2.3: Population and Growth in Developing Countries

Region	1950	1960	1970	1980	1990	2000	1950-60	1960-70	1970-80	1980-90	1990-2000
	Population (millions)						Population growth rate (%)				
Low Income Asia[1]	589	716	909	1,135	1,406	1,694	2.0	2.4	2.2	2.2	1.9
Sub-Saharan Africa[2]	169	212	272	360	480	614	2.3	2.5	2.8	2.9	2.5
Middle East and North Africa[3]	74	94	121	159	206	255	2.4	2.6	2.8	2.6	2.2
East Asia and Pacific[4]	81	106	140	175	214	249	2.8	2.8	2.3	2.0	1.5
Latin America and Caribbean	154	208	273	355	454	556	3.0	2.8	2.6	2.5	2.0
Southern Europe	83	97	111	129	145	160	1.5	1.4	1.5	1.2	1.0
All developing Countries	1,150	1,443	1,826	2,312	2,905	3,528	2.3	2.4	2.4	2.3	2.0

1 Includes Afghanistan, Bangladesh, Bhutan, Burma, India, Indonesia, Cambodia, Laos, Maldives, Nepal, Pakistan, Sri-Lanka and Vietnam.
2 Excludes the Republic of South Korea.
3 Excludes Capital-surplus oil exporters.
4 Excludes Japan.
Source: Squire L (1981), Table 10, p.44.

Appendix Table 2.4: Labour Force by Region 1950-2000

Region	1950	1960	1970	1980	1990	2000	1950-60	1960-70	1970-80	1980-90	1990-2000
	Labour Force (millions)[5]						Labour force growth rates (%)				
Low-Income Asia[1]	259 (44)	298 (42)	351 (39)	429 (38)	524 (37)	623 (37)	1.4	1.7	2.0	2.0	1.9
Sub-Saharan Africa[2]	79 (46)	94 (44)	115 (42)	143 (40)	183 (38)	235 (38)	1.7	2.1	2.2	2.5	2.6
Middle East and North Afriac[3]	23 (31)	27 (29)	33 (27)	42 (27)	56 (27)	70 (27)	1.6	1.9	2.6	2.9	2.2
East Asia and Pacific[4]	36 (44)	44 (41)	56 (40)	72 (41)	90 (42)	109 (44)	2.1	2.4	2.6	2.3	2.0
Latin America and Caribbean	54 (35)	67 (32)	85 (31)	110 (31)	148 (33)	193 (35)	2.2	2.4	2.7	3.0	2.7
Southern Europe	38 (45)	42 (43)	45 (41)	52 (40)	59 (40)	66 (41)	1.1	0.8	1.3	1.3	1.2
All Developing Countries	488	571	685	848	1,058	1,296	1.6	1.8	2.2	2.2	2.0

1 Includes Afghanistan, Bangladesh, Bhutan, Burma, India, Indonesia, Cambodia, Laos, Maldives, Nepal, Pakistan, Sri-Lanka and Vietnam.
2 Excludes the Republic of South Korea.
3 Excludes Capital-surplus oil exporters.
4 Excludes Japan.
5 Figures in parentheses are participation rates
Source: Squire L (1981) Table 10, p.45.

Appendix Table 2.5: Rural and Urban Population Growth 1950-2000

	Percentage Urban Population			Average Annual Growth (%) 1950-80		1980-2000	
Country group	**1950**	**1980**	**2000**	**Urban**	**Rural**	**Urban**	**Rural**
All developing countries	18.9	28.7	..	3.4	1.7	..	..
Excluding China	22.2	35.4	43.3	3.8	1.7	3.5	1.1
Low-income							
Asia	10.7	19.5	31.3	4.4	2.0	4.2	0.9
China	11.2	13.2[a]	..	2.5	1.8	..	..
India	16.8	23.3	35.5	3.2	1.8	4.2	1.1
Africa	5.7	19.2	34.9	7.0	2.5	5.8	1.5
Middle-icome							
East Asia and the Pacific	19.6	31.9	41.9	4.1	1.8	3.1	0.9
Middle-East and North Africa	27.7	46.8	59.9	4.4	1.6	4.3	1.6
Sub-Saharan Africa	33.7	49.4	55.2	3.1	1.0	2.9	1.7
Latin America and Caribbean	41.4	65.3	75.4	4.1	0.8	2.9	0.4

a Government estimate for 1979.
Source: World Development Report (1984), p.67.

Appendix Table 2.6: Output in Manufacturing Sector (at 1959-60 prices)

(Million Rupees)

	1960	1970	1980	1988
Total Manufacturing	2018	5187	8803	17201
Large-Scale	1159	4043	6417	12654
Small-Scale	859	1144	2386	4547
Small Scale (% of Total)	43	22	27	26

Source: Economic Survey (1991-92).

Appendix Table 2.7: Distribution of GDP over time (at 1959-60 price)

(Percentage)

Sector	1960	1970	1980	1988
Agriculture	46	39	31	25
Mining & Quarrying	-	1	1	1
Manufacturing	12	16	17	20
(Large-Scale)	(7)	(13)	(12)	(15)
(Small-Scale)	(5)	(3)	(5)	(5)
Construction	3	4	5	6
Electricity & Gas	1	2	3	3
Transport	7	6	7	7
Wholesale & Retail Trade	13	14	14	15
Others1	21	18	23	24

1 Includes Banking & Insurance, Ownership of dwellings, Public administration & Defence and Services Sectors.
Source: Economic Survey (1991-92).

Appendix Table 2.8: Investment in Manufacturing Sector (at current prices)

(Percentage)

	1965	1970	1981	1988
Gross Fixed Capital Formation	100	100	100	100
Total Manufacturing	24	23	25	23
Large Scale	22	21	22	20
Small Scale	2	3	3	3
Small scale(% of total manufacturing)	8	13	12	13

Calculated from Economic Survey (1991-92).

Appendix Table 2.9: Growth Rates in Manufacturing Sector (at 1959-60 prices)

(Percentage Per Annum)

	1950-60	1960-70	1970-80	1980-88
Agriculture	1.6	5.0	2.3	3.7
Manufacturing	8.0	9.9	5.4	8.7
Large-Scale	15.4	13.3	4.7	8.9
Small-Scale	2.3	2.9	7.6	8.4
Construction	9.1	12.2	7.0	7.8
Electricity & Gas	12.4	22.1	9.1	8.4
Trade	3.6	7.8	5.2	7.2
Others	3.3	5.6	7.1	7.1

Caculated from Economic Survey (1991-92).

CHAPTER 3

FACTOR PRICE DISTORTIONS, UNDERUTILISATION OF CAPACITY AND EMPLOYMENT: SOME THEORETICAL VIEWS

3.1 Introduction

In the previous chapter we have seen that the manufacturing sector has limited capacity to provide employment opportunities. There are many factors such as technological progress, economies of scale, skill upgrading, and managerial reorganisation which may reduce employment opportunities in the sector.[1] The most striking element, widely discussed in the development literature is the issue of capital deepening.[2] It is generally believed that physical capital intensity, whether measured in terms of capital-labour ratios, or value added per worker is high in the manufacturing sector of developing countries.[3] The basic assumption is that labour is abundant (and presumably cheap), whereas capital is scarce (and presumably dear) and that therefore, whenever a choice is possible between two methods of producing the same product the more labour-intensive method will be preferred. However, in practice in most of the developing countries the prices of certain inputs fail to truly reflect the supply situation of those items; for a variety of reasons factor prices are distorted in favour of more use of capital.[4] In consequence, the labour absorptive capacity of modern industry is low.

To rectify the situation three broad policy suggestions have been advanced; changing factor price ratios, utilisation of idle capacity and, finally, changing the demand pattern. Our discussion will be confined mainly to the first two suggestions; factor price distortions and underutilisation of capacity, though in the long-run removal of factor price distortions can also have a strong impact on changing the pattern of demand.[5]

This chapter discusses the role of relative factor prices and capacity utilisation in determining techniques of production and affecting employment in the manufacturing sector. The relevance and importance of these factors to employment generation in the manufacturing sector of Pakistan will be dealt with in subsequent chapters.

3.2 Relative Factor Prices and Employment

There are two conflicting views concerning the role of relative factor prices in generating employment opportunities in the manufacturing sector. The first is the optimistic view under the neoclassical paradigm according to which changes in relative factor prices can affect employment via changing techniques of production. The basic assumption under this approach is that substitution possibilities between capital and labour exist.

The second is the pessimistic view under the "technological determinists"[6] which, for various reasons (which are discussed later), rejects any positive role for relative factor prices in determining techniques of production. The basic assumption is that capital and labour are used in a fixed proportion and no substitution possibilities between capital and labour exist in the production process.

A brief review of these two approaches/views is made in the following sections.

3.3 Factor Price Distortions and the Neoclassical Approach

The concept of factor price distortions and its effect on employment forms the central pivot of much of the neoclassical analysis of economic growth. In a neoclassical world of perfectly competitive conditions, free interplay of market forces would allocate resources in such a way that output and employment are maximised. In the absence of any `imperfections', the economy would quickly move to an equilibrium in which there is no involuntary unemployment. Open unemployment is then attributed to interference with the free and flexible working of the perfectly competitive capital and labour markets (see for details, Godfrey, 1986, Clark, 1985, pp. 106-110). The argument is that if there is no government interference in the smooth functioning of markets, factor prices would reflect scarcity prices and would ensure the selection of techniques according to the factor endowments of the country.

In the context of technology,[7] the neoclassical approach can be explained in the model of choice of techniques (see Stewart, 1977, Godfrey,1986, Colman and Nixon, 1986). In this model it is assumed that output can be produced with the assistance of two inputs; capital and labour. A range of techniques is available to produce any given level of output. From the available techniques, i.e. capital-intensive or labour-intensive, the firm will choose that technique which maximises profits, given the relative factor prices, and the substitutability between capital and labour. Factor prices are the sole determinant of the choice of techniques. With the change in relative factor prices, the selection of technique of production also changes. The crucial assumption is that substitution possibilities between capital and labour exist.

The neoclassical approach can be explained with the help of Figure 3.1. The smooth isoquant curve YY shows all combinations of capital and labour which, for given technical conditions, will produce a given level of output. Given the relative prices of resources shown by the isocost AB, OK units of capital are used in combination with OL units of labour to produce Y units of output. If labour becomes cheaper relative to capital in terms of the shift in the price line from AB to CD, it would be possible to produce the same level of output with less capital (OK1) and more labour (OL1).

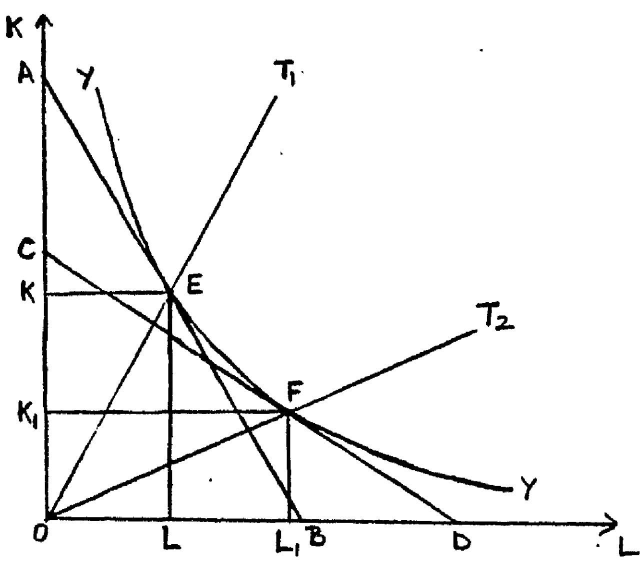


Figure 3.1: Choice of Techniques

The shape of the isoquant (which is determined by the marginal rate of technical substitution between capital and labour) ensures that quite small changes in factor-price ratios will be reflected in changes in factor combinations. The shift from E to F shows the substitution of capital for labour with respect to change in relative factor prices.

Technological progress is assumed to be neutral affecting all techniques equally.[8] At any one time choice of technique is between techniques represented by an isoquant though an isoquant may shift inward over time implying neutral technical change (see Clark, 1985, Stewart, 1977).

The application of this model in developing countries concentrates on this critical aspect that given the relative availability of labour and capital, the unskilled wage rate is too high in relation to the price of capital. This in turn encourages more use of capital-intensive techniques in these countries as reflected by the technique T1 (Figure 3.1). The argument is thus to remove factor price distortions to reflect scarcity prices or to subsidise/tax factor use.

The practical significance of the role of factor prices in determining the choice of techniques in the neoclassical framework however, depends on substitution possibilities between capital and labour. If the substitution between capital and labour is comparatively easy (the elasticity of substitution is high) then variations in relative factor prices can affect the level of employment. If the substitution is relatively difficult (the elasticity of substitution is relatively low), then changes in capital-labour ratios through changes in factor prices will be difficult. Estimating the elasticity of substitution implies an analysis of the production function and its translation into an estimable form.[9] The Cobb-Douglas and the CES production functions have been mostly used to estimate the elasticity of substitution between factors of production and, more significantly, the impact of wage changes on industrial employment growth in developing countries.[10] The results obtained are said to support the contention that shifts in relative factor costs will be largely reflected in shifts in relative factor use. For instance in the case of Ghana, Roemer (1975) suggests that a 25% fall in the wage-rental ratio could create 30% more jobs, over short period of five years (p.89). Harris and Todaro (1969), in the case of Kenya reveal a wage elasticity of demand for unskilled labour of 0.76 in the modern private sector (industry and commerce) in 1953-63 (p.36). Kim (1984) estimated the elasticity of substitution for 9 two-digit small and large firms in Korea and showed that the elasticity of substitution ranges from the high (0.89) in the chemicals, pcoal, rubber, and plastic to low (0.01) in wood and wood products in the small-scale industries while it ranges from 1.61 in the chemicals, coal, rubber, and plastic industries to 0.47 in other manufacturing in the large-scale firms (pp. 151-152).

3.3.1 Assumptions

The neoclassical model of choice of techniques is based on certain restrictive assumptions which are listed below:

- Only two factors of production i.e., capital and labour are taken into account in the production process.
- There are constant returns to scale in the production process.
- All techniques of production are equally efficient.
- Factor prices are the critical determinant of the choice of techniques.
- A wide range of techniques is available to produce a given level of output.
- Entrepreneurs are profit maximisers and act rationally.

Most of these assumptions have been criticised and indicate many limitations of the model. These are discussed below.

3.3.2 Limitations and Other Qualifications

The neoclassical model of choice of technique has been criticised mainly for its stringent assumptions mentioned above. A fundamental objection is that this model picks out just two factors of production - labour and capital. It completely ignores other factors which are also important in determining the choice of techniques such as material inputs and infrastructure, skilled labour requirements, and economies of scale, etc. (Godfrey, 1986, Stewart, 1977). However, many of these factors have been introduced and incorporated in the empirical analysis of the production function.[11]

Another criticism is that all units of capital and labour are assumed to be homogeneous. The aggregation of capital goods which are built at different times, at different costs and with varying productivities, and equating the marginal productivity of capital with the rate of profit may severely limit the analysis of production functions (Robinson, 1962). As regards the aggregation of heterogeneous capital goods, the objection is quite valid. However, we think that in practice it is very difficult to overcome this limit because the problems of measurement of capital stock are well known. Techniques for approximating the value of capital stock are discussed in Chapter 4.

Similarly labour is also not homogeneous in the sense that there are considerable differences in the quality of labour. Skilled and unskilled labour cannot be treated together. But if we consider the characteristics of labour in developing countries the majority is unskilled. Thirlwall (1983a) say that although the aggregation of heterogeneous inputs is a worry, nonetheless capital and labour aggregates seem to perform well in production-function studies as measured by the correct picture they convey of relative factor shares (see for details Thirlwall, 1983a, p.68).

Another objection is that labour may be abundant, and its cost may be lower than in developed countries, but this is offset by its low productivity so that it is not necessarily cheaper or less costly to employ in developing countries. In other words, the so-called efficiency wage (that is the wage rate divided by the productivity of labour), or wage costs per unit of output, may differ very little between the developing and developed countries (see for details Thirlwall, 1983a, pp 38-40).

It is also argued that the approach highlights an important subsection of technical choice that is concerned with the capital/labour intensity aspect of producing a given output (Stewart, 1977). The developments of techniques could be viewed as a historical process. With the progress of technology, some techniques become obsolete in efficiency terms (Stewart, 1977, Clark, 1985). These may at one time have been the most efficient labour-intensive techniques in existence, but then may have gradually become obsolescent. Hence the movement of factor prices will not have any effect on factor proportions (Stewart, 1977). Although this objection may not be ruled out, some reservations must be made about the source and development of technology. As most of the developing countries import their technology from developed countries (see Stewart, 1977, chapter 5) the development of techniques probably also takes place there. We think that if developing countries have the capability to adapt the imported techniques, or if they use their own technology or if techniques are developed in developing countries, the technological development may be labour-intensive because efforts would probably be made to develop labour-intensive techniques.

There are many economic and empirical problems in estimating the Cobb-Douglas and the CES production functions. For example, there is an identification problem in attempting to distinguish shifts in the function (technical progress) from movements along the function (changes in factor intensity) unless the assumption of neutral technical progress is made. Technical progress may not be neutral and therefore the effects of technical progress[12] and changing factor intensity become confused, biasing the results of the contribution of factor inputs and technical progress to growth (See Bhalla, 1975).

Many other qualitative considerations which are also important in relation to the technological choice have been ignored in the neoclassical theory of production. For example, sometimes high levels of mechanisation may be necessary to ensure high quality which is especially important when export markets are concerned. The use of more capital can substitute for managerial skills in organising and supervising workers, skills which are even in shorter supply in most LDCs than is capital.[13] The frequency of breakdown of machinery and the repair and maintenance costs are also considered in making any decision. These factors have also been ignored by the neo-classicists. Moreover, the frequency of lock-outs and the difficulties in laying off labour whenever required also influence the choice of techniques.[14]

Non-labour costs are sometimes more important in making decisions. Stewart (1975) estimated the fuel costs for labour-intensive and capital-intensive techniques respectively. She shows that fuel costs are much higher in the case of capital-intensive techniques than in that of labour-intensive techniques. It is quite possible that high fuel costs may encourage investors to choose labour-intensive techniques.

Despite these criticisms the neoclassical theory within the production function framework has been widely used for empirical purposes to estimate the elasticity of substitution in the manufacturing sector (See White,1978, Bhalla, 1975 for the references of these studies). Moreover, according to Barua (1985), in the absence of any other better alternative, the production function approach is still used for empirical research (p.3).

Some suspect that the neoclassical theory may not have any practical significance as a policy prescription (see for example, Sutcliffe, 1971, Sen, 1972, Clark, 1985), we think the approach may be useful in highlighting the important technological features of industries to see the employment potential there.

3.4 How are Factor Prices Distorted?

We have seen above that neo-classicists blame factor price distortions as a major cause of open unemployment in developing countries. The question may be asked how and why are these prices distorted? The main reason for factor price distortions in developing countries has been well explained by Ranis (1971), when he attributes the failure of the governments of developing countries to allow `the changing factor endowment of society to be `heard over time' by permitting a close relationship between the market prices of the factors of production and their equilibrium level. Cordova (1972) says that a wide variety of government policies make capital artificially cheap in capital-short economies, while labour is artificially expensive in many of these same economies.

Up to the 1970s, factor price distortion was mostly associated with the development/trade strategy of import substitution industrialisation (ISI) which is usually associated with over-valued exchange rate, low interest rates, tariff concessions to imported capital goods, and tax holidays etc.[15] Balassa (1988) examined in detail the effect of different policy measures on the resource allocation in different developing countries and, according to him, the ultimate effect of factor price distortions was the flow of resources away from labour-intensive to capital-intensive industries (pp. 449-461). Nevertheless, we think that factor price distortions are not necessarily related to the ISI strategy. Under the alternative trade strategy i.e, export-oriented industrialisation (EOI)[16], factor prices may also be distorted through various forms of government intervention in capital and labour markets. For instance, in the case of Korea which relied mostly on EOI since 1960s, the government subsidised the cost of capital and increased capital intensity in export goods industries (see Hong, 1981, pp. 341-387). Nevertheless, factor price distortions may be less in the EOI than in the ISI strategy (See Balassa, 1988, Table 1, p. 451).

In the beginning of 1970s, however, many developing countries began to shift their development strategy from ISI to EOI for a variety of reasons[17] and a wave of liberalisation began to spread all over the developing countries (For the case for, and advantages of, trade liberalisation see Harrison, 1991, Salvatore and Hatcher, 1991, and World Development Report, 1990).

Nevertheless, the possibility of factor price distortions is relevant even with the change in the development policy of industrialisation from ISI to EOI. The major reason is that since the 1970s the real wages of industrial workers have increased substantially in many developing countries. For example, the index of industrial real wages rose from a base of 100 in 1970 to 276 in Korea, and to 112 in Argentina in 1984. In India the index increased from 100 in 1970 to 130 in 1979 (Amsden, 1989, p.196, Table 8.1). The industrial real wages in Pakistan also began to show an upward trend especially after 1970 (this will be discussed in Chapter 5). There may be many factors responsible for the increase in real wages of industrial workers but mostly government interference in the labour market (as has been mentioned earlier) through various legislation, such as statutory minimum wages, compulsory social insurance and the like, is blamed for distorting the price of labour in the industrial sector.[18] According to the World Development Report (1990), when governments intervene in the markets for capital and labour, they often increase the anti-labour bias of protection. Many countries make imports of capital goods cheap (through low tariffs and overvalued exchange rates), offer tax breaks for investment in capital equipment, and subsidise credit - all of which tend to reduce the price of capital. On the other hand, labour market policies such as minimum wages, and job security regulations are usually intended to raise welfare or reduce exploitation. But they actually work to raise the cost of labour in the formal sector and reduce labour demand (World Development Report, 1990, p.63). In the case of India and Zimbabwe it is said that by trying to improve the welfare of workers, governments reduced formal sector employment, increased the supply of labour to the rural and urban informal sectors, and thus depress labour incomes where most of the poor are found (World Development Report, 1990, p.63).

It may be argued that with the rise in productivity in manufacturing, average wages should also rise. White (1978) says that this argument is wholly inappropriate with widespread unemployment and underemployment. As long as there is substitutability between capital and labour, greater capital shallowing should be encouraged through low wages; only when labour grows scarce should real wages rise in line with productivity (White, 1978, p.48). This of course was the basis of Lewis's (1954) seminal article. Another view is that under conditions of unlimited supply of labour, absence of migration, and weak grouping of unskilled workers, one would expect at most stability - if not a decline in real wage rates (Amsden 1989, p.195).

Though the cheap-capital and high wage-policies have laudable goals - to encourage investment and to raise workers' income - their inevitable result is to encourage entrepreneurs to substitute away from labour to capital-intensive processes (see ILO, 1970, pp. 44-45).

3.5 Some Other Views on the Choice of Techniques

An early contribution in the issue of the choice of techniques in labour surplus economies was in terms of the maximum output-capital criterion. It was Polak (1943) who first suggested the maximisation rate of turnover, defined as the ratio of output (or turnover) to capital as a basis for investment criteria for the countries reconstructing after the war (p. 218). Later Kahn (1951) used the criteria of social marginal productivity (SMP) for the choice of techniques to maximise the national product. The SMP criteria states that from the welfare point of view of society as a whole the total available capital should be allocated in such a way that the marginal unit of capital in each industry or sector should yield the same contribution to the national product.

A completely different line of argument favouring capital-intensive technologies has been given by Galenson and Leibenstein (1955) which rests on the investible surplus/growth criterion for the choice of techniques. The argument is that relatively capital-intensive techniques would mean high returns to capital, and capitalists have higher savings and reinvestment rates than do workers and this reinvestment is imperative for future growth of income and employment (Galenson and Leibenstein, 1955, pp. 343-70). As developing countries have low savings and low income, relatively capital-intensive techniques are selected to generate more income and employment in the future. Along the lines of Galenson and Leibenstein (1955), Dobb (1955) and Sen (1972) also advocated the similar criterion of investible surplus in the choice of techniques. These arguments are based on certain assumptions e.g. all profits are saved and reinvested and no savings take place out of wages, there is no role of the government to raise the level of savings etc. (see for details Sutcliffe, 1971, pp. 164-165, Colman and Nixon, 1986). The arguments relating the high rate of savings to relatively capital-intensive techniques has not been supported by many empirical studies. For example, Ranis (1961) in the case of Pakistan provides evidence that medium-size (less capital-intensive) firms have higher savings and reinvestment rates per unit of output than do the large. Appavadhanulu (1974) argues that small firms in India have higher saving rates than large firms. Moreover, Stewart and Streeten (1971) have found that most of the assumptions on which the investible surplus criterion is rested are completely invalid (See for details pp. 145-168).

3.6 Two Views: Separate but May be Interrelated Indirectly

Mostly in the context of the choice of techniques, the "investible surplus criterion" and "factor price distortions" are discussed together in the economic literature (see Sutcliffe, 1971, Colman and Nixon, 1986). Although both are related to the reasons for increased capital intensity in developing countries, we think it may be useful to make a clear distinction between these two types of arguments because;

(a) in practice, the choice of techniques depends on who makes the investment decisions. In a planned economy if a large part of the investment decisions are made by the government, capital-intensive techniques of production may be chosen on the basis of the "investible surplus criterion" in the belief that relative capital-intensive techniques would generate more savings in the economy. However, if most of the economic decisions are made by private investors in a capitalist or mixed economy, then it is not necessary that the private investors would choose capital-intensive techniques of production on the basis of investment surplus/growth criterion. In this case, the government may subsidise the cost of capital to attain the required objective. Hence, in our opinion the arguments by Galenson and Leibenstein (1955) may answer indirectly why the governments in developing countries distort the relative price of capital.

(b) on the other hand, the neoclassical arguments are not concerned with the question of why factor prices are distorted. They simply state that factor price distortions are a major cause of low employment in developing countries. However, in the context of removal of factor price distortions an immediate question may be asked about the impact of changing relative factor prices on the rate of savings in the economy as a whole in terms of

Galenson and Leibenstein (1955) arguments. In this way both of the arguments may be interrelated indirectly.

(c) another difference is that the arguments based on the growth and saving criteria are in fact macro-economic theoretical models. It is very difficult to test them empirically at the micro - or industry-level because information on the rate of savings by different industry groups is not easy to obtain. On the other hand the neoclassical theory can be tested empirically on a micro basis in the form of production function for different industries as well.

3.7 Fixed Factor Proportions/Technological Determinists

Concerning the substitutability between capital and labour, the "technological determinists" maintain that technical efficiency alone determines the eventual choice of technique and since technically efficient techniques are capital-intensive ones, the norms of efficiency dictate continuous capital deepening in production. No choice of techniques is possible, as the elasticity of substitution between capital and labour is zero or near zero.[19] In this case the production function is L shaped and there is complete technological fixity (Figure 3.2).

It has been illustrated in Figure 3.2 that for any given amount of investment say, OK, a unique amount of employment, OL will be generated irrespective of factor prices. The increase in output and employment would be only possible by increasing the level of investment.

Different reasons have been given to explain fixed factor proportion phenomenon. Sometimes it is said that the structure of industry requires a fixed proportion of capital and labour irrespective of factor prices. For example the oil refinery, heavy chemicals and iron and steel industries require a fixed proportion of inputs and technical constraints may prove to be the decisive element.[20] The importance of such industries cannot be ignored in the development of a healthy industrial base.[21] Our argument is that even in capital-intensive type of industries, the production of any good can be split into a number of activities and there are inevitably certain processes in which the choice of techniques is possible.

In fact, much of the literature on technological choice is concerned with the production of final output. Nevertheless, the manufacturing of most products involve a series of processes, each consisting of a different activity or task which requires different inputs of unskilled labour, skills and equipment. For some tasks very little scope will exist for substituting capital for labour, whereas for others a range of efficient possibilities may exist. For example, Stewart (1975) in her analysis of cement blocks in Kenya, investigated at least nine processes in the production of cement blocks, and the actual block making machine was only one part of the production process (p.228). Similarly, Boon (1975) in the case of metalworking in Mexico found 88 processes out of which 55 were those where the choice of technique was possible (P.261). In the iron and steel industry, for example, there may not be any choice of technology in the process of the furnace itself at a very high temperature but loading or unloading of iron ore can be done either with the use of labour or machines. So it is wrong to say that if capital-intensive industry is established, no choice of techniques is possible. What requires is the need to analyse on a disaggregated basis the possibilities of substitution between capital and labour.

During the 1970s, the rigidity in the choice of techniques was expressed in terms of the dependence of developing countries on developed countries for their technology. The argument put forward was that since the technology is developed in advanced countries for their factor proportions, it is likely that it will be too capital-intensive for less developed countries.[22] Much attention was also paid to the transfer of technology[23] and the need to adapt imported technology to local conditions through R & D expenditure.[24]

3.8 Concluding Remarks on Factor Prices

The empirical studies on the substitution possibilities between capital and labour were mainly concerned with finding out whether the techniques of production are flexible or rigid in the production process. Relative factor prices can play an important role in the former case while in the latter case other measures than changes in relative factor prices are required. In reality, neither complete flexibility nor complete rigidity in the choice of techniques has been found. The econometric studies of the elasticity of substitution confirm the possibility of substitution between capital and labour with respect to relative factor prices.[25] The engineering and process analysis studies also tell the same story.[26] However, doubts have been expressed about the flexibility of technology once the products (and so the income distribution and the tastes) are specified (Stewart, 1977).

In the light of our discussion we may say that relative factor prices may not be the only factor determining the choice of techniques. Other qualitative factors such as the quality of product, costs of other inputs such as fuels, the frequency in machine breakdown and the availability of spare-parts are also considered in the adoption of a specific technique at a particular point of time. We think that in a country like Pakistan where factor prices were severely distorted in the past and where the manufacturing sector is experiencing high real wages, the analysis of factor price distortions and their effect on changing capital-labour ratios in different industries would be useful to obtain an insight into an important variable affecting employment opportunities in the sector. The analysis may be also useful in the present situation of high unemployment and underemployment in Pakistan (as has been discussed in Chapter 2), particularly when one of the objectives of the government is to increase employment opportunities in industrial sector (Planning Commission, 1983).

3.9 Uderutilisation of Capital Stock

Another important factor affecting employment and output in developing countries is the existence of an idle stock of capital. Owing to the scarcity of capital in developing countries it is generally suggested that more utilisation of the existing capacity would not only increase output and employment but will also reduce capital intensity (see Winston, 1971, 1974a,b). From a macro perspective, capacity is defined by Winston (1977), as "the maximum sustainable level of output (per year) that can be obtained when the economy's available resources are fully and efficiently employed, given tastes and technology" (p.418). From a micro point of view, Klein and Long (1973) define capacity at the firm level as the output that achieves the lowest average costs. Given a certain level of technology, there is a maximum amount of labour that can be employed on a given piece of capital equipment. In most developing countries, the capital stock in the manufacturing sector is not fully utilised. For example, Farooq and Winston (1978) cited in their studies that industrial capital stocks in both Pakistan and Korea are idle over 85 per cent of the time (p.227).[27] Hence, the role of capacity utilisation cannot be ignored in the field of generating industrial employment opportunities, since it can have a positive effect on output, distribution and employment.

3.10 Capacity Utilisation, Employment and Shift Work

Additions to the stock of capital not only increases the rate of growth but may also provides new job opportunities. Plants operated for only a small part of the time will almost always use fewer man-hours of labour than the same plant operated at a high level of utilization. It is said that the effect of changing utilization on both capital productivity and employment is greater the less it is possible to alter the proportions in which capital and labour services are used (Winston, 1977, pp. 418-21). Because the more rigid the number of men needed to operate a plant, the greater will be the effect on output and employment of a given increase in capital utilization. Given no opportunity to change the number of men needed, any increase in utilization would bring a proportional increase in man hours and output: a 15 per cent increase in utilization would have to be matched by a 15 per cent increase in man-hours. On the other hand, to the extent that there is an opportunity for the substitution of capital services for labour services, a firm can increase utilisation by 15 per cent while increasing man-hours (and output) by something less than 15 per cent (see Kabaj, 1968, pp. 243-73).

Alres (1974) has drawn attention to the considerable possibilities for expanding employment that are offered by the introduction of multiple shift work but has also stressed that it is quite impossible in practice to achieve the trebling of employment that would theoretically be obtained by adopting a system of three eight hour-shifts working continuously. Shift working is in fact suggested to utilise the existing unused capacity on the basis of the proposition that industrial workers in LDCs prefer to work at any time than to remain unemployed. Farooq and Winston (1978) argue that unemployed industrial workers in Pakistan preferred to work days if given the choice, but the vast majority would take a job at any time of the day. The relationship between employment and shift work system can be explained with the help of

Table 3.1.

Table 3.1 presents a theoretical model of capacity utilisation through shift work advocated by Kabaj (1968). Three levels of capacity utilisation are given. A is the minimum level and C is the maximum. With the same fixed assets the theoretical employment opportunity level varies from 1 to 3, which may play a crucial role in the employment expansion strategy in developing countries. In certain developing countries the transition from A to B and C was possible and was achieved in practice as has been expressed by Kabaj (1965), who claimed firmly that the change in the pattern of capacity utilisation played a substantial role in employment expansion. If total employment level is 100 in one shift in any industry, then introducing a second shift in the same industry will also require 100 workers i.e, the total employment would be 200 and there would be net increase of employment up to 100. The policy lies in raising the shift coefficient which is the ratio of actual shift to the optimum level of shift as has been defined by Kabaj (1968).

The approach explained in Table 3.1 is too simplistic and suffers from many limitations. It has been assumed in this theoretical model that the same quantity of labour is required in the second shift. In practice it may be very difficult to achieve the same proportional increase in employment level to the increase in number of shifts. Similarly it has been assumed that plants operate 24 hours a day and no allowance has been made for the maintenance of the plant in this theoretical model. However, this objection may become invalid if the plant operates five days a week. But it is not clear how many days in a week the plant will operate thus creating a confusion about the maintenance allowance of the plant. It is quite possible that administrative staff may not be available all the time as required.

Table 3.1: Pattern of Capacity Utilisation

	Number of shifts	Number of working hours per shift	Number of working hours per day	Employment opportunity level
Pattern A	1	8	8	1
Pattern B	2	8	16	2
Pattern C	3	8	24	3

Source: Kabaj M.,(1968) p. 247.

3.11 A Model of Employment Expansion Through Utilisation of Idle Stock of Capital

In this part we will develop a model which relates employment expansion to capacity utilisation. Our main hypothesis is that there is a positive relationship between employment and capacity utilization. We assume that there is a fixed proportion between labour and the existing capital stock to produce a given level of output and this ratio remains constant. At time t the capital stock is not fully utilised, hence output is not at the maximum level. The basic assumption is that at this level of output employment is low. So the total stock of capital at time t is Kt and the utilised stock of capital is Ku. The difference between these two is the idle stock of capital. The present level of employment (L) has a fixed proportion to the working or utilised capital (Ku). L/Ku is fixed. If this ratio is maintained, then the utilisation of idle capital will give a new level of the employment created by it. Thus we have;

Idle capacity = Kt - Ku = Ki

Labour capital ratio = L/Ku

New employment level = L + L/Ku. Ki

The above mentioned approach is a very simple mathematical calculation of employment generation through utilisation of idle capacity. It assumes that technology and the distribution of income remains the same and more utilisation of idle stock will generate more employment. Sometimes however, if the same workers work overtime, there would not be any net increase in total employment. In this case the net effect on employment of capacity utilisation may be felt in the long-run via higher incomes.

3.12 Measures of Capacity Utilisation

While it is generally recognised that industrial capacity is underutilised, it is not always easy to estimate the extent of underutilisation owing to ambiguity in the definition of capacity and difficulties in measuring the rate of utilisation. Many economists such as Leeuw (1962), Schultze (1963), Phillips (1963), Winston (1974a,b), Betancourt and Clague (1975), and Lim (1975, 1976), have explained the concept of capacity utilization, problems in its definition and methods to measure it.

There are different concepts of capacity utilisation such as rated capacity, assessed capacity, and installed capacity. But the basic difference that has been established in the literature is between economic capacity and engineering capacity. The former is defined as that level of output which corresponds to the least short-run cost combination of factor inputs. The latter simply regards capacity output as the maximum output per unit of time irrespective of cost or demand conditions.

Engineering capacity can be quantified, while economic capacity has proved to be an elusive concept as it has usually been found that there is not a unique optimum combination on the short-run average cost curve and therefore a range of capacity outputs could result.

At a micro level, there are two approaches to measure capacity utilisation. The first is by the survey of firms. In the USA, the measure of capacity utilisation by McGraw-Hill (1961) is based on this approach. In this method, firms are usually asked to respond about their `actual' or `preferred' or `full capacity' output rates. There are many drawbacks in this technique.

The concept of full capacity is not fully defined. Companies set their own definitions and follow a common sense definition of capacity, such as maximum output under normal work schedules. However, such surveys can be useful to get information on the amount of spare capacity as viewed by the entrepreneur.

The second measure is a time-series approach by the Wharton School Econometrics Unit developed by Klein and Summers (1966). Their procedure is very simple. Linear segments between successive peaks and cyclical peaks in production are marked off. The linear segment between two successive peaks is extrapolated until a new peak is reached. The primary advantage of the Wharton School Index is that its computation is quick and easy. This approach is based on three assumptions. (1) Potential output grows at a constant absolute rate between two peaks. (2) Potential output is reached at each cyclical peak. (3) Potential output can be extrapolated. The second and third assumptions are not plausible. It is likely that at cyclical peaks, labour and capital are being used at more than normal intensity levels. The third assumption will not hold true if the investment rate varies significantly between periods.

Lim (1975) provides important insights into the weaknesses inherent in the various popular measures of capacity utilisation, and provides examples based on 1972 data for West Malaysia and suggests a number of micro measures of capacity utilisation. He refers to the shift measure, as one of the earliest of capacity utilisation. This approach compares the actual number of shifts worked in a year with the possible number of shifts. But he strongly opposes this measure being used in developing countries, because shifts may be longer than 8 hours, in which case taking three shifts may overstate capacity.

Lim (1975) also refers to the electricity measure. Here the actual consumption of electricity by electricity motors in a plant in kilowatt-hours is compared with the rated capacity on the assumption that 10 per cent of the power input into electric motors is dissipated in the form of heat. Kim and Kwon (1971) used the electricity measure of capacity utilisation for South Korean manufacturing and found the average rate of capacity utilisation was only 25%. According to their opinion the electricity measure has strong built-in downward bias for many reasons.

Morawetz (1976), determines the extent of this bias for industries in Israeli and Philippines. He finds that it gives a measurement of capacity utilisation on average three times lower than other measures.

A more reliable measure of capacity utilisation, suggested by Lim (1976) is the time measure, (Ut), which measures the number of hours that capital plant is utilised to the total number of hours available in a year i.e. 8760. The basic defect in this technique is that it does not allow for compulsory holidays and plant shut downs. However, Ut is still a good approximation.

More refinement to the Ut measure is the inclusion of the concept of intensity of use of plants (Uit), which adjusts the Ut according to the intensity of different shifts. If entrepreneur intends to use 100% of its plant capacity there is no need to adjust Ut. However, if the intention is 50% then Ut has to be adjusted downward by half. Lim (1976) has measured the value of Ut and Uit for 350 West Malaysian manufacturing establishments in 1972 at the three digit level of the Malaysian Industrial Classification. The principle conclusions he made are that the rate of Ut was slightly higher than Uit. Ut on average was 75% while Uit was 71%. The difference between the two is generally less than 10% and does not appear substantial. Therefore, subject to some downward adjustment, Ut is a good approximation to the rate of capacity utilisation. The great advantage of this method is that it is non-technical and easy to calculate.

3.13 Causes of Idle Capacity

Numerous reasons have been identified by economists to explain the existence of idle stock of capital; but generally these fall into two categories and are best explained by Winston(1974a) in his statement,"aside from the small amount of time necessary for maintenance, idle capital is explained as a consequence of unwanted (unintended) accidents and adversities that occur after a plant is built, or as a result of rational ex ante investment planning"(p. 1302). Unintended idle capacity may be due to the deficiency of demand for the product or due to the non-availability of raw materials and imported inputs which is more relevant in developing countries as a major cause of idle capital stock (Hogan,1967, Schydlowsky, 1973). For example, entrepreneurs, after building a plant, may expect to have easy access to foreign exchange for importing inputs and spare parts; but the ex post situation is quite different and scarcity of foreign exchange disturbs their plan. Hence a part of the capital stock remains idle (Thoumi, 1973).

On the other hand, intended idle capacity is based on profitability considerations. Winston (1974b) has developed a theoretical model of capital utilisation and optimal shift work on the basis of Marris's(1964) analysis of cost differentials between two shifts If the cost of production declines in the second shift, it may be optimal to increase the number of shifts and vice versa (see Winston, 1974b, pp. 524-26). Marris' (1964) explanation of idle capacity rested on wage rate differentials in different shifts preventing optimum utilisation of capital stock. According to him, wages at night time are higher than the day time because the former has a higher opportunity cost. Hence, wage differentials paid to night shift workers determine the rate of capacity-utilisation.[28] Later on, subsequent developments of the model have generalised this to other inputs and other periods. For example, Nerlove (1972), pointed out that input price changes affect the utilisation of capital stock. Seasonal variations affect the prices of agricultural raw materials. Electricity is cheaper during off-peak periods; such variations in input prices appear are inevitably widespread.[29]

In developed countries, labour is scarce and skilled. Moreover, it has an option to select between work and leisure at different times of day and night. The resulting wage differentials between different times play a significant role in making decisions on capacity utilisation. In Great Britain the range of night work differentials was 17-25% in 1970. In Colombia, legislated night differentials are 50% (Thoumi, 1973). Standard practice in the U.S. pays a premium of 50 % for Saturday work and 100 % for Sunday.

In developing labour surplus economies, in the presence of unemployment and without any unemployment benefit, people may not have a choice between leisure and working time. So wage differentials may not exist. But in certain cases labour can become costly at night times in developing countries as well. For example, there is the possibility of night time wage differentials for skilled workers. Sometimes management and supervisory staff are not available for the night shift, so to induce them to work at night a higher wage may be offered. However, as a whole, the ratio of skilled labour to unskilled labour is quite low in developing countries. Some industries may not require highly skilled labour. Since there is difficulty in getting information on the proportion of skilled and unskilled labour in developing countries, it is usually assumed that labour is unskilled, homogeneous and there is no shortage of labour supply. In consequence, no wage differentials may exist.

Under monopolistic competition, where firms face a downward sloping demand curve, plant may be used below its optimum level to gain a higher share of profit. Fluctuations in demand justify the intentionally idle capital for perishable products and services. Smith (1969) views market structure combined with demand fluctuations as a cause of under-utilisation of capital. Giglo (1970), considered the effect of stochastic demand and equipment life as explaining the existence of idle capacity. So it can be said that some causes of idle capital come from the product demand side, others from input supply. These causes are interrelated and a clear distinction between them cannot be made.

Factor price distortions may also affect utilisation of capacity. The argument is that factor price distortions lead to the selection of capital-intensive techniques of production in developing countries which are inappropriate to their factor endowments. Output and employment is not maximised because the scale of production under capital-intensive techniques is too large to be fully utilised in a limited domestic market of developing economies.[30] If factor prices reflect scarcity prices, it would be possible to use the scarce resource (capital) more intensively by employing more and more labour with it. In this way both output and employment will expand (see Stewart, 1977, Clark, 1985). Khan (1970) in the case of Pakistan says that the relative underpricing of capital has not only led to the selection of a degree of capital-intensity higher than the socially desirable level but has also created the incentive to build up greater capacity than can be used at any given period to ensure against the difficulties of getting licenses for capacity expansion in future, to stop the possibility of new entry at a future date and similar considerations.

It might be possible that the plant has been designed for an output far greater than the local demand can absorb, but the product is not of a type or quality which can find an export outlet. In this case employment cannot be generated unless sufficient measures are taken to increase demand. In developing countries the shortage of inputs is often considered responsible for the underutilisation of the existing capital stock. For example, in Pakistan, it has been reported that demand is not a binding constraint, rather, the shortage of inputs has been blamed for the existence of idle capacity. It is stated in the Seventh Five Year Plan (1988-93) that sizeable capacity in the manufacturing sector is lying idle mainly due to supply factors like shortages of raw materials, utility constraints, labour problems etc. (p.22). Another problem realized in this regard is power shut downs which affects capacity utilisation (which will be discussed in details in subsequent chapters). Similarly, the shortage of raw materials has been also widely quoted. Hogan (1967) in analysing the capacity creation and utilisation in Pakistan's manufacturing sector revealed that the industries which relied heavily upon overseas sources for raw materials and semi-finished goods as well as the capital equipment necessary for their establishment, did not record a very good performance. This situation exists in metal, machinery and equipment, chemicals and leather preparation.

Even when the output could be sold many plants are partially idle because shift working is rarely introduced. Fei and Ranis (1964) describe that during Japan's early industrialisation, when wages were relatively low, machinery in textiles and other industries were run faster and more intensively (extra shifts). The overall effect was greater labour intensity and greater efficiency in the use of all resources. Thus even in processes in which mechanisation was necessary for quality reasons, double and triple shifts greatly decreased the overall capital-labour ratio (Fei and Ranis, 1964, pp. 594-607).

Many empirical studies have been also made to test certain variables determining capacity utilisation. For example, Thoumi's study, was undertaken in 1973-74 on Colombian manufacturing. The sample included 347 plants resolved at the four - digit International Standard Industrial Classification (ISIC) code level, which corresponded to coverage of 61 two-digit sub-sectors. His results supported the prevailing views that, on a priori grounds, utilisation is:

positively related to capital-labour intensity as
measured by the K/L variable;
positively related to economies of scale;
positively related to export demand;
negatively related to import dependence on inputs
to production.

There were other variables also mentioned by Thoumi (1973), which were not used in the regressions analysis. These were overtime, weekend, and shift premium, plant location, production seasonality and age of the plant.

The study by Morawetz (1976) on Israel was based on a 1972 survey of 354 plants resolved at the four digit ISIC level. He included a number of explanatory variables, all derived from survey and contemporaneous supplemental data. Some of these variables are the ratio of fixed assets to day crew size, the user cost of capital, gross wages including fringes, the log of scale in terms of value added, market concentration, etc. Despite his considerable discussion of the outcomes of regressions in terms of variable signs and coefficients, the results are unreliable because of a significant degree of multicollinearity among the independent variables.

Kim and Kwon (1971), investigate the role of increased utilisation of capital over time on overall growth in South Korean manufacturing output for the period 1962-1971. Their principal finding is that increased utilisation of capital resources contributed about as much to growth in output as did new capital formation.

Lecraw (1978), investigates the relationship between actual, desired, and profit-maximizing rates of capacity utilisation in the case of manufacturing in Thailand over the period 1962-1974. His principal findings are that the difference between optimum and desired rates of utilisation depends upon the nationality of firms in the industry, projected profits, and the risks of multi-shift operations perceived by management (Lecraw 1978, pp. 139-153).

Wangwe (1977), while identifying the determinants of capacity utilisation conducted a study on Tanzanian manufacturing units which is based on data collected from 39 units. He concluded that supply factors such as shortage of raw material, shortage of electricity, shortage of spare parts, and machine breakdown were the main factors responsible for low utilisation of capital in Tanzania.

Winston (1971), contributed much in empirical studies of manufacturing capacity utilisation in Pakistan. Winston (1971), found that four variables in the case of Pakistan explain eighty per cent of the variations in capacity utilisation across 26 industrial sub-sectors. These are the capital-output ratio, exports as a percentage of production, average size of firm and the share of competing imports in total supply.

Kemal and Alauddin's (1974) empirical work on capacity utilisation in Pakistan's manufacturing sector finds the degree of dependence on imported raw materials, and the demand for the product as the major determinant of capacity utilisation.

Pasha and Qureshi (1984), selected 23 industries at the four digit level of Standard Industrial Classification of Pakistan's manufacturing sector for the periods of 1972 and 1976. They ran simple regressions and considered many of the factors responsible for underutilisation of capital stock. Some were supply-side factors while others were demand-side factors. According to their conclusion, supply factors had more effect on capital utilisation than demand side factors.

3.14 Conclusion

The foregoing discussion suggests that relative factor prices and underutilisation of capacity may play an important role in affecting capital-labour ratios. Under the neoclassical production function framework however, full reliance on relative factor prices as a policy suggestion may not be made because of its over-simplification. At the same time if factor prices are distorted in the economy, then the estimation of the elasticity of substitution between capital and labour with respect to relative factor prices in the manufacturing sector may help in highlighting the important features of technology in the production process. The empirical studies on the elasticity of substitution between capital and labour confirm that technological choice is not rigid at least in certain processes of industries. This means that the analysis of substitution possibilities between capital and labour is more useful at a disaggregated level. There are also many other aspects e.g. the economies of scale on which more and more exploration is required and in this sense one may not work strictly in terms of the neoclassical model.

The most popular specification of the production function is to assume that labour productivity changes between regions and overtime can be explained by wage-induced changes. We think that the estimation of the elasticity of substitution between capital and labour for the sake of exploring employment potential in different industries becomes a purely microeconomic phenomenon, though the basic root of this analysis in developing countries lies with the overall strategy or process of industrialisation that has been ignored in the neoclassical approach. Despite many limitations of the model, a country where factor prices are distorted and manufacturing employment is also very low, the analysis of the role of factor price distortions in affecting capital-labour ratios can be useful to see how strong is the impact of relative factor prices on employment in the manufacturing sector.

Utilisation of the existing industrial capacity can also play an important role in increasing both output and employment. Many factors are responsible for underutilised capacity. Generally these take two forms: demand side and supply side. In developing countries the latter has been mostly attributed to the underutilisation of capacity. As regards its effect on employment, we have seen that more utilisation of capital through increasing total working hours may well increase employment.

Notes and References to Chapter 3

1 All these factors increase labour productivity and lower the demand for labour. For detail and references of these factors see Thirlwall (1983a), especially chapter 4.

2 For instance, Fei and Ranis (1964) , who in the case of India and Japan viewed labour reallocation in the development of industrial sector and found that capital deepening took place in the sector, see pp. 125-136. See also Williamson (1971a, 1971b) for the analysis of capital deepening.

3 For an elaborate discussion on different indicators to measure capital intensity see Bhalla (1975). Khan (1970a) by using capital-labour ratios in the manufacturing sector of Pakistan found that capital intensity in the manufacturing sector is higher than the United States. Lary (1968) used value added per employee as an index of capital intensity for developing countries and found it high in most of the industries.

4 See Ranis G. (1971). Guisinger and Irfan (1981) also pointed out that factor price distortions in Pakistan affected the resource allocation and alleged that these factor price distortions are a major cause of high capital intensity in the manufacturing sector of Pakistan see pp. 323, 337-338.

5 If removal of factor price distortions changes the capital-labour ratios and in consequence, more labour is used in the production process, income redistribution in favour of labour may take place implying an increase in the demand for essential labour-intensive goods. For the effect of income redistribution on changing the demand pattern see Morawetz (1974), Cline (1972), Nirgis et al (1972), Paukert et al (1976), Ho (1975), and Cheema and Malik (1984).

6 This term has been used to describe all those who believe that technological choice is rigid or very limited.

7 The technological aspect is more concerned to the features of ruling technology in industries while from trade point of view there are many other aspects which discuss the effect of relative factor price distortions on the development of export goods industries, see for example, Little, Scitovsky and Scott (1970), see also Krueger et al. (1981).

8 Neutral technology does not affect capital-labour ratios see for details Stewart, 1977, Thirlwall, 1983a.

9 The most convenient variant of the production function is the constant elasticity of substitution (CES) function introduced by Arrow, Chenery, Minhas, and Solow (1961).

10 Many economists empirically tested the elasticity of substitution between capital and labour with respect to wage rates and confirmed that the elasticity of substitution between capital and labour is positive and different among different industry groups, see for instance, Diwan

and Gujarati (1968), Harris and Todaro (1969), Hussain (1974), Kemal (1981), Kim (1984) etc.

11 For example, Laumas and Williams (1981) have incorporated another factor `raw material' in their analysis of the elasticity of substitution in the manufacturing sector of India and found it significant see pp. 331-333. Roemer (1975) also considered `raw material' in his empirical analysis of the elasticity of substitution for the manufacturing sector of Ghana see pp. 76-79. Moreover, the effect of output changes to reflect the economies of scale on productivity has been tested in some empirical studies see for example, Diwan and Gujarati (1968), Katz (1969), Kazi et al (1976).

12 For the analysis of technical progress in developed countries see for instance, Solow (1957), Salter (1966), Atkinson and Stiglitz (1969); for technical progress in LDCs see Coretz (1978), Lall (1978), Mytelka (1978), who observed that technical progress is taking place in LDCs and has an important impact on improved productivity, better export performance, and better use of available resources.

13 It is generally recognised that developing countries have skill shortages which creates problems for the efficient use of labour-intensive techniques. Due to such shortage of skilled labour, capital-intensive techniques are preferred which are characterised by a pattern of employment in which semi-skilled labour and high-level manpower predominate, see Arrighi (1970), Clark (1985), p. 186.

14 Some of these points have been made by Stewart (1975) in her case study of cement blocks in Kenya.

15 The basic aim of the ISI strategy is to replace imported goods by domestic production. For the basic concept and definition of the ISI see Bruton (1970), Sutcliffe (1971), Kirkpatrick and Nixon (1983), Colman and Nixon (1986).

16 Export-oriented industrialisation (EOI) strategy puts more emphasis on the expansion of export goods industries and requires less policy controls by the government. See for the concept of EOI Kirkpatrick and Nixon (1983), Colman and Nixon (1986).

17 The shift from ISI to EOI strategy was mainly due to two reasons; (a) the former could not solve the major economic problems of developing countries such as low employment, low per capita income, balance of payment difficulties etc. (b) the economic success of newly industrialised countries NICs (Singapore, Korea, Hong Kong, and Taiwan) who relied on the latter strategy encouraged some developing countries to shift the policy from ISI to EOI, see for details Colman and Nixon (1986), pp. 306-312.

18 The effect of different government labour policies on factor price distortions has been explained by a number of economists. For instance in the case of Venezuela see Balassa et al (1986), for Panama see Fischer and Spinanger (1986), see also Carvalho and Haddad (1981), Krueger (1983), etc.

19 Eckaus (1955) first pointed out that factor proportions are rigid. Later on, it was realised that although possibilities of substitution between capital and labour exist but these are very limited; see Pack (1976),

Forsyth, et al (1980), Lall (1978).

20 For example, in the Dominican Republic, the ILO mission observed that given the technological constraints, undistorted input prices would have created no more than 20% of additional jobs in the modern sector. The total volume of employment would have increased as a result by only 1.4% and the unemployment rate would have slightly fallen to 12.6%, see Pazos F., (1975), pp. 244-45.

21 For a good discussion on the role of capital goods sector see Stewart F. (1977), chapter 6.

22 One of the distinctive attributes of this dependence is that the technology utilised in the process of industrialisation is taken more or less unadapted from the `centre' (developed countries) either by means of direct investment by TNCs or by means of licensing of local enterprises, see Lall (1981), p. 6. For further discussion on the dependence on developed countries see Stewart (1977), chapter 5; Colman and Nixon (1986), pp. 51-54, 312; and Lall (1978), p. 237.

23 Transfer of technology may take place through a TNC which is defined as an enterprise that owns or controls assets such as factories, mines and sales offices in two or more countries. For more elaborate definition of TNCs see Volker Chase-Dunn (1985). For the role of TNCs in transferring technology see Colman and Nixon (1986), pp. 382-385; Lall (1978, 1981); and Soloman and Forsyth (1977).

24 Recently the emergence of the "evolutionary theories" has put emphasis on the assimilation of imported technology and developing countries are suggested to increase the expenditure on R & D which would assimilate the imported technology to their local need, see for instance, Lall (1980), Bell et al(1984), Nelson and Winter (1982), Nelson (1981, 1987), and Dosi (1988). On adaptation of imported technology see Lall (1992).

25 There are numerous empirical studies which substantiate the argument that relative factor prices affect capital-labour ratios hence any downward change in wages relative to the cost of capital will bring a positive effect on employment. See for example, the studies by Kim (1984), Laumas and Williams (1981), Pack (1976), Roemer (1975) etc.

26 In these studies researchers investigate individual manufacturing processes or individual products and usually use engineering or other technical information to determine inputs necessary to produce a given volume of products. Such studies have been done by Pack (1974), Boon (1975), Stewart (1975), and Huq and Islam (1990, 1992).

27 Their study is related to the analysis of shift work possibilities and its impact on employment generation in Pakistan, see Farooq and Winston (1978), pp. 227-243.

28 According to Marris (1964) wage differentials over different time of work appear simply because people normally prefer day-time work. To induce people to work at night, firms have to pay a higher wage - a shift differential. The simplest differentials is a percentage increase over the average day-time wage for the same job.

29 See Nerlove (1972), pp. 60-122, and also see Huthings (1971), and

Stigler and Kindahl (1970).

30 This argument is basically developed by Schumacher (1971) and has been fully explained by Clark (1985).

CHAPTER 4

CAPITAL INTENSITY IN THE LARGE-SCALE MANUFACTURING SECTOR OF PAKISTAN

4.1 Introduction

This chapter considers the measurement of capital intensity of industries at a three digit level of disaggregation in the manufacturing sector of Pakistan. The objective is to determine the degree of capital intensity in different industries at a specific point of time and variations in capital intensity between two points of time. This analysis should help to highlight the technological and employment features of different industries. Moreover the analysis should also provide a crude indication of the efficiency in factor use.

4.2 The Concept and Measurement of Capital Intensity

From the employment point of view capital intensity is generally defined as the ratio of capital to labour used in a production process or industry at a given time: the higher the ratio the more is the capital intensity and vice versa. However, this is not a unique way of defining capital intensity. Other indicators have been also used to measure capital intensity and will be examined later. Generally it is argued that in a labour surplus economy with scarcity of capital, it is economically costless or nearly so to use labour which produces little at the margin.[1] Minimising capital intensity as an investment criterion in developing countries is desirable and the suggestion is that from alternative sectors those with lower capital-labour ratios should be expanded and from alternative technical blueprints for each sector the projects with the lowest capital intensities should be chosen.[2]

Under conditions of factor price flexibility and smooth neo-classical production functions, factor proportions are infinitely variable and any amount of capital can be associated with any amount of labour (see Figure 3.1 in Chapter 3). An increase in output is possible with an increase in the input of either factor, although economic optimisation will set a limit to the absorption of labour by the level of wages relative to capital or by the subsistence wage.[3]

In reality, however, it is the optimal degree of total factor intensity (a combination of different inputs, including capital and labour) determined by relative factor prices and the state of technological knowledge which matters. Private investors in market economies are motivated by profit maximisation for a given level of output which is only possible at the optimum level of output (i.e, when the marginal rate of substitution between all factors of production is equal to their relative factor prices or $MRS_{ij} = P_i/P_j$ for all i and j). Thus in practice the entrepreneurs are more concerned with total factor productivity, not so much with capital intensity or labour intensity of productive operations. From the profit maximisation point of view neither the most capital-intensive nor the most labour-intensive methods need be optimal. Hence, the question which arises is what should be the acceptable or optimum level of capital intensity?

If the object is to create maximum employment then the highest degree of labour intensity (the inverse of which is capital intensity) will be the sole criterion in selecting any technique of production. However, if the object is to create productive job opportunities (as has been explained in the footnote to Chapter 2), then the optimum degree of capital intensity can be chosen only on the basis of some criterion of efficiency and cost minimisation. An efficient technique may be expressed as a ratio of output to input, so that the higher the ratio the more efficient is the technique of production. A production technique is technically inefficient if, to produce a given output, it uses more of some inputs and no less of other inputs than other techniques. While the efficiency criterion eliminates the inefficient techniques, it does not help in choosing among the other equally efficient possibilities. Therefore the criterion of technical efficiency needs to be supplemented by another criterion such as cost minimisation or optimality.[4] Given the set of alternative techniques, if one knows the shadow prices of all inputs a unique economically efficient technique can be chosen.

In the real world however, the selection of techniques may not be necessarily efficient strictly in economic terms. Sometimes inefficient techniques may be regarded as desirable, especially when people's preferences in relation to different modes of production are taken into account. For example, a technique which qualifies as inefficient in economic terms may be used in a family-based production because it is preferred by those applying it (Sen, 1975).

The foregoing discussion suggests that there are many factors which are involved in the choice of optimal techniques of production, and a clear dichotomy between capital-intensive and labour-intensive techniques of production may be difficult to make. Nevertheless, some indicators have been used in economic literature to measure the degree of capital intensity in order to: (a) study the variations in factor proportions; (b) examine the functional relationships between partial factor inputs and outputs and finally (c) to determine the allocation of investment and to see its effect on the choice of production techniques, etc. In pursuing similar objectives, we will use these indicators to examine the degree of capital intensity in the large-scale manufacturing sector of Pakistan.

4.2.1 Indicators of Capital Intensity

The most widely used indicator to measure capital intensity is in terms of capital-labour (K/L) ratios. Other indicators such as capital-output (K/O) ratios, output per employee (O/L) and ratio of wages to output (wL/O) have also been used to measure the degree of capital intensity. All these indicators are derived from the production function and are clearly not independent. The questions related to functional relationship among different indicators and how these measure capital intensity may be best explained within the production function framework. In a static framework a production function indicates the maximum level of output that can be produced with a given set of inputs. If we assume that output is produced by the two homogeneous resources; capital, and labour, the production function[5] may be written as:

$$O = f(K, L). \qquad (4.1)$$

where O stands for output, K for capital and L for labour. Hence, any given level of output can be produced either with more labour and less capital or vice versa. Following the neoclassical theory of production function it is assumed that the function is subject to diminishing returns which requires;

$$dO/dK = Ok > 0, \ Okk < 0 \text{ and } dO/dL = OL > 0, \ OLL < 0 \qquad (4.2)$$

where Ok and OL are the marginal products of capital and labour. Under the assumption of perfect competition factor inputs receive their share of the total output equal to their marginal products. Hence the share of capital in total output (rK/O) will be equal to Ok i.e., rk/O = Ok (where r refers to the rate of return) and the share of wages in total output (wL/O) will be equal to OL i.e wL/O = OL (where w refers to wage rate).

It is also often assumed that the function is homogeneous of degree one i.e, there are constant returns to scale which means that an equi-proportional change in inputs by a factor ã will change the output by the same factor i.e.;

$$O = f(\tilde{a}\ L,\ \tilde{a}\ K) \qquad (4.3)$$

The form of the above production function can be used to derive the technical relationship among different indicators of capital intensity A brief examination of different indicators as a measure of capital intensity and the technical relationship among them is made below.

4.2.1.1 The Capital-Labour (K/L) Ratio

The capital-labour (K/L) ratio is one of the most commonly used indicators of capital intensity, especially when the objective is to see the employment implications of technological choice. Given a certain level of technology, there is a maximum amount of labour that can be employed on a given piece of capital. Thus the higher the K/L ratios the higher is the capital intensity and vice versa. The index (K/L) however, leaves out of account efficiency considerations which can be then better explained by other indicators such as the labour coefficient L/O or the capital coefficient K/O. The higher the input coefficient, the lower would be the efficiency in factor use.

The K/L index is closely associated with K/O ratios. If K/L is large and K/O is also large (or capital productivity is low), then the capital intensity of a given investment is
high (a further explanation follows).

Capital-labour ratios as an indicator of capital intensity however, suffers from some limitations. For example, different rates of capacity utilisation may affect the capital-labour ratios, since two plants with different capacity utilisation may have different capital-labour ratios.[6] K/L ratios may be affected by the nature of the bias of technical change, while neutral technical change will leave K/L unaffected, capital-using technology will raise it.[7]

4.2.1.2 The Capital-Output (K/O) Ratio

Capital-output (K/O) ratios represent a stock-flow concept relating the stock of capital to the flow of output at a given time. The technical relationship between K/L and K/O implies that production functions are of such form that an increase in K/L or K/O necessarily reflects a decline in the degree of labour intensity (Bhalla 1975, p.11).

The technical relationship between K/O and K/L may be shown from the production function (4.1). If O = f(K, L), then dividing through by K gives O/K = f(K/K, L/K). K/K=1 and the function can be written as:

$$O/K = f(L/K) \qquad (4.4)$$

Equation (4.4) implies that high labour capital ratios will occur in conjunction high output capital ratios.

Capital-output ratios measure the efficiency of capital use. In a partial and static analysis of the production function, high K/O ratios indicate low efficiency in capital use. According to Bhalla (1975) the use of K/L and K/O for measuring capital intensity in isolation could lead to the identification of a given industry or technique as labour-intensive or capital-intensive at the same time. Hence, to overcome this inconsistency it is suggested that the triple objectives of output, employment and reinvestment from a given total investment need to be considered in conjunction rather than in isolation (Bhalla, 1975, p.28) which implies the use of K/L and K/O indicators together in the analysis of capital intensity.

The technical relationship between K/L and K/O ratios derived from the production function is based on many strict assumptions such as perfect competition, constant returns to scale etc. In reality these assumptions may be violated and the indices used may reflect non-technological factors as well in explaining capital intensity. For example, K/O ratios are limited in their use as an indicator of capital intensity if the increase in output is due to other factors such as increase in the utilisation of the existing capacity or to better methods applied to older plants (Reddaway, 1962). Output may also increase due to human factors such as skill improvements, and the efficiency of managerial decisions etc.

4.2.1.3 Output Per Employee (O/L)

The treatment of output per employee (O/L) as an index of capital intensity simply implies that labour productivity is a composite index of the contribution of both physical capital and human capital (skilled labour). Lary (1968) who has used O/L (whereas O is the value-added in his analysis) as an indicator of capital intensity argues that skilled labour (human capital) is just as scarce as physical capital in developing countries. Thus a generalised measure of capital intensity would consist of both physical and human capital. On the basis of correlations between skill level and the wage component of output per worker, and between non-wage output and physical capital across industries in the United States and India, Lary (1968) assumes that total output per worker is linearly related with total capital intensity. In reality there are many limitations of using O/L as an indicator of capital intensity. For example, there is no conclusive proof that a linear relationship between non wage output per worker and physical capital per worker is always maintained.[8] Moreover, the ratio of physical capital to human capital may be different in different industries and no strict comparison can be made about the nature of capital intensity. Labour productivity (O/L) may be also affected by many other factors irrespective of the more use of physical and human capital such as changes in the decision of the management, change in the design of the machinery, etc. and this limits its use as pure indicator of capital intensity.

The technical relationship between K/L and O/L may be shown from the production function (4.1). If O = f(K,L), then dividing through by L gives O/L = f(K/L, L/L). L/L = 1 and the function can be written as:

$$O/L = f(K/L) \qquad (4.5)$$

Equation 4.5 implies that a high ratio of K/L is necessarily reflected in a high O/L ratio and a high ratio of K/L reflects high capital intensity. A rise in the cost of labour in relation to capital is likely to raise the capital-labour (K/L) ratio , lower the labour coefficient L/O, or raises its inverse, the average output per worker (O/L).

In reality output per employee (O/L) may increase due to economies of scale and not purely due to the technical relationship between O/L and K/L ratios.[9] Imperfections in the product market also account for productivity (O/L) differentials which cannot be attributed to differences in technical requirements of factor inputs (Bhalla, 1975, p.22). Some firms may charge a high price for their products due to monopoly power. This results in very high output per employee (O/L), and would largely reflect an element of monopoly rent rather than a high contribution of labour or capital (Bhalla, 1975, p.22).

4.2.1.4 Wages as Share of Total Output (wL/O)

Wages as a share of output (wL/O) used as an index of capital intensity is based on the assumption of perfect competition. Under perfect competition, if the elasticity of substitution between capital and labour is unity, then the relative share of wages and profits in output always remains the same. If the elasticity of substitution is less (more) than unity then with the increase in K/L ratios the wage share rises (falls). Thus a process that permits substitutability and could thus potentially be run labour-intensively may be observed to have a low wage share if the elasticity of substitution is greater than unity and it is in fact operated in a capital-intensive manner. The relationship between the share of wages in total output and the elasticity of substitution between capital and labour can be elaborated further by explaining the concept of the elasticity of substitution.

The elasticity of substitution (σ) relates the proportional change in relative factor inputs to a proportional change in the marginal rate of substitution between labour and capital (MRS) (or the proportional change in the relative factor price ratio on the basis of marginal productivity theory). The elasticity of substitution may therefore be written as:

$$\sigma = \frac{d(K/L)}{K/L} \cdot \frac{r/w}{d(r/w)} \qquad (4.6)$$

The technical relationship among all indices of capital intensity can also be explained with the help of the Cobb-Douglas production[10] function which holds all the properties of a general production function and can be written as:

$$O = AK^{\alpha} L^{\beta} \qquad (4.7)$$

where A is the index of technology. The α and β are the partial elasticity of capital and labour with respect to output. The sum of the partial elasticities of output with respect to the factors of production gives the scale of returns, or the degree of the homogeneity of the function. if;

$\alpha + \beta = 1$ there are constant returns to scale
$\alpha + \beta > 1$ there are increasing returns to scale
$\alpha + \beta < 1$ there are decreasing returns to scale

Generally the Cobb-Douglas production function is assumed to be homogeneous of degree one and constant returns to scale are assumed to prevail in contrast to the CES production function where variable returns to scale may also be assumed.[11]

With the rise in K/L ratios the effect of share in wages (wL/O) would be different under different conditions. For example, if

$\alpha + \beta = 1$ wL/O will remain the same as K/L rises
$\alpha + \beta > 1$ wL/O will decline
$\alpha + \beta < 1$ wL/O will rise.

The use of the wL/O indicator is severely limited under the conditions of imperfect competition. Wages may be affected by the influence of trade unions and this has no relevance to the predictable technical relationship between factor inputs and output. Alejandro (1965) who has used wL/O indicator as an index of capital intensity himself realizes that these ratios are inferior to those based on capital-labour ratios although he gives no precise reason for this. We think that if the elasticity of substitution between capital and labour is unity the wage share tells us nothing about capital intensity. Even if the elasticity is not unity, it is a poor indicator so long as the elasticity is not known before.

We have seen that all the indices used as indicators of capital intensity suffer from limitations however, these help in giving some crude idea about the degree of capital intensity.

To measure the degree of capital intensity in the large-scale manufacturing sector of Pakistan we have used all these four indicators viz, capital-labour (K/L), and capital-value added K/V) ratios, value-added per employee (VA/L) and share of wages in total value-added (wL/V).

4.2.2 Capital Stock its Measurement and Data Problem

There is a voluminous literature on capital theory and much of the theoretical debate has been on capital as a factor of production.[12] However, our concern here is with the problems associated with the measurement of capital stock which has implications for capital intensity. Capital stock is fundamentally of two sorts: Physical capital, and financial capital. Physical capital such as buildings, plant and machinery, dwellings and vehicles etc. is the stock of produced goods that contribute to the production of other goods and services. Financial capital is the money and paper assets which are a claim on physical capital. Most of the economic discussion is concerned with physical capital.

Physical capital is possibly the more difficult to measure since producers' goods and their products are both heterogeneous. Even machines of the same type may cause aggregation problems if they are of different vintages, with different technical characteristics, particularly different levels of productivity or efficiency.

In practice, the term which is used in valuing the capital stock at any point of time is the `net fixed capital stock at current replacement cost' - `net' meaning `in the condition in which it stands at a particular point of time', and `current replacement cost' meaning `valued at the prices ruling at the date to which the valuation refers'(see Jackson, 1982 for detailed examples).

The problem may arise in the valuation of different vintages of capital assets at a particular point of time as the value of new and old assets would be quite different (see for details Robinson, 1962). Inflation also raises the nominal value of physical capital stock without any real increase in it. Hence, the adjustment of rising prices in the valuation of the cost of capital is necessary.

The actual difficulty in valuing the capital stock arises because of its depreciation over time and the need to make some investment in new replacement capital goods to maintain the capital stock at a constant level. As capital wears out over a period of time, becoming less productive and less valuable it is necessary to measure the rate at which depreciation takes place. The simplest method of calculating depreciation however, is to take the initial cost, or value, of the item in question and to divide this by the length of the asset's life i.e:

$$\text{Flow of depreciation per annum} = \frac{\text{Initial cost/value of asset}}{\text{Length of life in years}}$$

In practice, there are many problems in estimating the rate of depreciation. For example, inflation will raise the nominal value of capital and in consequence the rate of depreciation will be affected. A larger problem is estimating the expected life of capital equipment and the expected rate of return over the rest of its life. In reality, the aggregation of heterogeneous capital goods with different life periods make it extremely difficult to have the accurate measurement of depreciation.

Despite many conceptual and theoretical problems in the valuation of capital stock, the "perpetual inventory method" is usually used for national accounts purposes for the estimation of the capital stock and can be written as:

Net capital stock at end of previous year	+	Gross Capital formation during year	-	Capital consumption during year	=	Net capital stock at end of year

The problem with the "perpetual inventory method" is that no adjustment to prices of the existing capital stock is made which may bias the value of capital stock upward.

In most countries a census of manufacturing industries provide data on the value of capital stock for the manufacturing sector. The census of manufacturing industries (CMI) of Pakistan also provides data on the value of fixed assets which is defined as the written down book value of the fixed assets and is arrived at by the perpetual inventory method as mentioned above.

The CMI data on the value of fixed assets for the manufacturing sector of Pakistan suffers from two problems; (a) the value of fixed assets is arrived at by applying the depreciation rates allowed by the government which are based on the government taxation policy and do not represent the economic cost to the producers. Mostly depreciation allowances had been allowed on an accelerated basis during 1960-1970 (Guisinger and Kazi, 1978) which has resulted in underestimation of the value of the remaining fixed assets (b) the historical figures are not adjusted to the price increases of investment goods each year. Some other economists in Pakistan pointed out that CMI values of capital stock are underestimated and are not very reliable for empirical analysis.[13]

An earlier attempt was made by Kemal (1976a) to construct a "consistent time series" of key data for 17 groups of large-scale manufacturing industries at the two digit level of classification for the periods of 1959-60 to 1969-70. To arrive at estimates of capital stock in each industrial sector he estimated gross annual investment in preceding years and applied the depreciation rates used by the government. (see Kemal 1976a, pp.33-36 for the details). For the period prior to 1962-63, Kemal (1976a) used "investment indices" based on the value of imported machinery and from 1963-64 onwards he used the published data on sanctioned investment assuming that actual investment was 70% of the planned total. This methodology, linking together two suspect data series has been strongly criticised by Norbye, (1978, pp. 99-108) and Ahmed, (1982, p.74).

The method adopted in this study to develop estimates of the value of fixed assets for the large-scale manufacturing sector of Pakistan is hopefully based on stronger foundations. Following the method of Vines, Muscatelli and Srinivasan (1990) a time series of net fixed asset (capital stock) for the periods of 1969-70 to 1989-90 has been constructed by the perpetual inventory method by using annual estimates of gross fixed capital formation (reported in the Pakistan Economic Surveys of different years) in conjunction with a depreciation value of 10 per cent per annum as reported in the United Nations (1985) for the manufacturing sector of Pakistan.

The value of capital stock (K_0) for the bench mark period (1969-70) has been arrived at by multiplying the estimated incremental capital-output ratio (assuming that average equals the marginal) by output of that year. The method of estimating the bench mark value of capital stock is in fact based on Koyock's (1954) distributed lag model and has been widely accepted and applied in empirical research (see for example stock adjustment model Nerlove 1958a,b).

The incremental capital-output ratio of 2.5 was derived on the basis of a three year moving average of incremental output and gross fixed capital formation for the year 1969-70. To check the stability of ICOR we also estimated the ICORs for the periods of 1979-80 and 1985-1986. While the ICOR remained unchanged at 2.5 for 1979-1980, it showed an increase in 1985-86 (3.4). We also calculated an ICOR of 3.0 on the basis of a simple average of annual incremental output and investment for the periods of 1969-70 to 1989-90. Later we estimated the values of fixed assets by applying different ICORs and depreciation rates (see Appendix Tables 4.1 and 4.2) to check the stability of our estimates of the value of fixed assets (Table 4.1). As the results are not substantially different from each other it supports our view that this procedure is fairly realistic and robust. In order to adjust the capital stock values to a constant price basis the following identity has been used;

$$K_t = K_{t-1} + I_t/P_t - d_t \qquad (4.8)$$

Where;

K_t = the capital stock at time t.
K_{t-1} = the capital stock at previous year.
I_t = the gross fixed investment at time t.
P_t = the price index of year t based on 1975-76 prices.
d_t = depreciation based on Kt-1.

The bench mark value of capital stock (K_0) in 1969 is at the constant prices of 1975-76. The result of this exercise is shown in Table 4.1.

We have noticed that the value of fixed assets reported in the CMI for the year 1977-78 (11282 millions in current prices) is 35% of the estimated value given in Table 4.1, while the value for the year 1984-85 (55292 millions in current prices) is 17 per cent higher than our own calculated value.

Table 4.1: The Estimated Value of Fixed Assets in the Large-Scale Manufacturing Sector
(Million)

Year	It/Pt	dt	Kt	Growth in Kt (%)
1969-70	2174	-	27330	-
1970-71	2677	2733	27274	-0.2
1971-72	1912	2727	26459	-3.0
1972-73	1418	2646	25231	-4.6
1973-74	1037	2523	23745	-5.9
1974-75	2263	2375	23633	-0.5
1975-76	4468	2363	25738	8.9
1976-77	5349	2574	28513	10.8
1977-78	6399	2851	32061	12.4
1978-79	6478	3206	35333	10.2
1979-80	6254	3533	38054	7.7
1980-81	5388	3805	39637	4.2
1981-82	5608	3964	41281	4.1
1982-83	6244	4128	43397	5.1
1983-84	6653	4340	45710	5.3
1984-85	6181	4571	47320	3.5
1985-86	7315	4732	49903	5.5
1986-87	6725	4990	51638	3.5
1987-88	7257	5164	53731	4.1
1988-89	7970	5373	56328	4.8
1989-90	8408	5633	59103	4.9

The values of Gross Fixed Capital Formation (I) have been taken from various issues of Pakistan Economic Surveys and were deflated at the price index for manufacturers at the constant prices of 1975-76.

The calculated value of capital stock as shown in Table 4.1 takes into account price fluctuations in investment goods each year and is closer to the national accounts figures of the gross fixed investment. The annual average growth of capital stock according to our estimated values is 4% per annum during 1969-70 to 1989-90 using end point estimates. The use of these estimated values of capital stock will hopefully give a better picture of capital-labour and capital-output ratios for the large-scale manufacturing sector of Pakistan. Nevertheless, possibility of incorrect estimates remains. For example, the depreciation rates may not be accurate, there may be some unknown problems in the published data on the gross fixed capital formation, etc.

At a disaggregated level it is difficult to estimate the value of fixed assets for industries as there is no information on gross fixed investment by industry sectors. For the purpose of this exercise it has been assumed that the same ratio of capital stock between different industries (as reported in the CMI) holds and that the reported capital stock figures of all industries are biased downward/upward by the same aggregate ratio which we have discovered, an adjustment of the value of capital stock for all industries has been made. All the other data on working capital, gross value-added and wages however, have been taken from the CMI.

Before going directly to our own estimates of capital intensity some studies related to the measurement of capital intensity in manufacturing sector of Pakistan are reviewed briefly.

4.3 Earlier Studies on Capital-Intensity in Pakistan

A study by Islam (1970a) can be considered the pioneer in measuring capital intensity in Pakistan. Following Lary's arguments (mentioned above) he used value-added per employee (VA/L) as an indicator of capital intensity in the manufacturing sector of Pakistan for the year 1959-60 and compared his estimates with the United States. The data on Pakistan had been taken from CMI, while he did not mention the source of data for the United States. Comparing observed capital intensity in Pakistan manufacturing with that of the United States, Islam (1970a) derived an interesting phenomenon, namely that industries which were found to be labour-intensive in the United States were capital-intensive in Pakistan in the sense of having less (more) than average VA per employee in the United States (Pakistan). We think that the mere use of VA/L as an indicator of capital intensity may give misleading results because of many limitations inherent in its use. For example the ratio of physical capital to human capital between the two countries may be quite different from each other. It is quite possible that in Pakistan high labour productivity may be due to the use of more physical capital compared with the United States where human capital might have played a pivotal role in determining labour productivity. Moreover, market conditions may be quite different in the two countries. For example, high labour productivity in some industries in Pakistan compared to the United States may be due to monopoly power which enables monopolists to charge high prices of their products and reflects in apparently high labour productivity.

Later, Khan (1970) measured the degree of capital intensity in twenty industries in Pakistan by using capital-labour ratios for the year 1962-63 on the basis of the CMI data.[14] By comparing his estimates with the United States and Japan he reached a startling conclusion, that with exception of basic metals, the capital intensities for Pakistan manufacturing are invariably higher than for Japan. More startling is that in many sectors Pakistani capital intensities are close to the US ones while in some (chemicals, and leather goods) they are higher. We think there are many problems inherent in the international comparison of capital intensity such as the non-uniformity in the method of calculating capital stock, non-equilibrium exchange rate, the treatment of non-traded goods, differences in the quality of the products etc, and may limit the usefulness of such kind of comparison.

According to Hussain's study (1974), capital-labour ratios for the whole large-scale manufacturing sector increased from Rs. 4531 in 1959-60 to Rs. 9558 in 1967-68 at current prices while at constant 1959-60 prices the increase was from Rs 4531 to Rs 6479 in 1967-68(p.212). Hussain's (1974) analysis is based on unadjusted CMI data and may not provide the true picture of the capital intensity. We also think that simple deflation of the capital stock at a point of time may not indicate the real value of capital unless each year investment is deflated separately by the price indices of each respective year.

Kemal (1976b) reported the degree of capital intensity in different industries by using three criteria, viz; capital-labour, capital-output and capital-value-added ratios. These ratios are based on the average figures for the years 1967-68, 1968-69, and 1969-70. In his estimates, paper, chemicals, and non-metallic mineral product industries appear to be the most capital-intensive according to all three criteria, while tobacco manufacturing, leather, and footwear the least capital-intensive industries. Kemal (1976b) used his estimated "consistent time-series data" (mentioned earlier) by adjusting the value of capital stock for price increases each year and by applying different rates of depreciation from those allowed by the government for the years 1959-60 to 1969-70 (For details see Kemal, 1976b, pp. 351-52). The data used by Kemal (1976b) has serious limitations as earlier mentioned and may provide spurious results.

Hamid (1978) estimated the capital intensity in the three broad categories of industries by the end use for the periods of 1959-60 to 1975-76. Hamid has used Kemal's data for the periods of 1959-60 to 1969-70 and adjusted the CMI data for the period of 1975-76 for undercoverage and price increases by following Kemal's (1976a) methodology. The study reported the highest capital-labour ratios in the intermediate group of industries in 1975-76 followed by the capital goods and consumer goods industries (See Hamid, 1978, p.10).

Afridi (1985) reported the estimates of capital intensity for different sized establishments in the manufacturing sector of Pakistan for the period 1970-71 to 1980-81 in terms of capital-labour ratios, value added per employee and the ratio of value added to capital on the basis of the CMI data. Medium-sized establishments (employing 250-499 persons) were found to be the most capital-intensive (p.467).

All the studies with the exception of Kemal (1976b) and Hamid (1978) mentioned above can be attacked on the grounds that they have used the unadjusted CMI data on the value of fixed assets and no effort has been made to adjust the data for underestimation of the capital stock. Moreover all the studies including Kemal (1976b) and Hamid (1978) which have used capital-labour (K/L) or capital-value-added (K/V) ratios as an indicator of capital intensity have ignored working capital completely. The inclusion of working capital in the value of fixed capital according to Sen (1972) "will affect not merely the absolute rates of surplus but also relative rates since it will tend to have larger adverse effects on the surplus-ratio of less capital-intensive techniques" (p.101). According to Sen (1975), two concepts must be differentiated, mechanisation, and capital intensity. The former is concerned with machinery and possibly other types of fixed capital, like buildings, excluding working capital. The latter includes working capital in the value of fixed assets. It might be the case that the ratio of working capital to physical capital in different industries may vary quite widely and will frequently tend to be higher for relatively less mechanized techniques (Sen, 1975, p.47). Hence, "the inclusion of working capital could make the ordering of capital intensity of different techniques quite different from that of mechanisation (Sen, 1975, p.48).

Moreover, these studies relate to the earlier years. Our analysis of capital intensity takes the most recent year for which data is available. In an economy where industries are in a continuous process of development, the most recent year analysis will highlight the changes in the structure of industries in terms of capital intensity.[15]

4.4 Observed Capital Intensity in Manufacturing Sector

The major additions which we have made to the earlier studies are; (a) we have adjusted the CMI data on the value of fixed assets (capital stock) for the price increases each year and for the underestimation for the years 1969-70 to 1989-90. The adjusted data of capital stock may give us a better picture of the analysis of capital intensity in the manufacturing sector (b) we have used capital-labour (K/L) ratios and capital-value-added (K/V) ratios as an index of capital intensity in a broader sense. Keeping in view the importance of working capital (as mentioned above) we have also taken this into account in our analysis of capital intensity in manufacturing sector of Pakistan by summing the value of fixed assets (fixed capital) and working capital. Thus two measures of capital-labour ratios are provided. K1/L uses the value of fixed capital divided by the number of employees at a given time, whereas K2/L uses the sum of fixed and working capital divided by the number of employees. A similar procedure has been adopted in measuring capital-value-added (K/V) ratios. Value-added is the gross value-added at constant prices of

1975-76.

The value of capital stock is the adjusted net value of fixed assets (as has been explained in section 4.2.2). In the manufacturing sector this consists of the value of land, building, plant and machinery and other fixed assets (CMI 1984-85). The working capital (stock) includes the value of raw-materials, chemicals and dyes, spare parts, packing materials, fuels, and other input materials, semi-finished and finished products and by-products at the end of the year (CMI, 1984-85). All the data is in constant prices of 1975-76.

We have made our estimates for twenty eight three-digit (according to PISC) industries of Pakistan for the year 1984-85. The estimates for the year 1977-78 will be used for comparative purpose.

Tables 4.2 and 4.3 show capital-labour ratios in terms of K1/L and K2/L respectively for the periods of 1977-78 and 1984-85. Industries have been grouped according to the end use for the sake of convenience in analysing the data. Columns 2 and 4 show the ranking of industries according to capital intensity. We have compared capital-labour ratios in each industry with the average capital-labour ratios in total manufacturing in the same year as well between the two years taken, i.e., 1977-78 and 1984-85.

According to the first estimates (Table 4.2) the average capital-labour ratios K1/L are Rs. 92.0 thousands per employee for the total manufacturing sector in 1984-85. The iron and steel industry shows the highest capital-labour ratios. Wood and cork products, furniture and fixture, industrial chemicals, glass and glass products and non-metallic products industries are other sectors where K1/L ratios are above the average of K1/L ratios for total manufacturing. Food manufacturing, paper and paper products, drugs and pharmaceutical, plastic products industries are also highly capital-intensive in terms of ranking position, however, K1/L ratios in these industries are slightly less than the average of K1/L ratios for all industries. Tobacco, wearing apparel, footwear, ginning and baling of fibres, miscellaneous, petroleum and coal products, fabricated metal products and professional goods industries seem to be labour-intensive.

Looking at the structure of industries, the intermediate group of industries on average shows the highest capital-labour ratios as compared to consumer goods and capital goods industries.

By comparing the capital-labour ratios between the two time periods we can see from Table 4.2 that average (unweighted) capital-labour ratios in total manufacturing increased from Rs 66.0 thousands in 1977-78 to Rs 92.0 thousands in 1984-85. The increase of K1/L in total manufacturing is 39% while the capital stock increased by 48% (see Table 4.1) during 1977-78 to 1984-85 showing that the employment must have increased by 6.5% (48%-39%). Looking at the aggregate employment figures (459,000 in 1977-78 and 492,000 in 1984-85) the increase is 7% for the periods of 1977-78 to 1984-85 (calculated from the CMI of the respective years) showing our estimates of capital-Labour ratios are robust.

Table 4.2: Capital-Labour Ratios in Major Group of Industries in 1977-78 and 1984-85 (First Estimates)

Industries	1977-78 First Estimates K1/L (1)	1977-78 First Estimates Ranking (2)	1984-85 First Estimates K1/L (3)	1984-85 First Estimates Ranking (4)
Total Manufacturing	**66.0**		**92.0**	
Consumer Goods	61.2		61.0	
Food manufacturing	110.0	24	86.9	19
Beverage	78.3	20	80.7	17
Tobacco	46.3	11	32.3	5
Textiles	49.6	14	54.6	12
Wearing apparel	34.5	5	26.9	1
Leather & leather products	81.5	21	51.8	9
Footwear	29.4	4	35.0	6
Ginning & baling of fibres	40.0	7	28.1	2
Wood & cork products	50.6	16	115.8	21
Furniture and fixtures	38.6	6	171.8	23
Paper & paper products	117.6	26	87.2	20
Printing & publishing	42.0	8	59.4	14
Pottery china	97.0	22	57.3	13
Miscellaneous	52.6	17	29.3	4
Intermediate Goods	100.4		198.6	
Drugs & pharmaceutical	59.9	18	85.9	18
Industrial chemicals	220.3	28	261.7	25
Other chemicals	48.2	12	55.6	12
Petroleum & coal products	19.2	1	38.5	7
Rubber products	21.4	3	62.2	15
Plastic products	112.8	25	81.4	16
Glass & glass products	50.5	15	119.4	22
Non-metallic minerals	118.9	27	177.4	24
Iron & steel	106.0	23	309.0	26
Capital Goods	50.0		51.3	
Fabricated metal products	48.4	13	39.9	8
Machinery non-electrical	76.3	19	54.4	10
Electrical machinery	42.7	9	54.6	12
Transport equipment	43.4	10	54.5	11
Professional goods	21.3	2	28.2	3

Notes: Notes: K1/L is the value of fixed assets per worker. The values are in thousands of Rupees at constant prices of 1975-76.
Ranking is done in such a way that the increase in numbers indicates an increasing degree of capital intensity.
Source: Calculated from the CMIs (1977-78, 1984-85).

Table 4.3: Capital-Labour Ratios in Major Group of Industries in 1977-78 and 1984-85 (Second Estimates)

Industries	1977-78 Second Estimates K2/L (1)	1977-78 Second Estimates Ranking (2)	1984-85 Second Estimates K2/L (3)	1984-85 Second Estimates Ranking (4)
Total Manufacturing	**90.6**		**123.1**	
Consumer Goods	87.7		83.0	
Food manufacturing	139.4	24	115.3	17
Beverage	91.8	17	108.4	15
Tobacco	87.5	16	69.9	6
Textiles	61.6	10	71.5	8
Wearing apparel	61.9	12	50.2	3
Leather & leather products	128.0	21	102.5	13
Footwear	51.1	6	69.6	5
Ginning & baling of fibres	49.0	4	29.9	1
Wood & Cork products	58.4	7	140.5	22
Furniture and fixtures	50.0	5	176.6	24
Paper & paper products	136.7	23	115.8	19
Printing & publishing	58.4	7	81.4	9
Pottery china	106.7	19	70.6	7
Miscellaneous	60.4	9	43.4	2
Intermediate Goods	133.6		245.4	
Drugs & pharmaceutical	107.7	20	136.0	21
Industrial Chemicals	271.7	27	336.6	26
Other chemicals	71.7	14	95.3	11
Petroleum & coal products	34.4	2	135.0	20
Rubber products	36.8	3	89.5	10
Plastic products	130.3	22	104.9	14
Glass & glass products	58.8	8	140.8	23
Non-metallic minerals	150.9	26	207.0	25
Iron & steel	140.5	25	359.1	27
Capital Goods	75.4		97.4	
Fabricated metal products	61.8	11	55.6	4
Machinery non-electrical	103.1	18	115.4	18
Electrical machinery	70.9	13	109.0	16
Transport equipment	74.5	15	97.8	12
Professional goods	32.4	1	43.4	2

Notes: K2/L is the value of fixed assets plus the value of working capital (stock) per worker. The values are in thousands of Rupees at the constant prices of 1975-76.. Ranking is done in such a way that increasing numbers indicates an increasing degree of capital intensity.
Source: Calculated from the CMIs (1977-78, 1984-85).

Among consumer goods industries capital-labour ratios have increased in six out of fourteen industries viz; beverage, textiles, footwear, wood and cork products, furniture and fixtures, and printing and publishing. The increase in capital-labour ratios is substantial in two industries viz; wood and cork products, and furniture and fixture. The increase in capital-labour ratios in these industries may be due to the high growth of industrial real wages which according to one study was 7.6% per annum during 1976-1981 (Noman, 1988, p.162) thus inducing the investors to substitute capital for labour. There is also the possibility that the new plants may be using modern and imported techniques of production thus indicating increased capital-labour ratios. However, the overall decline in capital-labour ratios in the rest of the consumer goods industries has offset the overall increase in these ratios in some industries with the result that overall capital-labour ratios in the consumer goods industry group almost remained the same during 1977-78 to 1984-85. The overall decline in capital-labour ratios in some consumer goods industries may be associated with the increased utilisation of capacity.

With the exception of plastic products, almost all the intermediate group of industries show a substantial increase in capital-labour ratios. The highest variations in capital-labour ratios have occurred in the iron and steel industry followed by rubber products, glass and glass products, and non-metallic mineral products industries etc.

The capital-labour ratios on average in capital goods industries have slightly increased from Rs 50.0 to Rs.51.3 thousands per employee. The capital-labour ratios have increased in the electrical machinery, transport equipment, and professional goods industries while in the fabricated metal products and non-electrical machinery these have declined.

A comparison of the 2 years indicates that the average capital-labour ratios have remained the same in consumer goods industries while these have increased slightly in capital goods industries. A major role in increasing the average capital-labour ratios in total manufacturing sector in 1984-85 as compared to 1977-78 has been played by the intermediate group of industries. Our analysis is consistent with Hamid's analysis who also found the highest capital-labour ratios in the intermediate group of industries in 1975-76 (See Hamid, 1978, p.10).

We have found low capital intensity in terms of K1/L ratios in capital goods industries. Khan (1970), and Hamid (1978) also had the similar findings. According to Hamid (1978) the reasons for much lower capital intensity in capital goods industries is that most of the existing industries in this sector are in fact in the nature of small engineering works producing job orders rather than being highly automated works capable of mass production (p.11). On the other hand, consumer goods industries are process industries with substantial automation (Hamid, 1978, p.11).

By looking at the increased overall capital-labour ratios in 1984-85 we may tentatively argue that the increase in capital-labour ratios was partly due to the change in relative factor prices and partly due to changes in technology.

Looking at Table 4.3 the estimates of capital intensity in terms of K2/L show that these have increased from Rs 90.6 thousands in 1977-78 to Rs 123.1 thousands in 1984-85. The rank correlation between K1/L and K2/L in 1984-85 is 0.87. The ranking position according to the second estimates across industries did not change significantly except in the petroleum and coal products industry in 1984-85. With the exception of this industry we have found no significant evidence that lower mechanisation in terms of K1/L ratios is characterised by higher capital intensity in terms of K2/L ratios and in general found no support for Sen's (1972) concern. In the petroleum and coal products industry, the ratio of working capital to fixed assets appears to be very high where K2/L ratios are above average of K2/L ratios for total manufacturing as compared to K1/L ratios which are less than average of K1/L ratios for total manufacturing in 1984-85. The ratio of working capital to fixed capital stock in the petroleum and coal industry was 2.55 in 1984-85 (calculated from our estimated data on physical capital and the reported CMI data on working capital) which reflects the fact that the petroleum and coal industry may carry very large stocks of raw materials as compared to the fixed assets so its ranking position in the second estimates changed significantly.

On the basis of percentage changes in K2/L over K1/L on average there is no conclusive evidence that labour-intensive firms use relatively more capital in the form of stocks as pointed out by Sen (1972).

Some observations can be made with respect to the analysis of capital-labour ratios. At a particular point of time these observed capital-labour ratios reflect a large number of historical circumstances relating to factor prices, ex ante technological possibilities etc. Between two time periods the overall increase in capital-labour ratios in 1984-85 as compared to 1977-78 shows that capital intensity has increased and that on average, workers have more capital stock to work with. Different industries are showing a different degree of capital intensity. Many reasons can be assigned to the wide variations in capital-labour ratios at the disaggregate level. For example, the increase in relative factor prices (which will be discussed in detail in the next chapter) may have led industries to substitute capital for labour. How far these industries are responsive to changes in relative factor prices is an empirical question which can only be answered by the estimation of the elasticity of substitution between capital and labour with respect to relative factor prices. In the case of developing countries there is sufficient empirical evidence to indicate that the elasticity of substitution in the manufacturing sector is positive which indicates that relative factor prices can play an important role in determining capital-labour ratios.[16] The use of more advanced technology might have increased capital-labour ratios in some industries. Sometimes the scale factor also accounts for high capital-labour ratios.[17] The new industries or new plants may be using more efficient techniques than the older plants. However, there are many other factors as well which may lead to high capital-labour ratios. For example, an increase in underutilisation of capacity across industries between the two time periods might have affected capital-labour ratios and which may not be easy to identify empirically.[18]

For calculating capital-value added ratios, the two methods have been used again, K1/V shows the ratio of fixed assets to value-added, while K2/V shows the ratio of fixed and working capital to value-added (see Tables 4.4 and 4.5 respectively). As there is no output indices for each and every item, we have deflated value added by the wholesale price index of 1975-76.

Capital-value-added ratios on average are Rs. 2.59 for all industries in 1984-85. Among consumer goods industries, wood and cork products, furniture and fixtures, paper and paper products and pottery china are found to be capital-intensive industries where capital-value-added ratios are above the overall average in both estimates (K1/V) and (K2/V) in 1984-85 (see Tables 4.4 and 4.5). Among the intermediate goods industries, glass and glass products, non-metallic minerals and iron and steel are the most capital-intensive industries. Capital-value-added ratios are exceptionally high in furniture and fixtures in 1984-85 (Table 4.4). There may be some problem of data on value-added in this industry. Average capital-value-added ratios are the lowest in capital goods industries in 1984-85.

We have found that, with the exception of industrial chemicals the industries where K1/L ratios are above the average of total manufacturing are also characterised by above the average K1/V ratios in 1984-85 (wood and cork products, furniture and fixtures, glass and glass products, non-metallic mineral products, and iron and steel).

Comparing capital-value added ratios between the two time periods it is evident from Tables 4.4 and 4.5 that K1/V and K2/V ratios for total manufacturing declined from Rs 3.19 to Rs 2.59 and from Rs 4.11 to Rs 3.39 in 1977-78 and 1984-85 respectively. With the exception of the intermediate group of industries, the other two groups of industries are showing an overall decline in average capital-value added ratios during 1977-78 and 1984-85. The overall decline in K1/V ratios in 1984-85 indicates that the efficiency in the use of capital stock has increased. The increase in the cost of capital after 1970s (see Planning Commission, 1978) may have induced entrepreneurs to utilise the existing capacity more efficiently in order to meet any increase in demand for their products.

Table 4.4: Capital-Value-added Ratios in Major Group of Industries in 1977-78 and 1984-85 (First Estimates)

Industries	1977-78 First Estimates K1/V (1)	1977-78 First Estimates Ranking (2)	1984-85 First Estimates K1/V (3)	1984-85 First Estimates Ranking (4)
Total Manufacturing	**3.19**		**2.59**	
Consumer Goods	3.72		2.26	
Food manufacturing	3.49	15	2.09	15
Beverage	1.98	9	2.05	14
Tobacco	0.84	2	1.13	4
Textiles	4.01	18	2.57	19
Wearing apparel	1.52	5	1.39	7
Leather & leather products	1.99	10	1.00	3
Footwear	1.58	6	1.56	9
Ginning & baling of fibres	1.85	8	1.25	5
Wood & Cork products	3.82	16	3.56	23
Furniture and fixtures	2.74	13	8.25	26
Paper & paper products	5.24	25	3.41	22
Printing & publishing	2.52	12	1.99	13
Pottery china	6.27	26	3.20	21
Miscellaneous	2.79	14	1.12	4
Intermediate Goods	2.41		3.23	
Drugs & pharmaceutical	1.11	4	1.36	6
Industrial chemicals	4.36	23	2.48	18
Other chemicals	1.87	8	0.78	2
Petroleum & coal products	0.06	1	0.69	1
Rubber products	1.01	3	2.33	17
Plastic products	4.09	20	2.22	16
Glass & glass products	4.00	19	5.51	25
Non-metallic minerals	4.22	21	3.09	20
Iron & steel	4.50	24	4.80	24
Capital Goods	2.66		1.62	
Fabricated metal products	3.88	17	1.63	10
Machinery non-electrical	4.30	22	1.65	11
Electrical machinery	1.80	7	1.55	8
Transport equipment	2.20	11	1.68	12
Professional goods	1.54	5	1.56	9

Notes: Ranking is done in such a way that the increase in numbers indicates an increasing degree of capital intensity.
K1/V is the ratio of value of fixed assets to value-added at the constant prices of 1975-76.
All the values are at the constant prices of 1975-76.
Source: Calculated from CMIs (1977-78, 1984-85).

Table 4.5: Capital-Value-added Ratios in Major Group of Industries in 1977-78 and 1984-85 (Second Estimates)

Industries	1977-78 First Estimates K2/V (1)	1977-78 First Estimates Ranking (2)	1984-85 First Estimates K2/V (3)	1984-85 First Estimates Ranking (4)
Total Manufacturing	**4.11**		**3.39**	
Consumer Goods	4.62		3.08	
Food manufacturing	4.43	18	2.77	12
Beverage	2.33	6	2.75	11
Tobacco	1.59	2	2.45	8
Textiles	4.99	22	3.37	19
Wearing apparel	2.59	8	2.60	9
Leather & leather products	3.13	12	1.96	4
Footwear	2.74	9	3.09	15
Ginning & baling of fibres	2.27	5	1.33	1
Wood & cork products	4.41	17	4.32	23
Furniture and fixtures	3.54	15	8.48	27
Paper & paper products	6.08	27	4.53	24
Printing & publishing	3.50	14	2.73	10
Pottery china	6.89	28	3.95	22
Miscellaneous	3.20	13	1.66	3
Intermediate Goods	3.21		3.84	
Drugs & pharmaceutical	1.99	4	2.15	5
Industrial chemicals	5.38	24	3.19	17
Other chemicals	2.78	10	1.35	2
Petroleum & coal products	0.11	1	2.41	7
Rubber products	1.73	3	3.36	18
Plastic products	4.72	20	2.86	13
Glass & glass products	4.66	19	6.50	26
Non-metallic minerals	5.35	23	3.60	21
Iron & steel	5.96	26	5.58	25
Capital Goods	4.01		3.08	
Fabricated metal products	4.96	21	2.27	6
Machinery non-electrical	5.80	25	3.49	20
Electrical machinery	3.00	11	3.10	16
Transport equipment	3.79	16	3.01	14
Professional goods	2.34	7	2.41	7

Notes: Ranking is done in such a way that the increase in numbers indicates an increasing degree of capital intensity. K2/V is the ratio of value of fixed assets and working capital (stock) to value-added at the constant prices of 1975-76.
Source: Calculated from CMIs (1977-78, 1984-85).

The rank correlation coefficient between K1/V and K2/V ratios in 1984-85 is 0.87 and shows a strong relationship between the two estimates.

The technical relationship between K1/L and K1/V at a point of time indicates that most of the industries with high K1/L ratios also show high K1/V ratios. High capital-labour and capital-output ratios at a point of time may be due to underutilisation of capacity which is common in many developing countries (see for instance, Winston, 1971, Pasha and Qureshi, 1984, and Afroz and Roy, 1976). However, between two time periods the average fall in K1/V and K2/V ratios for all industries in 1984-85 indicates that the efficiency in the use of capital stock has increased. Many economists have pointed out that capital stock remains underutilised for most of the time in Pakistan,[19] we may say that one of the reasons for the decline in capital-value- added ratios in subsequent years is the increase in capacity utilisation. Nevertheless, this is not the only explanation, it may also be due to other non-technological factors such as improvements in human capital leading to output increases irrespective of the increase in physical capital.[20] In the intermediate group of industries the average capital-value-added ratios however, have increased in 1984-85 as compared to 1977-78.

Table 4.6 reports value-added per employee (VA/L) and shows that this has increased from Rs. 22.1 thousands in 1977-78 to Rs. 36.3 thousands in 1984-85. The technical relationship between K/L and VA/L ratios appears to be correct in the case of intermediate goods industries which on average are showing the highest VA/L, K1/L and K2/L ratios in 1984-85. The rank correlation coefficient between K1/L ratios and VA/L for the period of 1984-85 is low (0.44) but positive, while the rank correlation coefficient between K2/L and VA/L in 1984-85 is 0.63.

Table 4.6: Value-added Per Employee in Major Group of Industries in 1977-78 and 1984-85

(1975-76=100)

Industries	1977-78 VA/L (1)	1977-78 Ranking (2)	1984-85 VA/L (3)	1984-85 Ranking (4)
Total Manufacturing	**22.1**		**36.3**	
Consumer Goods	18.2		26.9	
Food manufacturing	31.5	20	41.6	19
Beverage	30.5	19	39.4	18
Tobacco	55.0	26	28.5	12
Textiles	12.4	1	21.2	4
Wearing apparel	23.8	14	19.3	2
Leather & leather products	41.0	21	52.2	20
Footwear	19.0	9	22.0	6
Ginning & baling of fibres	46.3	22	22.5	7
Wood & Cork products	13.2	3	32.5	14
Furniture and fixtures	13.6	4	21.0	3
Paper & paper products	22.4	11	25.5	9
Printing & publishing	16.7	7	29.9	13
Pottery china	15.6	6	18.0	1
Miscellaneous	25.1	15	26.0	10
Intermediate Goods	41.7		64.0	
Drugs & pharmaceutical	54.1	25	63.1	23
Industrial chemicals	50.6	23	105.5	26
Other chemicals	25.9	16	70.8	25
Petroleum & Coal products	313.1	27	56.0	21
Rubber products	21.3	10	26.7	11
Plastic products	27.5	17	36.8	17
Glass & glass products	12.7	2	21.8	5
Non-metallic minerals	28.2	18	57.4	22
Iron & steel	23.6	12	64.3	24
Capital Goods	18.8		31.6	
Fabricated metal products	12.4	1	24.4	8
Machinery non-electrical	17.8	8	33.0	15
Electrical machinery	23.7	13	35.1	16
Transport equipment	50.8	24	32.5	14
Professional goods	14.0	5	18.0	1

Notes: Ranking is done in such a way that the increase in numbers indicates an increasing degree of capital intensity.
Value-added is at the constant factor prices of 1975-76.
VA/L is value added per man year.
Calculated from CMIs (1977-78, 1984-85).

Among consumer goods industries, food, beverage and leather and leather goods industries are showing VA/L above the average of total manufacturing. With the exception of rubber and glass and glass product industries, all other intermediate goods industries reflect above average labour productivity of total manufacturing in 1984-85. Capital goods industries on average are showing labour productivity below average.

While comparing labour productivity between two time periods it may be noticed that with the exception of only a few industries all others are showing an increase in labour productivity. A similar kind of analysis has been made by Afridi (1985) in the case of Pakistan large-scale manufacturing sector where on average labour productivity for all industries increased from Rs. 30.7 thousands to Rs. 63.5 thousands respectively in 1976-77 and 1980-81 (p.468).

Though average capital-labour ratios (K1/L) and VA/L ratios have increased in 1984-85 for all industries, inter-industry differentials in K1/L and VA/L do exist and the increase in labour productivity cannot be assigned wholly to the increase in capital-labour ratios. For example, the capital-labour ratios in many industries have declined during the two time periods considered (see Tables 4.2 and 4.3) but labour productivity has increased in these industries. Capital-labour ratios (K1/L) increased in petroleum and coal products industry but VA/L declined during two time periods taken. This industry also shows the lowest K1/L ratio in 1977-78 with highest VA/L per employee in the same year. One of the plausible reasons may be that coal and products industry may be enjoying monopoly prices due to which value added per employee is very high. In fact there are many other non-technical factors as well which may explain a part of the increase in labour productivity. More efficient use of labour, improvements in labour skills, and advanced technology etc. all can play an important role in raising labour productivity. For example, Ahmed (1980) made an empirical analysis of inter-industry differentials in labour productivity for the period of 1966-67 in the large-scale manufacturing sector of Pakistan. According to his estimates four variables; K/L ratios, skill and quality of labour, dependence on imported technology, and the ownership of firms explain 73% of the inter-industry variations in productivity in the large-scale manufacturing sector of Pakistan (Ahmed 1980, pp. 21-31). Sometimes the change in managerial decisions can also raise labour productivity irrespective of any rise in K/L ratios. An International Labour Organisation (ILO) productivity study by Kilby (1962) shows that in the textile industry alone in Pakistan there was a dramatic increase in labour productivity when only a few changes in management decisions were taken (p. 305).

The share of wages in total value-added (wL/V) as shown in Table 4.7 indicates that on average wL/V has declined slightly from 0.32 in 1977-78 to 0.28 in 1984-85. As mentioned earlier, the indicator wL/V is associated with K/L ratios and the elasticity of substitution. As we do not know the size of the elasticity of substitution at this stage, we may only assume that with a rise in K/L ratios, the decline in the share of wages in total output may be reflecting a high elasticity of substitution. Among consumer goods industries food, leather, ginning and baling of fibres, and miscellaneous have wL/V ratios below average of total manufacturing in 1984-85. About half of the intermediate industries and all the capital goods industries are showing above average wL/V ratios in 1984-85.

Table 4.7: Share of Wages in Total Value-added in Major Group of Industries in 1977-78 and 1984-85

Industries	1977-78 wL/V (1)	1977-78 Ranking (2)	1984-85 wL/V (3)	1984-85 Ranking (4)
Total Manufacturing	**0.32**		**0.28**	
Consumer Goods	0.33		0.28	
Food manufacturing	0.27	15	0.27	13
Beverage	0.22	18	0.28	12
Tobacco	0.15	20	0.33	9
Textiles	0.41	6	0.32	10
Wearing apparel	0.26	16	0.48	2
Leather & leather products	0.14	21	0.16	20
Footwear	0.35	11	0.32	10
Ginning & baling of fibres	0.20	19	0.25	15
Wood & cork products	0.41	6	0.28	12
Furniture and fixtures	0.40	7	0.33	9
Paper & paper products	0.39	8	0.40	5
Printing & publishing	0.46	4	0.36	7
Pottery china	0.38	9	0.36	7
Miscellaneous	0.51	3	0.21	16
Intermediate Goods	0.23		0.22	
Drugs & pharmaceutical	0.23	18	0.26	14
Industrial chemicals	0.25	17	0.18	19
Other chemicals	0.31	13	0.19	18
Petroleum & coal products	0.03	22	0.19	18
Rubber products	0.32	12	0.38	6
Plastic products	0.28	14	0.32	10
Glass & glass products	0.42	5	0.41	4
Non-metallic minerals	0.37	10	0.29	11
Iron & steel	0.35	11	0.20	17
Capital Goods	0.45		0.37	
Fabricated metal products	0.60	1	0.33	9
Machinery non-electrical	0.33	12	0.35	8
Electrical machinery	0.37	10	0.32	10
Transport equipment	0.55	2	0.42	3
Professional goods	0.55	2	0.70	1

Notes: Ranking is done in such a way that the increase in numbers indicates an increasing degree of capital intensity.
Value-added is at the constant prices of 1975-76.
wL/V is total wages per annum divided by gross value added at the constant factor prices of 1975-76.
Calculated from CMIs (1977-78, 1984-85).

4.5 Limitations

Our analysis of capital intensity shows that this has increased in manufacturing sector of Pakistan and different industries are showing varying degrees of capital intensity. Certain limitations of the analysis however, necessitate us to qualify our results. Some of these limitations are related to the indicators used (as has been discussed earlier). For example, the technical relationship between capital-labour and capital-output ratios derived from the general production function is based on many strict assumptions such as perfect competition, constant returns to scale, full utilisation of capital stock etc. The violation of these assumptions may limit the use of these indices as pure indicators of capital intensity and non-technological factors may as well explain capital intensity (as explained earlier).

In our study different indices are indicating different degree of capital intensity. With the exception of a few industries no uniform ranking under different indices has been found. Bhalla (1975) has also shown in the case of Brazil and Mexico that different indices reflect different ranking of industries (see pp. 30-32). Since most of these indices are by themselves pure ones in reflecting capital intensity, unless these were purged of non-technological factors they would be of limited usefulness for purposes of comparison across a heterogeneous mass of industries (Bhalla, 1975). Hence, in theory and practice, there are considerable difficulties in ranking projects and industries according to capital intensity under different indices. Much depends on the substitutability of products, differences in scale and variations in relative factor prices and their effect on substitution. Only a few industries, namely, beverage, plastic products and fabricated metal products show close ranking according to different indices. One can only speculate that a non-similar ranking in industries may occur owing to different degree of market imperfections and variations in returns to scale.

Certain limitations of the data also suggest caution in interpreting the results. Data reported in CMI suffers from undercoverage due to non-response by the establishments. The CMI is conducted through mail enquiry supplemented by field visits. The number of factories on the mailing list was 8083, and the number of non-responding factories was 1722 in 1984-85 (CMI 1984-85 p.xiv). The number of factories on the mailing list and non-responding factories varies from year to year. This non-response may affect the overall capital intensity in the manufacturing sector.

The usefulness of the observed measures as a guide to the choice of the "right" project or "right" sectors would be limited because there is no information available on alternative techniques. For the choice of the technical blueprint with optimum capital intensity such information is indispensable.

The degree of capital intensity in the manufacturing sector of Pakistan can be best appreciated when compared with other countries. But difficulties may arise due to the problems of the uniformity of the methods of estimation of value of fixed assets in different countries. It is also difficult to obtain homogeneity of products of industries between countries. The market structure may not be the same. Mason and Sakong (1971) have tried to overcome these difficulties and applied a special procedure. They have used installed horse power capacity per person engaged as a surrogate for capital intensity. In their study per capita product (V) provides a surrogate for the level of economic development or relative factor endowment and population (P) provides a surrogate for the size of market. They regressed capital intensity in terms of K/L ratios for developing and developed countries and derived the conclusion that the capital intensity of developing countries is too high relative to developed countries in relation to levels of development. We cannot imply directly the conclusion of this study in our analysis as Pakistan is not included in their analysis.

Nevertheless in the light of our analysis of capital intensity we have convincing evidence that capital intensity in manufacturing sector of Pakistan between 1977-78 and 1984-85 has increased and substitution of capital for labour had been taking place.

4.6 Impact of Capital Intensity on Employment

To see the impact of capital intensity on employment a very simple method is adopted by following Williamson and Sicat's technique (1968), which measures the displacement of labour due to changes in capital-labour ratios. It will indicate the level of employment if base year ratios had been maintained in subsequent years.

Using 1977-78 as a base year Table 4.8 shows how labour displacement took place due to a movement away from the 1977-78 factor combinations. If 1977-78 capital-labour ratios had prevailed in 1984-85, employment would have increased. We can compare the "estimated" level of employment (L^*) with the actual levels of employment (L). The difference between the two can be termed as the labour displacement effect for manufacturing as a whole.

The labour displacement effect is 38 per cent of the total employment in 1984-85. In other words, if the 1977-78 capital-labour ratios were maintained, employment would have been 48 per cent higher in 1984-85 than it actually was.

Table 4.8: Labour Displacement Effects

Industries	K 1977-78 1	L (000) 2	L/K 3	K 1984-85 4	L* (000) 5	La (000) 6	L*-La (000) 7	(L*-La)/La % 8
Total Manufacturing	**302101**	**458**	**0.015**	**450591**	**676**	**490**	**186**	**38.0**
Consumer Goods	19331	316	0.016	18777	300	308	-8	-2.0
Food manufacturing	5605	51	0.009	5561	50	64	-14	-21.9
Beverage	266	3	0.011	403	5	5	0	0.0
Tobacco	416	9	0.022	323	7	10	-3	-30.0
Textiles	10553	213	0.020	9548	191	175	16	9.1
Wearing apparel	93	3	0.032	188	6	7	-1	-14.3
Leather & leather products	308	4	0.013	259	3	5	-2	-40.0
Footwear	34	1	0.029	35	1	1	1	0.0
Ginning & baling of fibres	365	9	0.025	393	8	14	-4	-42.9
Wood & cork products	54	1	0.019	232	5	2	3	150.0
Furniture and fixtures	34	1	0.029	344	10	2	8	400.0
Paper & paper products	824	7	0.009	697	6	8	-2	-25.0
Printing & publishing	374	9	0.024	534	13	9	4	44.4
Pottery china	218	2	0.009	172	2	3	-1	-33.0
Miscellaneous	187	3	0.016	88	1	3	-2	-66.7
Intermediate Goods	7491	75	0.010	22842	228	115	113	98.6
Drugs & pharmaceutical	597	10	0.017	1288	22	15	7	46.0
Industrial chemicals	2771	13	0.005	4450	22	17	5	29.4
Other chemicals	334	7	0.021	444	9	8	1	12.5
Petroleum & coal products	45	2	0.044	38	2	1	1	100.0
Rubber products	195	9	0.046	622	29	10	19	190.0
Plastic products	156	1	0.006	326	2	4	-2	-50.0
Glass & glass products	175	3	0.017	478	8	4	4	100.0
Non-metallic products	1540	13	0.008	2838	23	16	7	43.8
Iron & steel	1678	16	0.009	12358	111	40	71	178.1
Capital Goods	3388	68	0.020	3440	69	67	2	3.0
Fabricated metal products	591	12	0.020	359	7	9	-2	-22.2
Machinery non-electrical	1081	14	0.013	979	13	18	-5	-27.8
Electrical machinery	764	18	0.024	982	24	18	6	33.3
Transport equipment	889	20	0.022	1035	23	19	4	21.1
Professional goods	62	4	0.065	85	6	3	3	100.0

1 Non-ferrous industry has not been taken because of its negative value-added at the constant prices of 1977-78, hence value of capital stock (K) for 1977-78 and 1984-85 is less than calculated value of capital stock given in table 3.1.

K = the Rupees value of fixed assets in millions.

L*: the optimal level of employment which has been derived by multiplying column 3 by column 4.

La: the actual level of employment in 1984-85.

Source: Calculated from the CMIs 1977-78 and 1984-85.

The analysis of Hussain (1974) shows 44% labour displacement effect in 1967-68 by maintaining capital-labour ratios of 1959-60 (pp.211-21).

An interesting outcome of our figures is that on average the largest displacement of labour has occurred in the intermediate industry groups and very little has occurred in either the consumer or capital goods sectors. The basic reason is that this group contains such industries as industrial chemicals, non-metallic mineral products and iron and steel etc., in which capital-labour ratios have increased and these may be using a large proportion of subsidized imported capital. Whether the technology used by the intermediate group of industries is flexible or rigid with respect to relative factor prices depends on the detailed analysis of the production function in these industries. The labour displacement effect is negative in the consumer goods industries which indicates a net increase in employment in 1984-85. It is quite possible that consumer goods industries are relatively small-scale compared with the intermediate group of industries and may be relying more on the increased utilisation of the existing capacity with any increase in demand for output. With the exception of fabricated metal products and non-electrical machinery all capital goods industries are showing a substantial labour displacement effect.

There are also some flaws in this technique. We cannot say that the capital-labour ratios in 1977-78 (the base year) were determined at true scarcity factor price. Initial factor price distortions might be in existence in the market at that time. We can only say that capital-labour ratios have changed and capital intensity has increased during the period considered which in turn has affected the labour absorption in industries. The proposition of constant capital-labour ratios in subsequent years is based on the assumption that the ratio of relative factor prices will remain the same in future years and the effect of technology is neutral etc. In reality wages may increase more than the cost of capital due to many reasons. Moreover, technology may change over the period and a return to past capital-labour ratios may become uneconomic.[21]

4.7 Conclusion

From the analysis made in this chapter we have convincing evidence that overall capital intensity in the manufacturing sector increased and substitution of capital for labour had been taking place. Some industries such as, wood and cork products, furniture and fixture, industrial chemicals, non-metallic minerals and iron and steel are highly capital-intensive industries in terms of both high capital-labour and capital-value added ratios. According to the end use, the intermediate goods industries on average are found to be the highest capital-intensive ones in terms of K/L, K/V and V/L ratios while capital goods industries on average are showing the lowest capital intensity in terms of the K/L and K/V ratios.

Increasing capital-labour ratios may be due to many factors such as the changes in relative factor prices and the increased use of imported technology. It is quite possible that a rise in wage-rental ratio during 1977-78 to 1984-85 might have induced substitution of capital for labour (this will be discussed at length in the next Chapter). It is not clear at this stage whether the changes in K/L ratios were driven by the changes in technology or by relative factor prices. This would require a detailed analysis of the features of technology and the form of the production function in the manufacturing sector. It may be the case that the technology used by many industries is rigid at a particular point of time and relative factor prices have little role in determining capital-labour ratios.

A positive and significant technical relationship has been found between capital-labour ratios and value-added per employee. In the economic literature, the higher cost of labour relative to capital is assigned to a technical relationship between capital-labour ratio and labour productivity which encourages more use of capital and in turn raises labour productivity. However, labour productivity is also affected by other non-technological factors such as improvements in skill, the existence of economies of scale, and the use of advanced technology etc.

The impact of capital intensity on employment has shown the magnitude of employment that would have been created if the capital-labour ratios had not changed in subsequent years. We have seen that the overall labour displacement effect is quite substantial due to changes in capital-labour ratios in subsequent years and a sufficient amount of employment can be created if factor combinations remain at some fixed proportion in some future date. However, the analysis of constant capital-labour ratios in subsequent years is based on certain assumptions which may be difficult to maintain in real world.

Since all the indices used to indicate capital intensity are derived on the basis of pure technical grounds, any non-technological effects severely limit the usefulness of these indices as an indicator of capital intensity. Nevertheless, our analysis has shown that the overall capital intensity has increased over the two time periods taken 1977-78 and 1984-85. On the basis of our analysis we can tentatively conclude that the increased capital-labour ratios are partly reflecting the increase in relative factor prices.

Further questions related to the causes of capital intensity and the possibilities of employment generation will be dealt in next Chapter.

Notes and References to Chapter 4

1 The earlier theories on economic growth were based on the assumption that the opportunity cost of labour is nil in labour surplus economies and the industrial sector can absorb as much labour as it can without affecting any loss of output in other activities; see for instance Lewis (1954). Many economists have argued that the social opportunity cost in labour surplus economy is not zero rather it is positive. See for example, Harberger (1971), Edwards (1982) who have explained how to measure the opportunity cost of labour.

2 An early contribution to the investment criteria for developing countries was made by Kahn A.E (1951). Later, Galenson and Leibenstein (1955), Dobb (1955), Sen (1969, 1972) contributed much in the theory of the choice of techniques.

3 This is based on the Lewis model (1954) of economic development with unlimited supplies of labour and has been well explained diagrammatically by Thirlwall (1983a), pp. 100-102.

4 For a lucid analysis of efficiency and optimality in choice of techniques see Sen (1969).

5 The features of general production function can be found in most of the applied micro economic books See for example, Intriligator (1978), Layard and Walters (1987), and Clark (1985).

6 Two plants with the same capital stock may have different capital-labour ratios if they have different rate of capacity utilisation. It is a general phenomenon that a plant with higher utilisation will use more labour and thus will have low capital-labour ratios. However, it depends whether factor proportions are rigid or flexible.

7 The labour-saving techniques means that more capital per unit of labour is being used, or the same stock of capital is using less labour.

8 For example, according to Khan (1970), in large and medium-scale industries, nonwage value added per worker explains only 14% and 7% of the variation in physical capital per worker respectively in West (present) and East (former) Pakistan, p. 234.

9 See for details Bhalla (1975), p.22.

10 The Cobb-Douglas production function named after its two American originators, Charles Cobb and Paul Douglas (1928) has been mostly fitted to aggregate data to distinguish empirically the sources of growth.

11 The CES production function has been given by Arrow, Chenery, Minhas and Solow (1961).

12 The contributions on capital theory include, among many others, Robinson (1970), Kaldor (1957), Johanson (1972), Salter (1966), Fisher (1965, 1969), Jorgenson (1963), Bruno (1969) and Ferguson (1969) etc.

13 See for instance, Kemal (1976b), p.350.

14 Khan (1970) made analysis of capital intensity for both parts of the country at that time; West Pakistan (present Pakistan) and the East Pakistan (now Bangladesh) and compared capital intensity with the United States and Japan.

15 Pakistan is a developing country and the industrial sector is in a process of development. Certain strategic industries are being developed. For example, in 1980s the steel mill started producing steel in the country; much attention is also being given to the establishment of engineering goods sector; see Economic Survey 1991-92, Industrial Policy Package by Ministries of Industries (1989).

16 For instance, Harris and Todaro (1969), Behrman (1972), Roemer (1975), and Kim (1984) among many others have estimated the elasticity of substitution between capital and labour with respect to relative factor prices and found that changes in relative factor prices can have an important impact in determining capital-labour ratios.

17 For example, in the case study of leather industry in Bangladesh, Huq and Islam (1990) concluded that most of the imported machinery from European countries shows strong features of scale economies p.64.

18 This general point has been made by Bhalla(1975), p. 28

19 The first study on underutilisation of capital stock in the industrial sector of Pakistan can be assigned to Hogan(1967). Later on Winston(1971), Pasha & Qureshi(1984), Planning and Development Division Report (1987), have pointed out the problem of underutilisation of capacity in the manufacturing sector of Pakistan.

20 Improvements in human capital may be due to the learning by doing or due to improved skills through education. The process of "learning by doing" gradually raises the productivity and efficiency of factor inputs, For the economic implications of "learning by doing" see Arrow (1962). The role of education in technological progress and in raising productivity has been well explained by Schultz (1961), Blaugh (1973), Psacharopoulos (1973).

21 For details of this phenomenon see Stewart(1977).

APPENDIX TO CHAPTER 4

Appendix Table 4.1: Estimated Value of Fixed Assets in the Large-Scale Manufacturing Sector At different depreciation Rates

(Million)

Year	I	Dep 8%	K_t	Dep 12%	K_t
1969-70	2174		27330		27330
1970-71	2677	2186	27821	3280	26727
1971-72	1912	2226	27507	3207	28639
1972-73	1418	2201	26724	3437	26620
1973-74	1037	2138	25623	3194	24463
1974-75	2263	2050	25836	2936	23790
1975-76	4468	2067	28237	2855	25403
1976-77	5349	2259	31327	3048	27704
1977-78	6399	2506	35220	3324	30779
1978-79	6478	2818	38880	3693	33564
1979-80	6254	3110	42024	4028	35790
1980-81	5388	3362	44050	4295	36883
1981-82	5608	3524	46134	4426	38065
1982-83	6244	3691	48687	4568	39741
1983-84	6653	3895	51445	4769	41625
1984-85	6181	4116	53510	4995	42811
1985-86	7315	4281	56544	5137	44989
1986-87	6725	4524	58745	5399	46315
1987-88	7257	4700	61302	5558	48014
1988-89	7970	4904	64368	5762	50222
1989-90	8408	5149	67627	6027	52603

All the data is at the constant prices of 1975-76.
The data on gross fixed investment (I) has been taken from Pakistan Economic Survey of different Years.

Appendix Table 4.2: Estimated Value of Fixed Assets in the Large-Scale Manufacturing Sector of Pakistan: At Different ICORs
(million)

Year	I 1	Dep 10% 2	K_t ICOR 3 3	Dep 10% 4	K_t ICOR 3.4 5
1969-70	2174		32796		37169
1970-71	2677	3280	32193	3717	36129
1971-72	1912	3219	30886	3613	34428
1972-73	1418	3089	29215	3443	32403
1973-74	1037	2922	27330	3240	30200
1974-75	2263	2733	26860	3020	29443
1975-76	4468	2686	28642	2944	30967
1976-77	5349	2864	31127	3097	33219
1977-78	6399	3313	34213	3322	36286
1978-79	6478	3421	37270	3629	39135
1979-80	6254	3727	39797	3914	41475
1980-81	5388	3980	41205	4148	42715
1981-82	5608	4121	42692	4272	44051
1982-83	6244	4269	44667	4405	45890
1983-84	6653	4467	46853	4589	47954
1984-85	6181	4685	48359	4795	49340
1985-86	7315	4835	50829	4934	51721
1986-87	6725	5083	52471	5172	53274
1987-88	7257	5247	54481	5327	55204
1988-89	7970	5448	57003	5520	57654
1989-90	8408	5700	59711	5765	60306

Notes: The estimates of Kt in column 3 have been derived on the basis of bench mark value of K0 (1969) which has been estimated by multiplying output in 1969 by ICOR 3.

The estimates of Kt in column 5 have been derived on the basis of bench mark value of K0 (1969) by multiplying output in 1969 by ICOR 3.4.

Columns 2 and 4 are based on the assumption of 10% depreciation of capital stock.

The data on gross fixed capital formation (I) have been taken from Pakistan Economic Survey of different years.

All the data is in constant prices of 1975-76.

CHAPTER 5

GOVERNMENT POLICY AND FACTOR PRICE DISTORTIONS IN THE MANUFACTURING SECTOR

5.1 Introduction

In the previous chapter we have shown that overall capital intensity in the large-scale manufacturing sector of Pakistan increased substantially between 1977-78 and 1984-85. There may be different factors determining capital intensity in the sector. Nevertheless, factor price distortions are considered one of the major factors encouraging capital intensity in a labour surplus economy and affecting employment absorptive capacity of the industrial sector (see Chapter 3 for theoretical discussion). Various forms of government intervention in capital and labour markets distort and determine the pattern of relative factor prices which differs from the pattern which would result from relative resource endowments.

Our main hypothesis is that during 1950-71, government industrial and trade policies, and from 1969 onwards labour policies distorted relative factor prices in Pakistan. These in turn may have affected the employment absorptive capacity of the manufacturing sector of Pakistan.

Against this background this chapter is devoted to the analysis of government policies towards the manufacturing sector of Pakistan. The basic aim is to see how different policies of the government manipulated relative factor prices in the large-scale manufacturing sector of Pakistan over the period 1974-75 to 1986-87.

5.2 Government Industrial and Trade Policies

Industrial and trade policies are closely related to each other and exert a powerful influence in shaping the allocative pattern of resources. One of the most important tools of Pakistan's trade policy has been the imposition of tariffs and non-tariff barriers (indirect controls on trade through quotas, licences etc.) on goods and services traded across national borders which not only distorts product prices but also factor prices.

The motivation behind tariff policy is generally twofold. First, tariffs serve as a device to protect domestic industries from foreign competition. Second, they serve as a means of raising revenue to finance the activities of the government. Both of these motives are usually at work in developing countries.

Protection to industries is frequently justified on the basis of the "infant industry argument". This contends that, because of various reasons such as untrained labour and inexperienced entrepreneurship, the cost of production in the manufacturing sector in its earlier stages of establishment exceeds the cost of imports. This makes domestic producers uncompetitive with the foreign producers unless protection is given for a transitional period. But as both labour and entrepreneurs gain useful experience the domestic industry should become competitive in its world market, and protection should no longer be required (see for details, Johnson, 1971, Bhagwati, 1971). The problem with this argument is that it cannot be generalised for all industries. It requires a selective approach to provide protection to industries conforming to the test of infancy. In practice this test may not be considered by the government in implementing its policies.

Protection to import substitution products through tariffs or non-tariff barriers raises the prices of domestic goods above world prices, exerts a bias against exports, causes loss of real income and distorts relative product prices (see for details Johnson 1971, p. 94, Godfrey 1986, pp.90-97). Protection, if accompanied by an overvalued exchange rate in terms of foreign currencies, also distorts relative factor prices. Protection reduces the demand for imports (depending on the elasticity of demand) but if the exchange rate appreciates (a unit of domestic currency buys more foreign exchange), this together, with low tariffs on capital goods reduces the price for imported capital goods in terms of local currency and encourages the choice of capital-intensive techniques (Godfrey, 1986, see also Balassa, 1988).

Industrial policy in Pakistan has been dominated by a system of trade and foreign exchange controls which has only been partially liberalised in recent years. For convenience we can divide the period since Independence (the first three years have been omitted due to lack of data) into three phases. The first phase, covering the period 1950-71, was characterised by import substitution policies directed at consumer goods industries and by the imposition of direct and strict controls on trade. The second phase, 1972-77, was marked by nationalisation of industrial units and devaluation of the exchange rate. The third phase, 1977 to the present, is signified by a move towards liberalisation and promotion of export based industries.

5.2.1 The First Phase (1950-71)

The policy adopted in the earlier periods of industrialisation (1950-71) emphasised the establishment of import substituting industries in the consumer goods sector during which machinery was mostly imported from abroad (see Power 1963, for details).

The historical circumstances after the country's independence in 1947 and the international economic conditions at that time largely helped in formulating industrialisation strategy. At the time of independence both parts of the country; West Pakistan (present Pakistan) and East Pakistan (now Bangladesh) were principally agricultural areas. India was the major trading partner providing manufactured goods in exchange of jute and raw cotton from Pakistan. But the cessation of trade with India in 1949[1] and the large domestic demand for manufactured goods launched Pakistan into a programme of rapid industrialisation.

The outbreak of war in Korea also gave a considerable boost to the industrialisation drive. The Korean Boom from mid-1950 to late 1952 raised raw material prices and increased foreign exchange earnings through exports of cotton and jute which were later utilized for the import of machinery and raw materials used for setting up new industries and expanding production in new units. This fortuitous growth in export revenues supported government policy which was aimed at channelling merchant capital into industrial capital. By the end of the Korean Boom in 1952, a series of foreign exchange crises, caused by the rapidly declining prices of the two major exports (jute and raw cotton) and a speculative increase in imports under the free open general licence (O.G.L) system then in force, required a drastic and immediate reduction in imports. Although there were a variety of alternative methods for restricting imports, the decision was made to impose direct and strict controls on foreign trade through a very complicated licensing procedure (for details see Thomas, 1970). At the same time the capitalists were given incentives to import machinery at a cheaper cost. This was made possible by the maintenance of a highly overvalued exchange rate for the rupee and the rationing of foreign exchange among capitalists through direct licensing for imports (for details see Lewis, 1969, chapter 1V). These licences were of two types, viz, industrial licences and commercial licences.[2] Licence allocations were regulated by giving the lowest priority to consumer goods, particularly luxury items, and high priority to raw materials, spare parts and machinery (Planning Commission, Government of Pakistan, 1987). Both the level and the product composition of import licenses changed from year to year, but in all years demand for imports exceeded the controlled supply, creating a gap between importer's costs (c.i.f. prices plus duties and sales taxes) and market price. The margin above importers' costs represented a windfall profit for those fortunate enough to have import licences (for details see Lewis, 1969, chapter 1V).

Winston's (1972) estimates showed that both the overinvoicing[3] and financial profits on the import of invoiced machinery increased substantially between 1966 and 1970. For example, the profits on invoiced machinery of worth Rs. 1 million at market price was Rs 76.5 thousand in 1966 at the 10% level of overinvoicing. This increased to Rs 351.5 thousand in 1970, at the 20 per cent level of overinvoicing (Winston 1972, p. 174).

The sale of foreign currency at an overvalued exchange[4] rate for domestic rupees was equivalent to a tax on exports - i.e., agricultural exports. The sale of import licences at the official rate of exchange to traders and investors constituted a corresponding subsidy to the capitalists. In this way the terms of trade were deliberately turned against agriculture during the 1950s through licensing of scarce foreign exchange earned primarily by agriculture to the industrial sector, generous tax concessions to industries and lack of similar incentives for commercial agricultural investment (see Lewis, 1969 for details). Thus the rural sector was transferring savings to the rapidly growing urban capitalist sector. According to one study, agriculture transferred about 3600 million rupees of resources to the urban sector which was over 15 per cent of the value of its gross output (Griffin and Khan, 1972, p. 44).

Moreover, the prices of agricultural goods were maintained at a low level to provide cheap raw materials and cheap food to urban consumers while farmers had to pay higher prices for the goods produced by the protected industrial sector. The domestic terms of trade were severely distorted by exchange and trade controls in the early to mid-1950s (see Annex Table A-3). Even by the end of 1960/61-1962/63, the agricultural terms of trade were less than two thirds of what might have been received through direct trade in world market (see Annex Table A-3). The transfer of foreign exchange revenues, earned by jute exports of the eastern wing, to West Pakistani industrialists, became a symbol of regional exploitation and led to political turmoil(see Bhatia, 1979, Noman, 1988).

The policies that began as a response to the developing historical situation were later formalized into a full-fledged system of a network of controls by the new government in 1958. The aim of the industrialisation strategy was to achieve a high growth rate in GDP through rapid industrial development. This policy was pursued consciously, with extraordinary determination, and with a disregard for other social goals. The growth strategy was in fact made under the influence of the then economists' beliefs that growth, equity, and employment are complementary and not competitive.[5] Given the stress on the development of consumer goods industries the industrialists were the primary beneficiaries of the economic strategy. Hence, various investment incentives in the form of cheap credit, tax concessions, and cheaper inputs, were provided to industrialists. (see Soligo and Stern, 1970, Lewis, 1969 for details of the trade policy). Government also established many industrial units through two main institutions; the Pakistan Industrial Credit and Investment Corporation (PICIC) and the Pakistan Industrial Development Corporation (PIDC) which were transferred later to the private sector (See Griffin and Khan, 1972, p.35). The Planning Commission, a powerful government institution, became an effective mechanism for policy and created a framework for industrial development.

The mechanism was periodically adjusted to match the changing situation. During the 1950s, when the economic system was simple, a set of direct controls on foreign trade through import licensing could serve the two purposes of squeezing resources from agriculture for financing industrial sector and promoting private industrial enterprise by maintaining high rates of industrial profits. When the system became more complex in the 1960s and various economic and administrative problems (such as concentration of wealth in a few hands, underutilisation of capacity due to lack of essential imported raw materials, less incentives to manufactured exports, and the delay in allocating licences etc.) were felt (See Thomas, 1970, pp. 12-14), direct controls were replaced by more complex policy measures by the new government. In 1959, the Export Bonus Scheme[6] was introduced which provided multiple flexible exchange rates to favour exports. This scheme provided a subsidy for exports and allowed a free market to import certain commodities. The main object of the scheme was to secure an exportable surplus by subsidising exports of manufactured goods.

A Pay As You Earn (PAYE) scheme was also introduced in 1962 to promote exports. It allowed entrepreneurs to import plant and machinery for the establishment of industrial units on credit and to pay for the cost of imported machinery and equipment in foreign exchange out of the export earnings (UNIDO, 1985, chapter 13, p. 8). With some modifications PAYE still remains in force.

The introduction of the "Free List" in 1964 was meant to liberalise imports. Initially the Free List was composed of four items of iron and steel which could be imported without licence (see Thomas, 1970 for details). Later, 51 items of imported raw materials required by domestic industries all were added. Free list imports in 1964 accounted for about one-fourth of all imports into Pakistan (Thomas, 1970, p. 7).

The policy of import liberalisation continued up to 1965 when war with India in 1965, and the unexpected diversion of a substantial amount of foreign exchange earnings for food imports in 1966 led to the reintroduction of strict and direct controls on imports.

The initial phase of import-substituting industrialisation behind a protective wall brought a rapid growth in the large-scale manufacturing sector (see Annex Table A-4). However, this high growth rate up to the mid-fifties is somewhat misleading as the starting base was extremely low (Noman 1988, see also Lewis, 1969). The agriculture sector was ignored officially and its stagnation put a constraint on the expansion of the domestic market for manufacturing output. This in turn affected the growth of the large-scale manufacturing sector after the mid-fifties (Annex Table A-4). However, in the 1960s, the large-scale manufacturing sector grew at an annual average rate of 9% between 1963-64 and 1970-71 in real terms (Economic Survey 1991-92) with consumer goods industries growing at 11% per annum (Annex Table A-5). Foreign aid played a crucial role in industrial development in the 1960s (see Annex Table A-6; see also Brecher and Abbas, 1972, for the analysis of impact of foreign aid on industrial development in Pakistan).

Despite the rapid growth of the large-scale manufacturing sector the overall industrial structure was highly inefficient. For example, a study by Soligo and Stern (1972) suggested that 23 out of 48 manufacturing industries had a negative value added when measured at world prices. This included most of the largest industries (in terms of domestic value added) such as cotton and jute textiles, sugar, tobacco, and petroleum products (Soligo and

Stern, 1972, pp. 145-146).

The scarce capital resources secured either through foreign borrowing or by squeezing the domestic agricultural sector, were spent on fostering the growth of consumer goods industries in the private sector. However, considering the availability of a secure protected domestic market and plentiful supplies of domestic raw materials, there is a high probability that these industries would have been started by private entrepreneurs anyway (Bhatia, 1979). Similarly not more than 15-37% of the amount transferred from agriculture was turned into investments, and the remaining 63-85% dissipated in higher consumption by the richer urban class (Griffin and Khan, 1972, p. 45). Though gross domestic savings increased from 4.6% to 9.5% of GNP in 1949-50 to 1964-65 respectively (Planning Commission 1965, p.4), this was insufficient to meet gross investment expenditure which as a percentage of GNP, rose from 4.6% in 1949-50 to 15.8% in 1964-65. Hence, much reliance had to be made on foreign aid (see Annex Table A-6).

Since the official exchange rate was overvalued in terms of domestic currency, larger firms who were generally favoured with these licenses, tended to invest in capital-intensive projects with capital intensive foreign equipment (Thomas, 1970, p.13). This investment was not necessarily efficient in the light of Pakistan's factor proportions, nor was it conducive to increasing employment (Thomas, 1970, pp. 13-14). According to Pal (1970), small scale industries which were relatively labour intensive could not get the licenses and were kept at a relative disadvantage (p. 166).

Protection of industries and profits also brought excess capacity in industries.[7] As profits were protected, investments were made in industries for which permits were currently available, rather than waiting for permission to enter an even more profitable industry (Papanek, 1967, p. 20).

The larger firms received most of the licences which led to concentration of wealth in a few hands. For example, between 1960 and 1965 the leading forty-three families received capital goods licences totalling Rs. 1.5 billion or 51% of the total (White, 1974 p. 122). Similar favouritism operated in the allocation of foreign exchange. During the period from 1960 to 1965 the most wealthy seven families were given one-fifth of all PICIC awards of foreign exchange (White, 1974, p. 123).

The growth strategy in fact overlooked the importance of many other aspects of the developmental process which were essential for its smooth working. Some examples of adverse factors were the neglect of agriculture due to the bias to industry, the political repercussions of the concentration of incomes (see Noman, 1988 for details), savings, and investment decisions in a few hands and a lack of control on unproductive consumption pattern of industrialists (see Papanek, 1967), and finally the capital-intensive nature of industrial development (see Khan, 1970) etc.

To summarise, by the end of this era the economy of Pakistan was facing severe economic and social problems. Uneven distribution of wealth, regional imbalances, monopoly power, and social injustice led to not only the overthrow of government in 1968 but also to the dismemberment of one part of the country in 1971 (see Lewis, 1969, Griffin and Khan, 1972, Bhatia, 1979, and Noman, 1988 for valuable discussions). Different studies suggested that the government's industrial and trade policies brought a serious misallocation of resources in the economy by distorting product and factor prices.[8]

5.2.2 The Second Phase (1972-77)

Industrial strategy during this period took a sharp `U' turn. A policy of nationalisation was adopted in 1972 and important industrial units were taken over by the government.[9] The objectives of the government industrial policy during this period were reflected in an official statement, "Although the regeneration of the growth process is no mean achievement, this is hardly the main objective of the government. The government has adopted a new development strategy, with provision of employment, satisfaction of the need of people and elimination of the worst forms of poverty being its major planks"(Pakistan Economic Survey,1972-73, p.2).

The nationalisation of industries in 1972 which was continued up to 1976 shattered private confidence. This was largely reflected in the behaviour of private investment which fell significantly from Rs 2026 million in 1971-72 to Rs 990 in 1974-75 (see Annex Table A-7). This fall was compensated for by a substantial increase in public sector investment (Annex Table A-7).

The aim of the government was to rectify the imbalance in Pakistan's industrial sector. During the sixties, Pakistan had developed an industrial structure capable of producing consumer goods. By investing resources into the capital goods sector, the new government helped to establish a more diversified production base. For example, establishment of a steel mill was a move towards development of basic key industries in the economy.

The most important event which took place in this era was the devaluation of currency by 58% in nominal terms and the pegging of the exchange rate at Rs 9.90 per US dollar in May 1972 (Pakistan Economic Survey 1984-85, p. 93). The entire structure of Pakistan's trade control system underwent a complete revision at this time. The export bonus scheme was dropped and tariffs on imports were lowered. Most important, the licensing system was changed. "An import license would now (post-1972) be issued freely to any Pakistani on registration" (Pakistan Economic Survey, 1971-72, p.16). The stringent system of restriction of private imports which accounted for 80% of the total imports was ended with the exchange rate reforms in 1972 (World Bank, 1988). Liberalisation and simplification of trade accompanied devaluation. This system opened avenues for even small manufacturers, in contrast to earlier programmes that were biased in favour of large firms.

Prior to devaluation, there was a multiple exchange rate regime, which led to an intricate system of foreign exchange controls. Overvalued exchange rates also allowed licence holders to earn economic rents. Devaluation simplified the procedure of imports, and the rents derived through the licences were removed. Moreover, devaluation of the currency and abolition of the export bonus scheme removed many of the incentives provided to the manufacturing sector in terms of high protection to industries. There is no information on the changes in effective rate of protection[10] during this period. Nonetheless, the information on nominal rates of protection[11] (i.e,protection afforded by tariff alone) suggests that protection to all industries was significantly reduced in 1972-73. For example, the average nominal protection to all industries declined from 110% in 1963-64 to 52% in 1972-73 (See Annex Table A-8). The largest decline occurred in consumer goods industries where nominal protection declined from 157% to 63% as compared to intermediate (85% to 43%) and capital goods industries (90 to 50%) during 1963-64- 1972-73 (Annex Table A-8).

Though protection continued to be given to industries the devaluation in 1972 made a significant contribution towards reducing the distortions in the cost of capital. According to Guisinger's (1978) estimates, there was a steep rise in the index of the rental cost of capital in 1974-75 (of machinery worth Rs. 100) i.e., it increased from Rs. 86 in 1972-73 to Rs. 108 in 1974-75 (p. 30). This was mostly attributed to devaluation and the rationalisation of industrial tariff structures (see Guisinger, 1978, and Noman, 1988).

In the context of extending assistance to small scale industry, several measures were taken to resolve difficulties faced by the manufactures of sports goods and surgical instruments. Efforts were made to improve the availability of raw materials needed by these industries and to improve their arrangements for selling goods abroad.

Despite many structural adjustments in the economy the growth in large-scale manufacturing sector was very low (see Annex Table A-4). Many internal factors (e.g. floods, political unrest, inflation) as well as external factors (oil price shock) led to virtual stagnation (See Naqvi and Sarmad, 1984).

5.2.3 The Third Phase (1977 to the Present)

With the change in government in 1977, the official industrial policy shifted towards the revival of the role of the private sector in industrial development. The aim was to develop basic capital goods industries such as chemicals, metals, and engineering industries and emphasis was given to the development of the export goods sector and liberalisation of the economy (The Fifth Five Year Plan, 1978-83, p.88).

In 1982 Pakistan delinked her currency from the US dollar and adopted a managed flexible exchange rate system. From 1982 to 1992, the currency depreciated by 60% against the dollar in nominal terms (Economic Survey, 1991-92, p. 56).

In 1988 the IMF and the World Bank suggested that Pakistan should deregulate its industrial sector (for details see UNIDO, 1990, pp. 74-75). However, the success of this policy will depend on the positive effects of the measures adopted to boost industrial investment in specific industries. There are a number of aspects where serious consideration is required such as protective measures for different industries, quality improvement of export goods, provision of infrastructure in under-developed areas, credit availability to the small-scale enterprises, etc. (see UNIDO 1990, pp. 78-81).

Protective tariffs continued on both industrial finished goods and inputs. As the objective was to increase manufactured exports, protection was mostly given to export-oriented industries (see Annex Table A-9). Protection rates are not uniform and varied from industry to industry (see Annex Table A-10). The average rate of nominal protection to Pakistan manufacturing industries was 89%, ranging between 130% for finished goods and 49% for intermediate goods. The nominal protection for capital goods industries had been 80% during the first half of the eighties (Pakistan Economic Survey, 1984-85, p.136). A nominal protection rate of 89% means, that, on average domestically manufactured goods sell for Rs. 189, when the same goods could be imported for Rs. 100 (free of duties). The effective protection rates (EPR) exceed 100% in more than half the industries of Pakistan and are close to zero or negative in one quarter of the industries (Pakistan Economic Survey, 1984-85 p.136). This pattern of protection is bound to result in a misallocation of resources, encourage inefficient industries which may not have potential for exports, and discourage efficient industries with export potential. Incentives to improve productivity and quality may be eroded in the presence of high rates of protected profits.

As earlier mentioned high rates of protection to many industries not only raise the domestic prices of these products above world prices but may also discourage manufactured exports because it becomes much more profitable for producers to sell domestically at high prices than to export. The export of manufactured and semi-manufactured goods accounts for about 72% of total exports of Pakistan (Economic Survey, 1991-92). However, a handful of manufactured goods account for about two-thirds of total manufactured exports, with cotton textiles alone accounting for 45 per cent of manufactured exports in 1989 (see Annex Table A-11). The textile industry also provides a major share of employment (see Chapter 4, Table 4.9). Hence, any fall in its output can severely affect the employment in the industry. Another 23% of exports is contributed by other traditional goods such as leather (9%), carpets (7%), sports goods (3%), surgical goods (2%) etc. (see Annex Table A-11).

Reliable and precise judgements on the economic efficiency of a country's whole manufacturing sector as well as on the efficiency of individual branches are generally rather difficult to obtain. A useful indicator of the relative efficiency achieved in production can be presented, however, by using the domestic resource cost (DRC)[12] criterion. By evaluating both inputs and outputs of production at world market prices, the DRC measures the efficiency of domestic production in terms of domestic cost.

Applying this approach Naqvi and Kemal(1984) have shown that out of a total of 90 industry groups only 13 industries can be classified as being efficient users of domestic resources (DRC<1). Indeed the most inefficient industries turned out to be those enjoying the highest effective protection from international competition (Naqvi and Kemal, 1984). The study also showed that export-oriented industries are far more heavily protected and are producing less efficiently than import-competing as well as import-noncompeting industries (See Annex Table A-9). The analysis of inefficient industrial structure suggests that various protective policy measures (tariffs, quotas, subsidies, etc) need to be rationalised.

The 1984-85 budget was accompanied by the issue of a new Industrial Policy Statement (1984) and offered the following package of incentives:[13]

(a) A tax holiday of 5-years to new industries in certain specified underdeveloped areas (see below for further details);

(b) Exemption from custom duties on import of plant and machinery for industrial projects to be established in underdeveloped areas;

(c) Custom duties on metal-working machines and machine tools which are necessary for the development of local engineering industry were reduced from 85% custom duty and 10% sales tax to 40% custom duty and no sales tax.

The rates of export compensatory rebates were also revised and increased for many items (see Pakistan Economic Survey, 1984-85, pp. 185-86 for details).

In 1989 a new industrial policy package was announced which maintained the different type of investment incentives given earlier e.g., tax holidays on corporate' income and profits, exemption from custom duties on certain imported machinery etc. (Ministries of Industries, 1989)

In reality the tariff structure in Pakistan is quite complicated and is a mixture of a number of tariffs/taxes. The average tariff rate is now 37 per cent and according to World Bank (1988) today Pakistan's average (nominal) tariff ranks at the top, along with India's, amongst the developing countries (p. 68).

From the analysis of industrial and trade policy of Pakistan after 1971, it seems that from the perspective of neoclassical trade theory there may no longer be any serious factor price distortions in Pakistan because of the managed floating exchange rate. In reality however, many other fiscal and monetary concessions to industries are still given to industries established in underdeveloped areas which substantially subsidise and distort the cost of capital there. Moreover, the cost of labour is also distorted (this will be discussed later).

5.3 Other Monetary and Fiscal Incentives

From time to time different investment incentives were given to industries which played an important part in determining the cost of capital.

5.3.1 Tax Holidays

Tax holidays on corporate incomes and profits are granted to stimulate investment in general and to locate industries in certain areas. The tax holiday scheme was introduced in 1959 and granted complete exemption from income tax to new undertakings provided they used local raw materials and reinvested 60 per cent of their profits (Guisinger and Kazi, 1978, p. 390). Depending on the region in which a firm is to be located, the length of tax holidays varied between four and eight years. During the sixties the tax holiday had a duration of two years in the case of industries set up in developed areas, four years for semi-developed areas and six years for underdeveloped areas (Amjad, 1982, p.35)

In 1972, the tax holiday scheme was limited to industries established in underdeveloped areas. In the 1980s, 5-year tax holidays continued to be given to promote industries in less developed areas (Pakistan Economic Survey, 1984-85). The aim of these tax incentives is to channel industrial investment into priority industries and areas, but the Seventh Five Year Plan (1988-93) reported that tax incentives given during 1983-88 proved ineffective due to the lack of infrastructure facilities in the less developed areas (p.136).

In 1989, a 4-year tax holiday was allowed throughout Pakistan to those key industries which were established up to the end of 30th June 1993. At the same time in order to encourage industrial development in less developed areas, an income tax holiday of 8-years was granted for all industries in some specified underdeveloped areas and 4-years for some other underdeveloped areas (for details see Ministries of Industries, 1989).

5.3.2 Accelerated Depreciation Allowances

Accelerated depreciation allowances enable the producer to defer tax payments. This not only improves his cash flow but also provides him with subsidies in the form of interest savings on deferred taxes In the sixties, the normal depreciation rate was 10 per cent on machinery. Beside this there was an initial depreciation rate of 25 per cent in the first year and extra depreciation at the rate of 50 and 100 per cent of the normal actual depreciation allowance for double and triple shifts respectively (Amjad, 1982, p.36). This enabled a company to recover 57 per cent to 78 per cent of plant costs of new investments in the first five-year period (Amjad, 1982, p.36). During the period 1970-71, a special allowance at the rate of 15 per cent of written-down value was accorded in the second year of the undertaking (Guisinger and Kazi, 1978, p. 388).

In the 1980s, for machinery on which the general rate of depreciation (10%) applies, extra depreciation equal to 50% for double shift and 100% for triple shift working was allowed in proportion to the number of days of such multiple shifts (Ministries of Industries, 1986 p. 14). As compared to the rates of normal depreciation of 10% recognised by the government, 25% depreciation allowances were granted on machinery and plant (not previously used in Pakistan) which had been installed during the 1976-88 period (Ministries of Industries, 1986, pp. 13-15). It was reported that in the 1980s, the subsidies implicit in the depreciation allowance were 10.3 per cent (Pakistan Economic Survey, 1984-85, p.28).

5.3.3 Credit Policy

Financial institutions provide funds to the private sector at relatively easy terms. Two major institutions, the Pakistan Industrial Credit and Investment Corporation (PICIC), and the Industrial Development Bank of

Pakistan (IDBP), played a dual role in the sixties. Not only did they provide foreign exchange required to import industrial machinery for the private sector but, by providing this foreign exchange at a cheap official exchange rate, and in the form of loans on favourable terms, they greatly influenced the profitability and financial position of the recipients (Amjad, 1982, p.53). From 1960 to 1965, these two institutions together provided almost 70 per cent of the foreign exchange component of the total investment sanctioned (Amjad, 1982). Projects funded by these institutions accounted for about 65 per cent of total investment sanctioned during the Second Plan (1965-70) period (Amjad, 1982, p.55).

In recent years a number of the Development Finance Institutions (DFIs) (see Annex Table A-12) along with the commercial banks have been allowed to sanction and disburse loans in local and foreign currency. These institutions are controlled by the government and the interest rate is determined by government policy. The disbursements of loans by these institutions to the private sector is increasing over time (Annex Table A-12). Excluding the National Development Finance Corporation (NDFC) the largest share of total disbursement of loans to the private sector comes from the Industrial Development Bank of Pakistan (IDBP), the Pakistan Industrial Credit and Investment Corporation (PICIC), and Bankers Equity Limited (BEL).(Annex Table A-12).

The industry-wise disbursements of loans to different industries by the three leading financial institutions (PICIC, IDBP and NDFC) during 1983-84 to 1985-86 shows that the actual disbursement of loans on average is only about 18% of the total sanctions for all industries (Annex Table A-13). The loans disbursements are made on the basis of the priority sectors of the economy and on the basis of the credit ceiling for financial institutions set by the State Bank of Pakistan (State Bank of Pakistan, Annual Report, 1991-

92). At present priority is being given to export goods industries and those established in the less-developed areas

The rate of interest (an important element affecting the cost of capital), as in many developing countries, is shaped by the monetary policy of the Government of Pakistan. The setting of interest rates by the government is not unique to Pakistan. Government intervention in financial market is pervasive, even in the industrialised countries. For example, even the U.S. financial system, which is among the most market-oriented, was subject to Regulation Q until 1983 which established ceilings on the interest rates paid on many important classes of deposits (World Bank, 1985, p.18). Since intervention is everywhere, the relevant issue in this study is not its existence but its impact on the cost of capital.

As mentioned above, financial institutions are a major source of loans in local as well as in foreign currency. Up to the 1970s the nominal rate of interest (irrespective of inflation) on borrowed capital in Pakistan had been no higher than 6 per cent and the repayment period to a favoured client was typically 5 or more years (Griffin and Khan, 1972, p.16). Planners observed, "Loans at low rates of interest have meant that prices have not reflected the real scarcity of capital and an insufficient margin has been left for an adequate volume of savings to be generated" (The Second Five Year Plan (1960-65), p.73).

The nominal interest rate after 1970 started to increase but the increase was not substantial. Though the rate on borrowed funds may be different for different industries, the average weighted rate of interest on borrowed funds gives some crude idea of the cost of capital (Table 5.1). There is no significant upward trend in the nominal rate of interest during 1971-72 to 1986-87 (Table 5.1; see also Figure 5.1). The domestic rate of inflation has reduced the real rate of interest and for some years the real rate has been negative. Negative real rates of interest in some years indicates that the government was unable to set nominal interest rates in line with average inflation. The real rate of interest declined sharply during 1972-73 and 1974-75 due to oil-price shocks. In 1983-84 the high rate of inflation again substantially lowered the real rate of interest. Since 1983-84 however the real rate of interest has been positive and high. Differences in average real interest rates in different time periods largely reflect differences in average inflation rates.

Table 5.1: Nominal and Real Rate of Interest
(in Rupees)

Year	Nominal Rate of interest (1)	CPI (2)	Rate of inflation (3)	Real Rate of interest (1-3) (4)
1971-72	8.1	49.6	4.7	3.4
1972-73	8.7	54.4	9.7	-1.0
1973-74	8.5	70.7	30.0	-21.5
1974-75	9.5	89.6	26.7	-17.2
1975-76	10.8	100.0	11.6	-0.8
1976-77	10.9	111.8	11.8	-0.9
1977-78	11.7	120.5	7.8	3.9
1978-79	11.8	128.5	6.6	5.2
1979-80	11.6	142.2	10.7	0.9
1980-81	11.1	159.8	12.4	-1.3
1981-82	11.2	175.8	10.0	1.2
1982-83	11.3	183.7	4.5	6.8
1983-84	11.0	199.0	8.3	2.7
1984-85	11.1	213.9	7.5	3.6
1985-86	11.1	224.2	4.8	6.3
1986-87	11.2	232.9	3.9	7.3

The data of columns 1 and 2 has been taken from Pakistan Economic Survey 1991-92.
Column 3 has been calculated from column 2 and is the annual average percentage change in consumer price index (CPI) (1975-76=100).

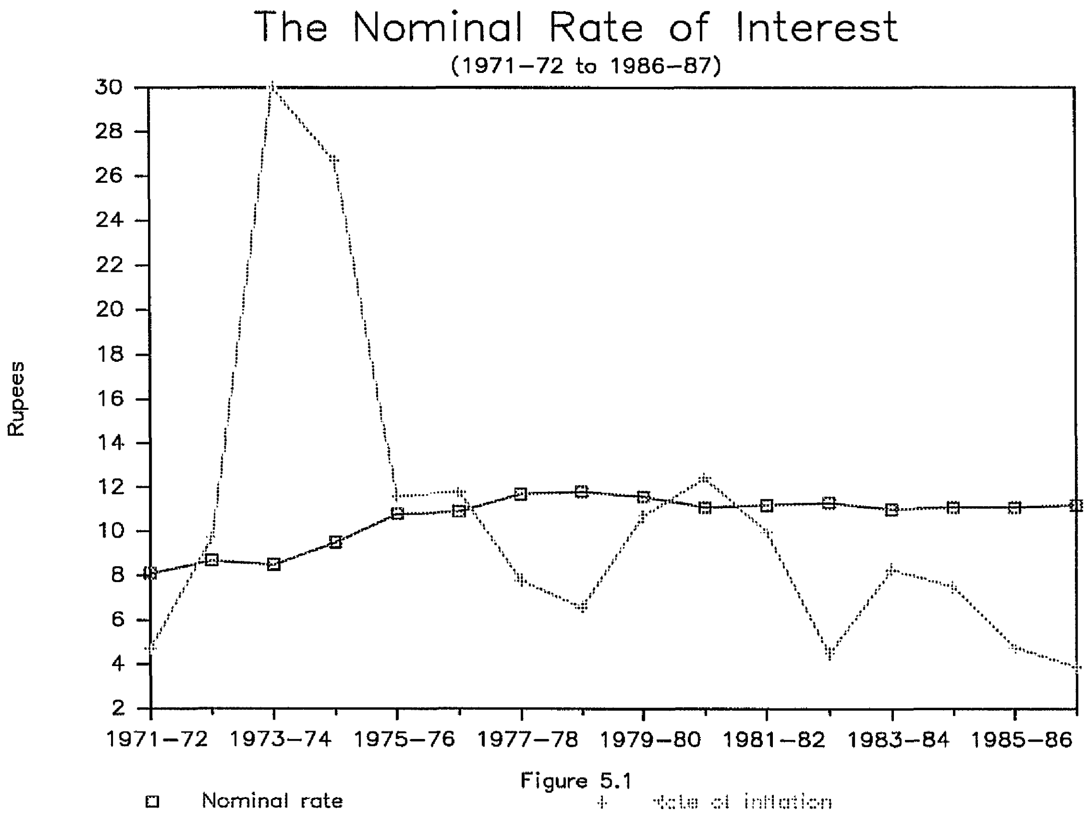


Figure 5.1

5.4 The Government Labour and Wage Policies

The government's labour and wage policies can have an important impact in determining industrial wages. In Pakistan a total of four labour policies have been adopted within the span of the 44 years since Independence (for details see UNIDO, 1985, Chapter 13). Each labour policy had set certain rules and regulations for employees and employers. These policies were adopted in 1955, 1959, 1969, and in 1972. The main objectives were the growth of a genuine and healthy trade unionism, settlements of disputes, protection of the just rights of workers, maintenance of industrial peace and harmony in labour management relations and speedy settlement of disputes through adjudication, where necessary etc.

The first and the second labour policies (1955, and 1959) did not pay any attention to the poor condition of labour. Up to the mid sixties, real wages of industrial workers were very low (see Khan, 1972, Guisinger, 1978). The government strategy of industrialising the economy through the encouragement of private investors was that labour must be squeezed temporarily to achieve the aim of building up a strong capitalist class. In the Third Five Year Plan (1965-70), for the first time it was realized that: "the industrial labour in Pakistan is among the lowest paid in the world. The Minimum Wage Ordinance is applicable in only a few industries, and in those too, the floor has been set at a very low level. The state will have to intervene with a policy for industrial wages in the interest of economic justice" (The Third Five Year Plan, 1965-70).

Due to much political pressure and unrest among the labourers, the third labour policy in 1969 introduced minimum wage legislation, a pension scheme, and the right of collective bargaining. The rate of workers shares in companies profit was also increased from 2% to 4% and later to 5% (see UNIDO 1985, chapter 3 for further details). According to one study the fixing of money wages in 1969 alone was responsible for increasing them in nominal terms by 21 per cent between 1967-68 and 1969-70 (Guisinger and Irfan, 1974, p. 367).

In April 1972, the fourth labour policy was announced which was further amended in 1975. The main features of the new labour policy were:[14]

- Worker's participation in the management of industry to be increased by 20%.
- The increase of workers' share in annual profits from 2.5% to 4%.
- On increasing the productivity, an additional 10% of increased profits to go to the workers.
- Free education up to matriculation for one child of each worker to be the responsibility of the employer.
- Workers welfare fund for the housing of workers under the Workers Welfare Fund Ordinance 1971 to be activated.
- Provision for old age pensions to be made for all workers.
- A quasi-judicial body to be set up to promote genuine trade unionism

at the trade level, to ensure the representative character of unions, to help in the formation of a federation of unions industry-wise and at national level, and to deal with cases of victimization and unfair labour practices.

- Payment of entire contribution to pension and social security institutions by the employer.

In August 1973, the government again announced many other privileges to the industrial workers. Through an Ordinance, employers were bound to award cost of living adjustments at a rate fixed by the government. There were three such adjustments under the 1973 Ordinance; Rs. 35 monthly in August 1973, Rs. 50 in June 1974; and Rs. 25 in April 1975. (Guisinger, 1978, p.5). Thus a worker, in an industrial area outside of Karachi, earning the statutory minimum wage of Rs 125 in June 1973, was earning Rs 235 by June 1975 - a nominal increase of 88% in two years. Since consumer prices rose by approximately 65%, real wage rose substantially during this period (Guisinger, 1978).

Wage indexation was introduced in 1985-86 and minimum wages were increased by 13.5% for workers drawing less than Rs 1500/per month and by 10% for those paid in excess of Rs 1500/per month (UNIDO, 1985, chapter 13). Future wage increases were linked to inflation, 80% of the rate of inflation for workers earning less than Rs 1500/per month and 60% or those getting more than Rs 1500/per month (UNIDO, 1985, chapter 13).

The CMI data on wages show clearly that real wages of industrial workers took a sharp upward trend between 1969-70 and 1973-74. For example, a study by Guisinger et al (1977) showed that in just five years - 1969-70 to 1973-74 real wages grew at the rate of 7% per annum (Guisinger et al, 1977).

The present labour policy has many aspects. It provides the right of association to employers and workers in accordance with relevant ILO's conventions. The law also provides for the determination of a collective bargaining agent and its role in the sphere of labour-management relations. It allows worker's participation in certain aspects of management/affairs of an establishment through such forums as workers councils, management committees and joint management boards (See for details UNIDO, 1985, chapter 13).

5.5 Impact of Government Policy on Relative Factor Prices

We have seen in our policy discussion above that various government policies intervened in capital and labour markets which may have manipulated relative factor prices. The following sections will make an empirical analysis of the cost of capital and labour.

5.5.1 The Cost of Capital: Concept and Measurement

The cost of capital termed `the rental or user cost of capital' is defined as the unit price of capital equipment times the rate of interest (see Jorgenson, 1963; see also Jorgenson and Siebert, 1968). There is a difference between the price of capital and the cost of capital. The price of capital is the sum for which the capital stock can be purchased outright. By owning a capital asset the purchaser acquires title to the future stream of capital services that the stock will provide. Hence, the cost of capital is the rental rate for capital and indicates the amount a firm would pay to the competitive asset leasing firm to rent the use of asset for one year (Jorgenson, 1963,). If a firm is using its own assets, the relevant price of capital to be compared with the price of labour in determining factor proportions is the hypothetical cost of renting these assets.

In the absence of distortionary monetary and fiscal policies and in a partial equilibrium framework, the minimum rental value of a capital asset can be expressed as:[15]

$$P_k = K(r + d) \qquad (5.1)$$

where;

P_k is the rental cost
K is the original price of the capital asset
r is the annual rate of interest
d is the economic rate of depreciation

According to the equation (5.1) there are two components which determine the rental cost of capital.(1) The interest rate (r) which is the opportunity cost incurred by tying up the funds.[16] (2) The economic rate of depreciation (d) since an allowance is kept each year for the wear and tear of the machines the amount of depreciation is a cost to the owner of the asset.

The rental cost of capital in the form of equation (5.1) is a very simple expression and ignores many other determinants of the rental cost of capital. For example, if there is uncertainty element in the market, the risk premium may be high which will raise the rental cost of capital (see Auerbach, 1983, p. 931 for discussion). Modigliani and Miller (1958) however adjust the risk premium in the interest rate and use the latter as the cost of capital. The cost of capital in developing countries is usually distorted by fiscal, monetary and trade policies of the government. We may divide such influences on the rental cost of capital into three groups: those affecting tax liability, those affecting financial capital, and those directly affecting the price of physical capital (i.e the original price of the asset). These are ignored in simple formulation of the rental cost of capital. Similarly, corporate taxes on incomes and profits also affect the rental cost of capital (see Auerbach, 1983, see also King, 1974)) and these should be also considered in determining the rental cost of capital. If the cost of financing the purchase of capital is not deductible for tax purposes, then the rental cost of capital, taking into account corporate tax of say u per cent, can be derived as follows:[17]

$$P_k = K\ (r+d) + u(P_k - K.d') \qquad (5.2)$$

the gross rental, Pk, must equal the sum of the financial and depreciation costs (r+d) plus the tax liability, $u(P_k\text{-}Kd')$.

where;

u is the rate of taxation of corporate income
d' is the rate of depreciation allowed for tax purposes

solving for P_k we can obtain;

$$P_k = \frac{K(r+d-ud')}{1-u} \qquad (5.3)$$

In Pakistan the large-scale manufacturing sector has always been the beneficiary of investment incentives in the form of subsidized interest rates, tax concessions, low tariffs on imported machinery, and accelerated depreciation allowances (See sections 5.2 and 5.3). All such kind of investment incentives reduce the actual (market) price of capital below its opportunity cost - the price that would have prevailed if a neutral set of government policies were in effect and if all markets function smoothly.

To see the effect of government policies on the rental cost of capital one needs a more general formula to incorporate all the investment incentives such as tax holidays, and nonconstant depreciation allowances in formulation of the rental cost of capital. Guisinger (1978) has introduced the notion of a uniform annual rental cost that represents the annuity of variable rental costs of capital over time. The uniform annual rental cost can be defined as the stream of variable rental values. If the two variable policies are the tax holiday and depreciation allowances, then the uniform annual rental value can be derived as follows:

$$\sum_{1}^{n} \frac{P_k}{(1+i)^t} = \sum_{1}^{h} \frac{K(r+d)}{(1+i)^t} + \sum_{h+1}^{n} \left[\frac{K(r+d)}{(1+i)^t} + \frac{u(P_k - d't.K)}{(1+i)^t} \right] \qquad (5.4)$$

where:

P_k is the uniform rental value
i is the discount factor
h is the length of tax holiday period
n is the economic life of the asset
d't is the depreciation allowance in year t.

The first term on the right hand side is the rental value of capital during the tax holiday period. The second set of terms represents the present value of the rental values for the remaining years. The sum of these two present values is equated with the present value of the uniform rental value, P_k. Following Guisinger (1978) equation (5.4) can take a final form as follows:

$$P_k = \frac{\left[K \quad r+d - u/S^n_1 . \sum_{h+1}^{n} \frac{d't}{(1+i)^t} \right]}{1-u \left(\frac{S^n_{h+1}}{S^n_1} \right)} \qquad (5.5)$$

where; S stands for summation of the discounted factor i.e 1/(1+i)t. $S^n h+1$ and $S^n 1$ are the summation of discounted factor covering non tax holiday period as well as total period (tax and non tax holiday period) respectively.

Developing countries usually import capital goods from developed countries, hence the price of capital assets is determined by the foreign price of capital goods. If imported capital goods are subject to high import duties, the domestic price of capital assets would be also high. The domestic price of capital assets is also affected by changes in domestic exchange rate in terms of foreign currency; devaluation would lead to increase the price of capital assets and vice versa. By combining all these factors the price of capital asset can be written as:

$$Kd = Kf.e\ (1+T) \qquad (5.6)$$

where;

Kd is the domestic price of capital asset
e is the domestic exchange rate/$
Kf is the c.i.f foreign exchange value of capital asset
T is the tariff rate.

By combining (5.5) and (5.6) the general formula can be written as:

$$P_k = \frac{Kf.e(1+T)\left[r+d - \frac{u}{s^n 1} \sum_{h+1}^{n} \frac{d't}{(1+i)^t} \right]}{1-u\left(\frac{s^n h+1}{s^n 1}\right)} \qquad (5.7)$$

Equation (5.7) indicates that the price of capital is affected by the three type of factors. **The first category** of factors are in the numerator outside the square bracket i.e., Kf, e and T. The higher these factors are, the higher would be, all other things being equal, the cost of capital assets. **The second set of factors** are within the square brackets in the form of r, u, and d' which indicate the annual financial cost of capital. The higher the rate of interest (r) and the economic depreciation (d), the greater the annual cost. On the other hand, if accelerated depreciation is permitted, and the larger are the permissible rate (d') and the tax savings represented by the rate of corporate tax (u), the lower is the annual cost of capital assets. Tax holidays lower the average tax rate over the life of the investment, other things being equal. **The third set of factors** consists of the term in the denominator. The higher the rate of taxation, the larger the rental cost. But the longer the tax holiday period (h), the lower will be the rental cost. The term, $u(s^n h+1/s^n 1)$ represents the effective tax rate incorporating the discounted benefits from the tax holiday scheme.

5.5.1.1 Assumptions

Guisinger (1978) has mentioned some restrictive assumptions under which equation (5.7) is valid. (1) The value of the asset is restored at the end of each year. Without this assumption the rental cost would decrease in successive years because the cost of financing the asset would be progressively reduced each year by the amount of depreciation. (2) The asset is financed by equity, and the costs of this to the firm are not excludable from income for tax purposes. If it is deductible for tax purposes then a more complex formula would be required to incorporate the tax advantages of interest deduction. (3) It is assumed that the corporate income tax is shifted forward in the form of a higher rental cost rather than absorbed by the suppliers of equity capital.

5.5.1.2 Trends in the Rental Cost of Capital (1974-75-1986-87)

Equation (5.7) has been used to estimate the rental cost of capital in the manufacturing sector of Pakistan. The object is to determine the rental cost of capital for the investor for every new investment. Earlier, Guisinger (1978) used equation 5.7 to calculate the rental cost of capital in Pakistan for 1959-60 to 1974-75. Our estimates are the extension to the earlier estimates covering the period from 1974-75 to 1986-87. Our methodology is however, different from the earlier estimates in many respects. Guisinger (1978) estimated the social opportunity/market cost of capital by assuming hypothetical values on different variables[18] and later calculated the policy induced cost of capital by taking into account different investment incentives. On the other hand we will use the actual values of the rate of interest and foreign exchange rate instead of assuming hypothetical values in estimating the market cost of capital. The reason is that since 1972, there has been a significant change in government policy towards the domestic exchange rate in terms of foreign currency. Though the rate of interest is still controlled (which as earlier mentioned is not unique) but there is no deliberate effort to distort the cost of capital for a large number of industries (see Planning Commission, 1987).

Later we will calculate the distorted cost of capital owing to certain government incentives. As the policy of the government varies from firm to firm one ideally needs detailed micro data for estimating the true or actual cost of capital but unfortunately lack of data makes this exercise impossible. Hence, the calculated cost of capital will show only the general trend and not the actual changes in the cost of capital for industrial firms. The source of data is the Government of Pakistan and the United Nations' publications.

As the policy of the government is different for different goods, in order to calculate the uniform rental cost of capital we have taken only one component of capital i.e, machinery (the share of which is about 50% in total manufactured imports in Pakistan). The rental cost of capital of a machine costing Rs. 100 (or $10.10) in 1974-75 has been calculated (Table 5.2). Table 5.2 shows that with the exception of one year 1980-81, there is continuous upward trend in the market cost of capital. Variations in the rental cost of capital can be largely attributed to variations in the index of foreign price of machinery and to the devaluation of domestic currency in terms of dollars (See Appendix Table 5.1). The rising trends in market cost of capital supports our contention that the policy of the government has changed since 1972 and there is no deliberate attempt by the government to subsidise the cost of capital through overvaluation of the domestic exchange rate.

Column 2 incorporates the combined effect of tax holiday of 5 years, accelerated depreciation of 25% and duty free imports of machinery on the rental cost of capital. All these incentives have been given to those firms established in underdeveloped areas (all rural areas are classified as underdeveloped areas while metropolitan areas are considered as developed areas, see Economic Syurvey, 1990-91). Hence we can say that policy induced costs are faced by the new firms located in underdeveloped areas while the market cost of capital is faced by a large number of firms established in developed areas.

Table 5.2: The Estimated Nominal Rental Cost of Capital

	Developed Areas	Underdeveloped Areas	
	Market Cost of Capital in Rupees	Policy Induced Cost of capital in Rupees	Rate of Distortion (%)
	(1)	(2)	2/1 100
1974-75	42	19	45
1975-76	45	20	44
1976-77	49	22	45
1977-78	60	27	45
1978-79	68	30	44
1979-80	75	34	45
1980-81	68	30	44
1981-82	84	38	45
1982-83	86	39	45
1983-84	94	42	45
1984-85	100	45	45
1985-86	127	57	45
1986-87	131	58	44

For details see Appendix Tables 5.1 and 5.2.

Comparing the market cost of capital with the policy induced cost of capital we can see that on average the distorted values are 45% of the market cost of capital during 1974-75 to 1986-87. The gap between the two costs is quite wide which means that government policies exert a substantial effect on lowering the cost of capital below its actual market cost (see also Figure 5.1). Nevertheless, the rate of distortions shows that it has remained almost constant over the years. The new industries located in underdeveloped areas are still enjoying many fiscal and monetary investment incentives and the cost of capital for them is distorted and is well below the average market cost of capital. There is no information on how much investment increased in underdeveloped areas due to these fiscal and monetary incentives. However, according to the Planning Commission (1987), investment in Hub-Chowki (one underdeveloped area) showed a high capital intensity, with 95 per cent of the projects possessing a capital-labour ratio of over Rs. 100,000 per worker, as compared to the incremental capital-labour ratio of Rs. 72,000 per worker for the industrial sector as a whole during 1978-1983 (p. 8). Virtually all machinery was imported mainly due to distortions in relative prices of capital and labour and because of the complete exemption of import duty on machinery (Planning Commission, 1987, p. 8).

However, one cannot say that the market cost of capital is reflecting the true scarcity price of capital. We have seen in our policy discussion (section 5.3.3) that the rate of interest is controlled by the government and is not freely determined. The analysis of the rental cost of capital nevertheless indicates how the rental cost of capital is distorted by the government investment incentives for industries in underdeveloped areas.

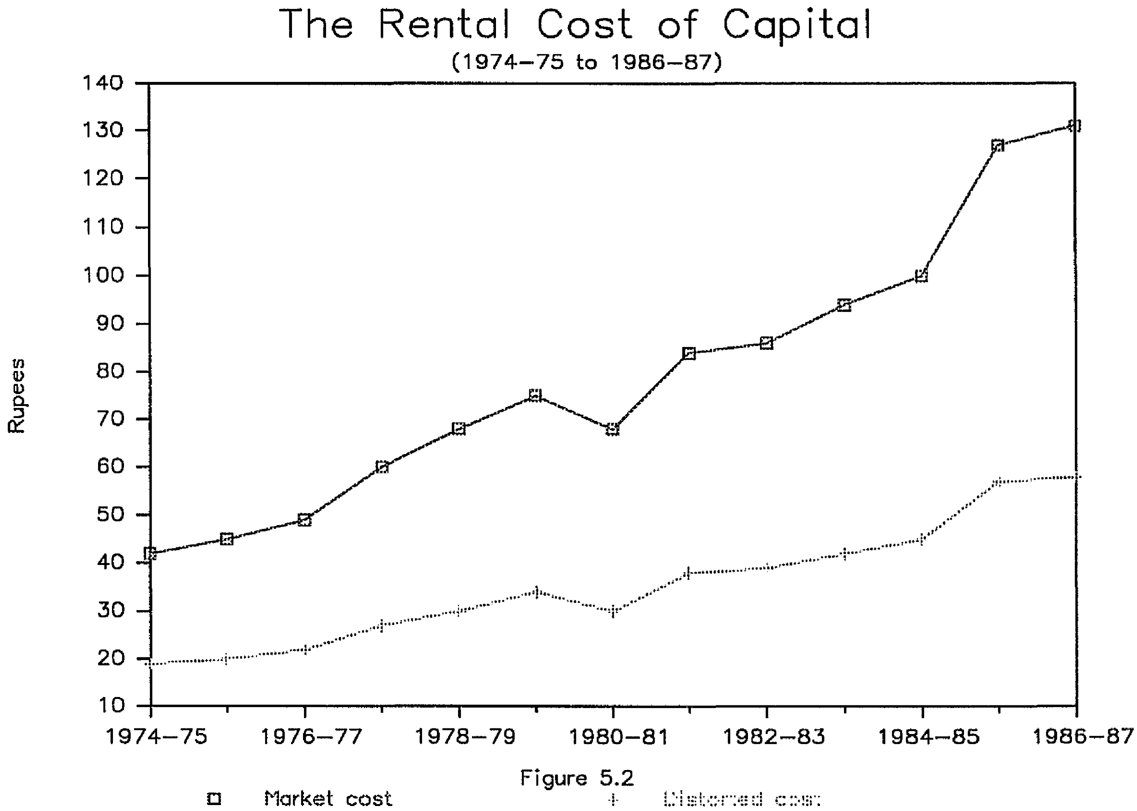


Figure 5.2

5.5.1.3 Limitations

The analysis of the rental cost of capital is limited by many ways. First, a number of assumptions have been made before carrying the actual calculations (mentioned above) and any relaxation in these assumptions will modify the original formulation of the rental cost of capital. Different types of subsidies reduce the impact of taxes on the rental cost of capital. These have not been taken account of in our analysis.

Despite these limitations, the market cost of capital shows the general trend in the cost of capital. Similarly the distorted or policy induced cost of capital shows the degree of distortions in the cost of capital due to policy incentives in the form of tax holidays, accelerated depreciation allowances and duty free imports of machinery to certain industries and to certain areas.

5.5.2 The Cost of Labour in the Large-Scale Manufacturing Sector

The cost of labour generally refers to the cash and non cash benefits for the use of labour services. As the CMI's industrial wage data in Pakistan includes both cash and non cash benefits and is termed as the `employment cost', we will use the terms `cost of labour' the `employment cost' and the `wages of industrial workers' synonymously in this study. The cost of labour has important implications for employment, income distribution and investment in human capital. The higher cost of labour as compared to capital induces investors to invest in capital-intensive techniques of production and affects the employment absorptive capacity of the sector (see chapter 3 for theoretical discussion). If the unskilled wage rate is too high and wage differentials between skilled and unskilled labour are narrow, it may reduce the expenditure on education and professional training.

In a labour surplus economy with the persistence of unemployment and underemployment, classical economic theory suggests that the wages of unskilled workers if allowed to be freely determined would be near to subsistence level.[19] Real wages in general thus will not rise with productivity, as in advanced countries where labour is relatively scarce, but will be held down until the increase in investment leads to the absorption of that labour surplus which is the cause of this wage depression. The suggestion takes into account only the supply side and ignores the demand side completely in the determination of wages. It is possible that a rational employer who attempts to minimise input costs per unit of output may increase wages if these result in greater increases in productivity via improving labour efficiency (See Knight, 1967, Aslam, 1983).

We will analyse the trend in real cost of labour in large-scale manufacturing sector of Pakistan from the employer's point of view. The ultimate objective however is to see the impact of relative factor prices on employment in the large-scale manufacturing sector.

5.5.2.1 Trend in Nominal and Real Cost of Industrial Workers (1974-75 - 1986-87)

The trend in wages of production workers[20] has been investigated by a number of researchers in Pakistan. Khan (1972) found that real wages of production workers declined over the period of 1954-1963. Guisinger and Irfan (1974) using a broader definition of wages to include both cash and non cash benefits and a longer time period (1954-1970), concluded that real cost remained stagnant over the period of 1954-1967 (p.367). A later study by Guisinger et al (1977) showed that the index of real employment cost rose from Rs. 124 in 1969-70 to Rs 163 in 1973-74 indicating annual average growth rate of 7% but declined to Rs 159 in 1974-75. Irfan and Ahmed (1985), covering the period from 1970 to 1981, analysed the structure and trend in real employment cost in different sectors of the economy. According to their study the growth in nominal cost of industrial workers was 15.8% per annum during 1970-76 and 17.0% per annum during 1976-81. The growth in average real employment cost for all workers (production and non-production)[21] was 1.4% per annum during 1970-76 and 7.6% per annum during 1976-81 (Irfan and Ahmed, 1985, p. 425). The wide gap in growth rates of real costs (1.4%) during 1970-76 given by Irfan and Ahmed (1985) compared to 5% in 1969-1974 provided by Guisinger et al (1977) may be due to the selection of different time periods. The fall in real costs between 1975 and 1976 due to high rates of inflation might have substantially reduced the annual average growth rate in real costs during 1970-76. The basic objective of these studies was to analyse the general structure and level of wages in the economy. The impact of the cost of labour on the choice of techniques, however, was not made in these studies. As our basic aim is to see the impact of relative factor prices on the choice of techniques and on employment absorptive capacity of the manufacturing sector, the analysis of industrial employment cost will be the basic step towards this goal.

We have calculated nominal and real costs of all industrial workers (both production and non-production) of the large scale manufacturing sector of Pakistan for the periods of 1974-75 to 1986-87. It could have been better to use the employment cost data separately on both production and non-production workers but because of the lack of information, we have taken the average employment cost data of production and non-production workers together. The available information for 1984-85 suggests that production workers are 57% of total employed industrial workers and average costs per annum accrue to them are 70% of total employment cost (CMI, 1984-85). Hence, we may say that average employment cost largely covers production workers.

The original source of data is the CMI. As earlier mentioned the wage data include cash and non-cash benefits termed as the "Employment cost" by the CMIs as reported in the Pakistan Economic Surveys. These represent the annual average cost of the employed workers in the large-scale manufacturing sector. As our interest is to see the cost of labour to the employer unlike other studies, we have deflated nominal wages by the wholesale price index to get real costs.[22] The wholesale prices are the producer's prices for their products, hence, the real cost of inputs to them can be best estimated by using these prices.

Table 5.3 shows nominal employment costs, real employment costs and the wholesale price index. We can see from Table 5.3 that nominal employment costs rose substantially over the period while the index of real employment costs more than doubled over the entire period from Rs. 95 in 1974-75 to Rs. 204 in 1986-87. In some years the growth of real cost of labour was extremely high. For example, during 1975-76 to 1976-77 the rise in industrial employment cost was 15 per cent. Such a high increase may be attributed to the cumulative effect of government wage indexation adjustments announced in 1973 Ordinance and which continued up to the period of 1975 (see section 5.4 for details). Between 1981-82 and 1982-83, the growth of real employment cost is also very high (16%). There may be some data problem in 1980-81 causing an apparent high growth rate in the next year. In fact no specific reason can be found for this high growth rate. With the exception of one year (1980-81), there is a constant upward trend in real costs of industrial workers (See Figure 5.3). In 1980-81, real cost of labour declined slightly and the increase in nominal cost of labour could not offset the high rate of inflation during this period. The increase in the real employment cost is also very high (about 10%) during 1985-86 to 1986-87. As the government raised the minimum wage indexation in 1985-86 (see section 5.4) this might have contributed to high increase in real wages during 1985-86 and 1986-87.

We have also computed the trend growth rate by fitting a semi-log regression, using time as the independent variable, to employment cost data for each year. The trend growth rate in nominal costs is 15.1% per annum during 1974-75 to 1986-87. Over the entire period the trend growth rate in real costs is 6.2% (Table 5.4). In the earlier years the high growth rate in nominal cost of labour appears to reflect mainly the high rate of inflation because the real cost of labour grew at a relatively steady rate throughout the entire period. The average annual growth rate of 17% and 7.5% per annum in nominal and real costs respectively between 1975-76 and 1980-81 in our analysis is exactly the same as given by Irfan and Ahmed (1985). The growth rates in real wages by using the consumer price index also show a similar trend (See Appendix Table 5.3).

By comparing the annual average growth rate in real employment costs in the manufacturing sector of Pakistan with some other developing countries, we can see that with the exception of Singapore, the growth rate in the manufacturing sector of Pakistan is higher than other countries (Appendix Table 5.4). In two countries; Sri Lanka, and India the real cost of labour in fact have fallen during 1976-1985 and 1976-1984 respectively (Appendix Table 5.4).

Table 5.3: Employment Cost of Industrial Workers in the Large-Scale Manufacturing Sector (1974-75 to 1986-87)

Year	Nominal Emp Cost Value in Rs.	Index 1975-76=100	WPI	Real Emp Cost Value in Rs.	Index 1975-76=100
1974-75	4953	88	92.10	5378	95
1975-76	5645	100	100.00	5645	100
1976-77	7301	129	111.92	6523	116
1977-78	8391	149	120.81	6946	123
1978 79	9658	171	128.85	7496	133
1979-80	11107	197	144.73	7674	136
1980 81	12450	221	163.69	7606	135
1981-82	14224	252	176.16	8074	143
1982-83	17074	302	182.27	9367	166
1983-84	19248	341	201.38	9558	169
1984-85	21079	373	208.92	10090	179
1985-86	23984	425	228.53	10469	185
1986-87	27137	481	235.39	11529	204

WPI= Wholesale price index; Emp = Employment
The data on nominal employment cost and wholesale prices indices have been taken from Economic Survey (1988-89).

Table 5.4: Trend Growth Rates in Nominal and Real Cost of Industrial Workers (1974-75 - 1986-87)

Nominal Cost	Real Cost
15.1	6.2

Source: Table 5.3

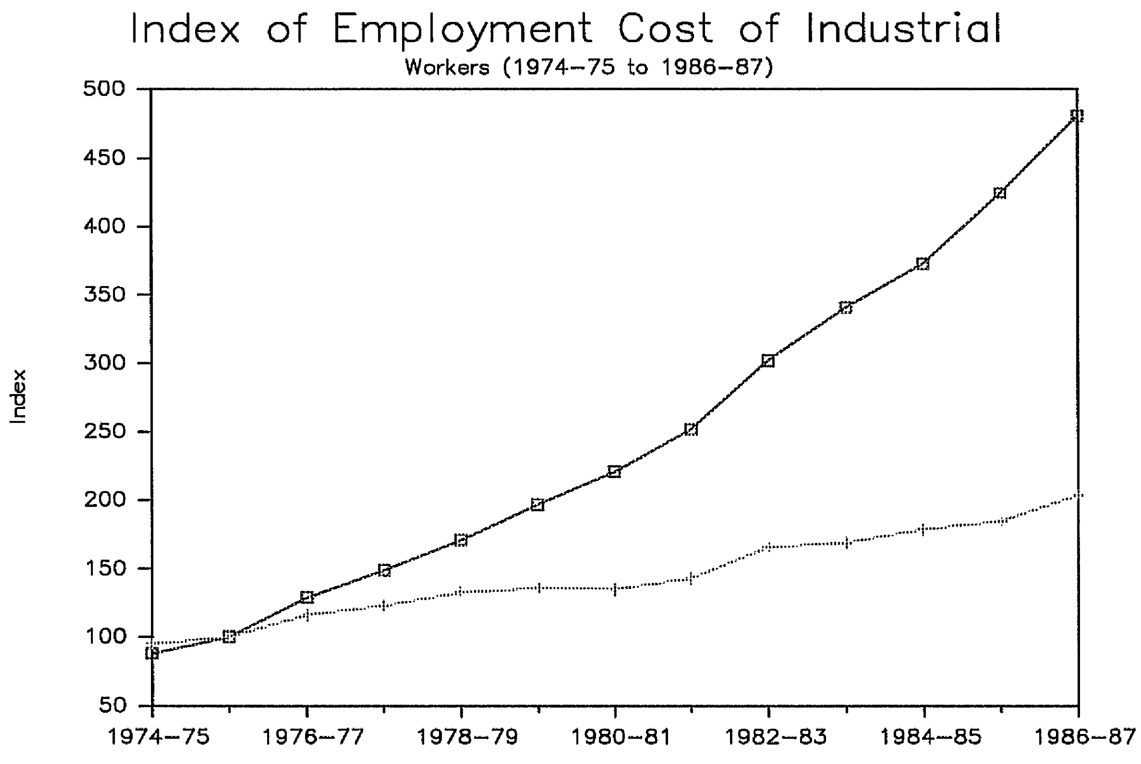


Figure 5.3

We have also calculated trend growth rates in nominal and real employment cost at three digit level of 28 industries (Table 5.5). It can be seen that the nominal employment cost has risen in all industries during 1975-76 to 1986-87 (Table 5.5). With the exception of only petroleum and coal, and miscellaneous industries, real employment costs have risen in all industries. This means that the increase in nominal and real employment costs has not been confined to a few industries but spread over all industries. In some industries such as leather and leather products, footwear, drugs and pharmaceutical, other chemical products and non-metallic mineral products the annual average trend growth rate in real cost of labour is extremely high (Table 5.5). In many other industries viz, ginning and pressing of bales, printing and pressing, glass and glass products, and iron and steel, the annual average growth of real wages is above average during 1975-76 and 1986-87.

Given the extremely high rate of increase in the real cost of labour, one would expect growth in capital-labour ratios as well. The capital-labour ratios grew at the rate of 5% per annum in total manufacturing between 1977-78 and 1984-85 while the real cost of labour grew at the rate of 5.5% per annum during the same time period considered (see Appendix Table 5.5). It seems that there is a positive and strong relationship between capital-labour ratios and real employment costs. However it may not be generalised to all industries at a disaggregated level. By looking at inter-industry level, we have seen that 11 out of total 28 industries (at the 3-digit classification) are not showing any positive relationship between real cost of labour and capital-labour ratios see Appendix Table 5.5). Nevertheless these results should be qualified in the light of difficulties in capital stock data (which have been discussed in Chapter 4).

Table 5.5: Trend Growth Rates in Employment Cost of Industrial Workers in Major Group of Industries (1975-76 - 1986-87)

(Percentage per annum)

Industries	Growth in Nominal Cost	Growth in Real Cost[1]
1 Food Manufacturing	13.3	5.0
2 Beverage industries	13.7	5.4
3 Tobacco industries	9.8	1.5
4 Textiles	11.7	3.4
5 Wearing Apparel	10.1	1.8
6 Leather & leather products	20.7	12.4
7 Manufacture of footwear	13.7	5.4
8 Ginning, pressing & baling of fibres	14.7	6.4
9 Wood and cork products	13.4	5.1
10 Furniture & fixtures	10.9	2.6
11 Paper & paper products	12.8	4.4
12 Printing and Pressing	17.1	8.8
13 Drugs & pharmaceutical	15.5	7.2
14 Industrial chemicals	14.7	6.4
15 Other chemical products	18.1	9.8
16 Petroleum and coal	8.0	-0.3
17 Rubber products	14.1	5.8
18 Plastic products	13.8	5.5
19 Pottery China	12.0	3.7
20 Glass & glass products	16.4	8.1
21 Non-metallic mineral products	19.9	11.6
22 Iron & steel	16.7	8.4
23 Non-ferrous metal	13.1	4.8
24 Fabricated metal products	11.9	3.6
25 Machinery (non elec.)	15.1	6.8
26 Machinery (electrical)	12.9	4.6
27 Transport	12.0	3.7
28 Miscellaneous	7.4	-0.9

1 Growth rate in real costs is derived on the basis of trend growth rate of inflation (8.3) based on wholesale price index during 1975-76 to 1986-87 (calculated from Table 5.3 in the text).

Source: Annex Table A-14.

There are many factors such as the size of firm, capital intensity, skill differentials, and the ownership of firms etc, which may determine inter-industry wage differentials (see Taira, 1966, Guisinger and Irfan, 1975, and Horowitz, 1974). In the case of Pakistan Guisinger and Irfan (1975) found skill differentials and capital intensity as significant factors in determining inter-industry wage differentials in the large-scale manufacturing sector for two periods 1964-65 and 1969-70. Due to the absence of skill data in

Pakistan, Guisinger and Irfan (1975) used the skill index of Indian industries as a proxy by assuming that skill intensities in the industrial sector of Pakistan and India are similar. This may put a limitation on their empirical estimates to derive any precise conclusion. The scenario presents a very strange picture of Pakistan's economy. On the one hand, efforts have been made to correct the distorted cost of capital since 1972 in terms of devaluation of the domestic currency (see sections 5.2.2 and 5.2.3) although some distortions remain. On the other hand the cost of industrial workers began to rise substantially which might have affected employment absorptive capacity of industries (which will be discussed in next chapter). Before discussing the factors affecting the growth in real cost of labour, we may first mention some of the limitations in the analysis of the employment cost data.

5.5.2.2 Limitations

The major limitation of our employment cost data is that it is highly aggregated and does not distinguish between skilled and unskilled workers mainly because of the lack of information on skill data in Pakistan. Nevertheless, the educational profile of Pakistani labour force suggests that the vast majority remains unskilled. For example, 78% of the labour force is illiterate or has not completed primary education, 15% has not completed secondary education, 5% has educational level below a degree, and less than 2% have a university or professional degree (Based on Labour Force Survey, 1986-87).

We have seen that real cost of industrial workers have increased substantially (either by using WPI or CPI) from 1974-75 to 1986-87 which apparently means that workers are better off than before. However, it does not necessarily mean that all the workers would be better off than before. There are a number of points which require considerations before deriving any conclusion from the rising trend in real cost of labour. First, the net benefit to "whom" and "by how much" cannot be inferred from the time series data alone. Because the net benefit of the increase in real wages (cash and non cash) to workers is also associated with working hours, if working hours increase with the increase in real wages, there may not be any net benefit to workers. Contrary to this if workers have to work less hours than before at the rising or stable real wages, their net benefit/welfare will increase. Our crude estimates on average total working hours show that these declined from 3161 per annum in 1976-77 to 2994 in 1984-85 (i.e., 5% decline) implying that welfare of workers has increased in real terms.[23]

Similarly, by looking at the trend in real employment cost it is not clear who benefited more, male or female workers. In reality the ratio of female to male workers has been quite low in Pakistan. For example, the ratio of female workers to total labour force (38.4 million) was only 2.4% in 1987-88 (Economic Survey 1991-92).

We think that if the high cost of labour is accompanied by higher capital intensity and skilled labour, then the rise in real employment cost would increase the welfare of the employed labour force at the expense of reduced jobs for unskilled labour. Thus from any increase in real cost of labour it cannot be deduced that the welfare of unskilled workers has increased.

Despite these limitations, the aggregate employment cost data gives us a crude idea that there is a continuous upward trend in the real cost of labour in the manufacturing sector of Pakistan.

5.5.3 Factors Affecting Employment Cost in the Manufacturing Sector

The evidence presented above have shown that the real cost of industrial workers has risen substantially during 1974-75 to 1986-87. Inter-industry employment cost data also indicate a similar upward trend in real costs. There are many contributing factors but they can be allocated to two groups, economic and non economic/institutional factors. We will discuss briefly some of these factors which may be responsible for raising industrial real employment cost in the large-scale manufacturing sector of Pakistan.

5.5.3.1 Economic Factors

Economic factors are related to supply and demand for labour in a free market which determine wages. The classical two sector model of economic development postulates that the supply price of unskilled labour to the urban sector is comprised of the subsistence wage in the rural sector and an incentive differential necessary for migration to bear the higher cost of living expenses in urban sector (Lewis, 1954). Hence in perspective of the two sector model any increase in agricultural wages may induce an upward movement in industrial wages. There are severe constraints in measurement of wages in Pakistan's agricultural sector because of peculiar features of the sector especially the large portion of self-employed persons in agriculture. The available data of casual labour however, show (see Appendix Table 5.6) that real wages in the agriculture sector declined between 1974-75 and 1976-77 and turned upwards thereafter. Real wages were much higher (126%) in 1984-85 than those reported in 1974-75. Some reasons for this high growth rate are, first the total impact of labour reforms in 1972 was felt far beyond the industrial sector which they directly affected and with wage increase in industry, wages rose substantially in other sectors of the economy as well (see Irfan, and Ahmed, 1985; Adams, and Iqbal, 1984). Second, casual labour in the agriculture sector is the category of labour which has a tendency to migrate from the rural to the urban sector. During the 1970s the migration of labour force to the Middle East (which will be discussed later) might have affected the supply of labour during the peak seasons (when demand for casual workers increases) thus putting pressure on agricultural real wages.

As the wage data in agriculture sector is limited, the analysis of real agricultural output per head in the sector may be useful because agricultural wages are related to the latter (See Knight, 1967). A positive relationship between real agricultural output per head and industrial wages is based on the assumption that any increase in the agricultural productivity may raise the demand for labour in agriculture sector and may put upward pressure on industrial wages by restricting the supply of labour. In reality the agriculture sector may not be the only source of labour supply to the industrial sector as has been supposed by the classical model of wages. A large pool of labour supply may either come from the informal urban sector or from urban unemployed who may be looking for jobs. We think that in the presence of a large number of urban unemployed in developing countries (see Chapter 2), the rise in agricultural productivity may not have any direct impact in raising industrial wages by restricting labour supply.

The average labour productivity in Pakistan's agricultural sector increased at a very slow rate of 1.5% during 1974-75 to 1984-85 (See Appendix Table 5.7). As compared to agricultural productivity the average growth rate of real wages of agricultural casual labour is very high (8.5% per annum). But many caveats apply to the data. For example, a large proportion of the agricultural output is self-consumed and may not be enumerated in total agricultural production thus underestimating total agricultural production. Similarly, non-wage employment iscommon in the sector which is difficult to measure with accuracy.

From a labour supply point of view an important event which took place in Pakistan's labour market was the exodus of labour to the Middle East during the 1970s. Emigration of the labour force can affect wages by affecting the labour supply curve which will shift to the left when emigration is high and vice versa. Migration of the labour force increased up to 1981 and then started declining (See Appendix Table 5.8). This emigration resulted in temporary labour shortages in the construction sector because a large number of workers went to work on this sector (Irfan and Ahmed, 1985, Noman, 1988). The average annual increase in nominal wages of carpenters and masons was 14% and of unskilled labour 12% in the construction sector during 1976-77 to 1980-81 (Appendix Table 5.9). As the wholesale price index rose at the rate of 10% per annum during 1976-77 to 1980-81 (calculated from Table 5.3), there was an increase in real wages of construction workers of all categories. After 1980-81, however the rate of increase in nominal wages of construction workers was much slower than the earlier years and so was the inflation rate. The tightening of the labour market in the informal sector and the increase of wages there might have contributed in increasing nominal and real wages of industrial workers. A time-series regression of real wages of production workers in the six manufacturing industries in the Punjab (one province of Pakistan) shows that real wages were strongly correlated with industrial productivity changes and with the stock of labour in the Middle East.[24]

Another important economic factor determining industrial real wages is labour productivity in the sector. The positive relationship between wages and productivity is based on two main hypothesis, viz (a) higher labour productivity results in higher wages and, (b) higher wages result in higher labour productivity within a certain range. As regards the first hypothesis Brown (1962) argued that with the rise in productivity "the ability to pay" increases which in turn may induce employers to pay higher wages. The argument is based on the assumption that liberal wage policies increase worker's goodwill and reduces costly turnover. On the other hand low wages induce labour turnover which results in substantial cost in hiring and training new labour. Hence, employers can have a better bargain if they pay better wages to induce workers to stay on.

The second hypothesis has been put forward in different forms by Leibenstein (1960) and by Fei and Chiang (1966). Horowitz (1974) in the case of Indian manufacturing found a significant positive relationship between wages and productivity, the former being the dependent variable. In the case of Pakistan, Aslam (1983) also tested the hypothesis of "ability to pay" and found a positive and significant relationship between wages and average labour productivity in the manufacturing sector of Punjab.

By taking into account all the above mentioned economic factors we have made a time series regression of real cost of industrial workers in the large-scale manufacturing sector for 1975-76- 1985-86 period. All the parameters are in log linear terms. The data have been taken from the relevant appendices. The results obtained are:

$$\underset{}{logrw} = 3.113 - \underset{(0.122)}{0.122 logagp} + \underset{(5.218)^{*}}{0.741\ logindp} - \underset{(-1.905)^{**}}{0.080 logem}$$

$$R^2 = 0.96$$

where logrw = log of real wages (cash and non-cash benefits) of industrial workers; logagp = log of agricultural productivity i.e, real output per employee; logindp = log of industrial productivity i.e., real output per employee; logem = log of the stock of workers in the Middle East. The figures in parenthesis are the t-values.

The regression results show that there is a strong positive relationship between real wages and industrial productivity. The coefficient of industrial productivity is significant at the 1% level. The coefficient of emigration is significant at the 5% level but the sign is negative and is not in accordance with our expectations. The variable agricultural productivity seems to have no effect in determining industrial real wages. Multicollinearity and direction of causality among variables however put a restriction on our regression results.

We think that the positive relationship between real wages and emigration may be strong during the time period considered by Irfan and Ahmed (1985)[25], when a large exodus of the labour force was taking place (see Appendix Table 5.10). Later as the number of emigres declined substantially while real wages continued to rise, its correlation with industrial real wages might have become negative.

5.5.3.2 Non-Economic Factors

Non-economic factors affecting industrial real employment cost are related to the government wage policy and trade unions. In developing countries, government interference in labour market is considered a major factor in raising and distorting the industrial real cost of labour (See Berg, 1969, Kilby, 1967, Knight, 1967, and Guisinger, 1978). Webb (1975) however, attributed the wage increase to both market and non-market forces. Ramos (1970) has suggested that the rising skill level is one of the explanatory variables for improving industrial real wages in Latin America. We will briefly discuss the role played by the government in raising industrial real cost of labour in the manufacturing sector of Pakistan.

5.5.3.2.1 Government Intervention in Labour Market

Government labour policies through the imposition of minimum wages and the provision of fringe benefits increased real cost of industrial workers. We have seen in our policy discussion that after 1968 there was a massive government intervention in labour market. Moreover the labour policy in 1972 provided a host of monetary and non-monetary benefits to labour. In fact government might have played an important role in raising the industrial real wages in Pakistan (see for details section 5.4).

The question is why do governments intervene in labour markets and raise the cost of labour substantially? The simple answer is to get the votes of the workers in a democracy. For example, in Pakistan by the end of 1969, workers' awareness of their poverty, and their resentment against the powerful capitalist class created political pressure and forced government to consider seriously their welfare. Hence, the increase in welfare of industrial labour was seen as an important basis for continued support of the new elected government in 1972 (Adam and Iqbal, 1984). Whatever the causes of increase in industrial real wages may be, the rise in real cost of labour compared to capital cost can affect employment opportunities in the industrial sector. According to the World Bank (1990), government labour policies actually work to raise the welfare of labour in the formal sector but in fact these curtail further employment opportunities in the sector (p. 63). The impact of wage increases compared to capital cost on employment in the manufacturing sector of Pakistan will be analysed in the next chapter.

5.5.3.2.2 Trade Unions

The existence and power of trade unions in determining wages largely depends on the government labour policy. Prior to 1969, there was no strong role played by trade unions in determining wages in industrial sector (for details see Ahmed and Amjad, 1984, pp. 226-228). The government labour policy in 1959 banned the right of trade unions to go on strike (for details see Ahmed and Amjad, 1984, pp. 227-228). The labour policy in 1969, however, recognised the right of collective bargaining and restored the right to strike after failure of bilateral negotiations and conciliation efforts (see UNIDO, 1985 for details). In 1977 the military government banned the strike activities of trade unions which were again resumed in 1988. This ban on trade union activity is reflected in a decline in trade union membership during 1975-76 to 1984-85 (Appendix Table 5.10). The data on industrial disputes also show no clear trend (Appendix Table 5.11). By looking at the data on the number of trade unions and the number of disputes we can say that trade unions might have not played any significant role in raising industrial real wages. On the other hand, trade unions might have influenced industrial real wages by resisting any decline in them during 1970-1976 when the development of the whole economy was nearly stagnant.[26]

In sum we may conclude tentatively that non-market forces, especially government wage policies, have played an important role in raising industrial real employment costs in the large-scale manufacturing sector of Pakistan. Nevertheless, the role of market forces cannot be ignored completely.

5.5.4 The Shadow Wage Rate

The shadow wage rate of labour is simply defined as the opportunity cost of hiring one additional unit of labour in its alternative use.[27] Little and Mirrlees (1968) have provided an excellent framework for measuring the shadow price of labour. In the Little and Mirrlees approach, the shadow price of a labour is the economic cost of employing a worker in the modern sector which is measured in terms of forgone output in its alternative use. The ratio of the worker's actual wage to his shadow cost to society is one measure of the degree for distortion in the price of labour. Harberger (1971) on the other hand provided another method to measure the opportunity cost of labour (shadow wage rate). According to him the opportunity cost of labour can be best approximated by the prevailing wage rate of the similar kind of labour in the unprotected sector (See Harberger, 1971, pp. 564-67).

Following either of the two approaches mentioned above the estimation of shadow wage rates in Pakistan by a number of studies have shown that market wages of industrial workers are distorted and do not reflect scarcity prices. For example, by following the Little and Mirrlees approach (1968), Khan (1974) estimated the shadow wage rate of labour for the period of 1970-71 and found it about half of the market wage rate in Pakistan (Khan, 1974, p. 398). Guisinger (1978) also estimated the shadow wage rate in Pakistan and gave the similar results. The World Bank (1979) provided a detailed analysis of shadow pricing in the economy of Pakistan and the estimates of the shadow wage were not different from the earlier studies. Khan (1979) followed Harberger's approach (1971) in estimating the shadow wage rate and found that for unskilled labour in Pakistan it is almost half of the market wage rate.

Unfortunately we do not have necessary data to estimate the shadow wage rate for the recent years and hence measure the extent of distortions in market wages rates. Nevertheless in the light of the earlier studies on the shadow wage rate of unskilled labour we may assume that there is no marked change in the distortion index over time in Pakistan and that wages of industrial workers are distorted and do not reflect the scarcity price of labour.

5.5.5 Trend in Relative Factor Prices

It is relative factor prices which play an important role in determining factor combinations in the production process. Higher cost of labour relative to the cost of capital may induce entrepreneurs to use more capital than labour. A study of incentive structures in developing countries found that government intervention raised the relative price of labour in all cases in the early 1970s (see Krueger et al, 1981). The increase was 11% in Korea, between 30 and 50 per cent in Argentina, Brazil, almost 90 per cent in Tunisia, and more than 300 per cent in Pakistan in the 1960s (World Bank, 1990, p.62-63). Such a high increase in relative factor prices in Pakistan was mostly attributed to government trade and industrial development policy.

We have computed the index of relative factor prices in Table 5.6 for the periods of 1974-75 - 86-87. The index of relative factor prices has also been plotted against time in Figure 5.4.

Table 5.6: Trend in Relative Factor Prices

(in Rupees)

Year	Cost of Labour (W)	Cost of Capital (r)	Relative Prices W/r	Index of W/r 1975-76=100
1974-75	4953	42	118	94
1975-76	5645	45	125	100
1976-77	7301	49	149	119
1977-78	8391	60	140	112
1978-79	9658	68	142	114
1979-80	11107	75	148	118
1980-81	12450	68	183	146
1981-82	14224	84	169	135
1982-83	17074	86	199	159
1983-84	19248	94	205	164
1984-85	21079	100	211	169
1985-86	23924	127	188	150
1986-87	27137	131	207	166

Source: Tables 5.2 and 5.3.

Table 5.6 indicates that relative factor prices grew at an annual average rate of 4.9% per annum between 1974-75 and 1986-87. The average annual increase in nominal wages was 15% per annum while the increase in the rental cost of capital was 10% per annum during 1974-75 to 1986-87.

The index of relative factor prices shows a continuous upward trend with the exception of only three years, 1977-78, 1981-82 and 1985-86 (see Figure 5.4). The decline in relative factor prices in these three years is mostly due to the rental cost of capital which escalated more than the increase in nominal wages (see Table 5.6).

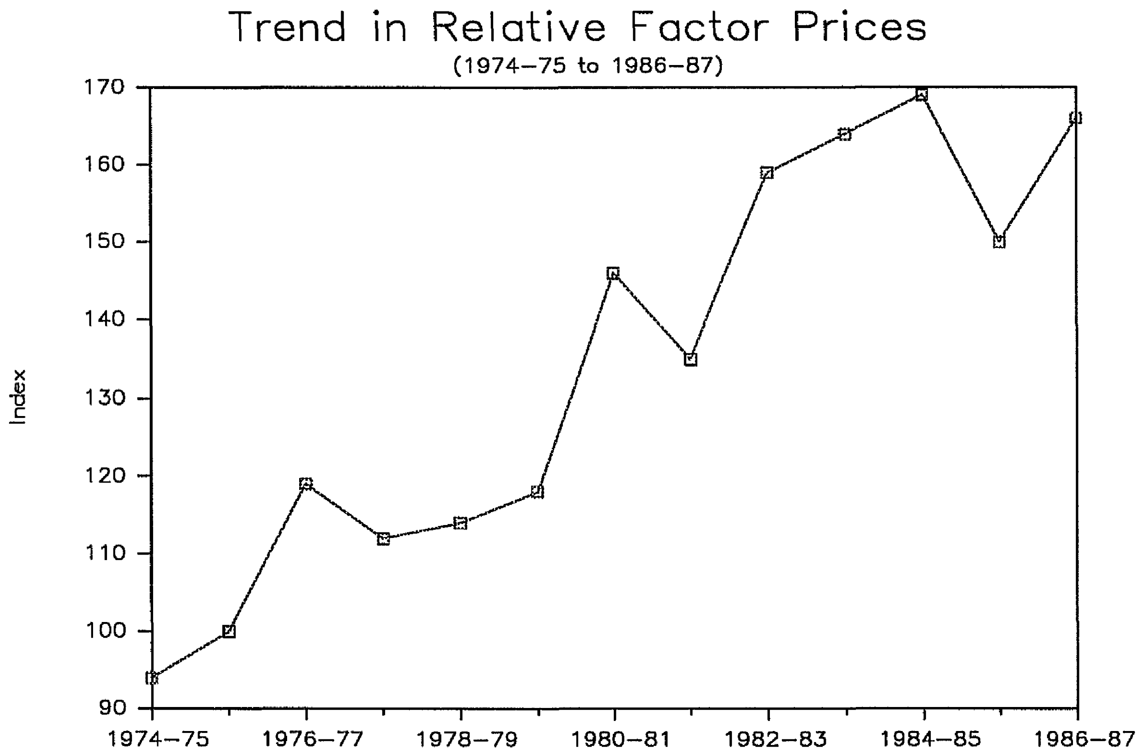


Figure 5.4

5.6 Conclusion

From the very beginning the Government of Pakistan took a keen interest in the industrial development of Pakistan. Earlier during 1950s and 1960s, an overvalued exchange rate, strict and direct controls on trade, cheap credit policy, tax holidays on corporate incomes and profits, accelerated depreciation allowances, and low tariff rates on imported machinery subsidized capital substantially and distorted relative factor prices. High rates of protection to industries resulted in an inefficient industrial structure which could not be corrected even after a long period of development. The rapid growth of the economy was made possible by the development of consumer goods industries like cotton textiles, jute manufactures, sugar and cement. With the availability of domestic supplies of raw materials, these industries would have grown even without providing them with extremely generous fiscal and monetary concessions. Many factors were completely ignored which were necessary for the smooth working of the development process. The neglect of the agriculture sector, the mobilisation of domestic savings, regional imbalances, and concentration of wealth, etc. all disrupted the development pattern in later years. In fact the industrial policy coupled with trade policy distorted product and factor prices and may have encouraged capital intensity and underutilisation of capacity in industries. Until 1969, there was no intervention in the labour market and wages of industrial workers remained stagnant. However, for the first time early in 1969 the government introduced minimum wage fixation and monetary and non-monetary benefits which increased real cost of industrial workers by 21% between 1967-68 to 1969-70 (Guisinger and Irfan, 1974, p. 367).

During 1972-77 industrial policy was reversed. Nationalisation of industries and structural adjustments remained dominant in this period. The most important event was devaluation of the domestic currency against the dollar in 1972 which reduced many investment incentives from the large-scale manufacturing industries and curtailed subsidisation of capital to a large extent. However, all those industries established in underdeveloped areas continued to be given different types of investment incentives.

The present policy is biased towards liberalisation and privatisation of the industrial sector. A rationalisation of the tariff structure might improve the efficiency and industrial structure. Quality improvement in manufactured exports is required to compete in international markets. The availability of infrastructure is a prerequisite to increase investment in underdeveloped areas.

The evidence suggested that up to 1971 the economy of Pakistan was suffering from product and factor price distortions. After 1972 certain measures were taken to raise the price of capital towards its scarcity price. However, fiscal and monetary incentives to industries established in underdeveloped areas still subsidise capital without achieving any desired results.

Due to non-interference of government in the labour market the cost of industrial labour almost remained stagnant up to 1968. But since 1969, the real cost of labour has risen substantially. There are many factors responsible for the rise in real wages, however, government intervention in labour market seem to be as a major factor responsible for the rise in industrial real wages.

All the evidence related to behaviour of factor prices, suggests that the creation of employment opportunities in the manufacturing sector is unlikely to be strong.

We have not yet explored the impact on the employment absorptive capacity of industries of the changes in relative factor prices. The effect of relative factor prices on employment is only possible if there is a positive elasticity of substitution between labour and capital. Thus a systematic exploration of the possibilities of factor substitution is of considerable importance which will be discussed in the next chapter.

Notes and References to Chapter 5

1 Cessation of trade with India in 1949 was mainly due to the reason that India followed the devaluation of Pound Sterling in 1949 and made the similar readjustment in her currency. Pakistan did not devalue her currency (which was linked to Pound at that time) on the basis of the argument that demand for her imports are inelastic. Pakistan's exports became costlier to India and she refused to trade with Pakistan.

2 Industrial licences were issued to manufacturers for importation of industrial raw materials, spare parts, and machinery and equipment, exclusively for their own use. On the other hand commercial licences were issued to importers who were generally expected to re-sell the commodities.

3 In overinvoicing an industrialist buys imported equipment from the supplier at a fictitious invoice price, higher than the price he actually pays. Presentation of the partly fictitious invoice to the foreign exchange authorities entitles the industrialists to buy the full invoice amount of foreign exchange at the overvalued official rate of exchange rate to make payments. The portion of the invoiced amount is then deposited by the supplier to the industrialist's account in a foreign bank and, because of a disequilibrium exchange rate, it can be sold for domestic currency at the higher black market rate. See Winston, (1972), for details.

4 Up to the 1970s, the official exchange rate in terms of dollar was Rs.4.75, which was two or three times less than the free market rate; Winston 1972, p. 169.

5 The growth model of development was associated with the works of two Pakistani economists Papanek (1967) and Haq (1962). The emphasis was to increase the rate of saving and investment in the economy through capitalist development which in turn would generate employment and output in future.

6 Under this scheme for every Rs 100 of foreign exchange earned, the exporter received a voucher for either Rs 20 or Rs 40, depending upon the type of product, that effectively became a licence to import goods up to the face value of the voucher.

7 The analysis made by Islam (1970b) showed that industries worked below 40% of their installed capacity in 1967.

8 The detailed analysis has been made by Lewis (1969), Papanek (1967), Bhatia (1979), see also Noman (1988) for a good analysis of the development policies in the economy.

9 For the details of the nationalisation policy see Noman (1988). See also Pakistan Economic Survey (1977-78), and The Fifth Five Year Plan (1978-83).

10 The effective rate of protection (ERP) measures the percentage by which import restrictions both on competing products and inputs

enable value added by an industry to exceed what it would be if world prices prevailed.

11 The nominal rate of protection measures the percentage by which the prices of the goods produced domestically can exceed what they would have to be if imports were unrestricted. See for detailed examples Godfrey (1986) p. 91.

12 DRC is the sum of costs of all domestic (non-traded) inputs divided by net value added at world market prices. Thus DRC>1 indicates that an industry is inefficient (at the current exchange rate).

13 For details see Pakistan Economic Survey, (1984-85), pp. 184-192.

14 For detailed features of the labour policy see UNIDO, (1985) and Ahmed and Amjad (1984).

15 This concept was first used by Jorgenson (1963) in estimating the rental cost of capital.

16 If the policy of the government is to subsidise capital deliberately by keeping the interest rate low, then the unofficial rate of interest may be used to reflect its scarcity price. Contrary to this if there is no such deliberate attempt by the government then we think market rate of interest may be used to estimate the rental cost of capita.

17 This formulation has been derived by Guisinger (1978)

18 Guisinger (1978) estimated the equilibrium cost of capital by assuming a 15% rate of interest and Rs 7.6/$ foreign exchange rate for all years and compared it with the market cost of capital, See Guisinger (1978), p. 28.

19 This view is contained in Professor Lewis's famous paper "Economic Development with Unlimited Supplies of Labour (1954).

20 According to the CMI production workers include all those who are engaged directly in production activities like manufacturing, assembling, packing, repairing etc.

21 For production workers see footnote (20) above. Non production workers as those who are engaged in administrative and professional activities including white-collar official employees, drivers, watchmen, sweepers etc.(CMI, 1984-85).

22 Khan (1970) however, used both the consumer price index and the wholesale price index to calculate the real cost of labour.

23 There is no information on the total number of working hours per day/per year in the CMI. However, on the basis of number of days factories worked per year we have calculated average number of working hours per annum by assuming total 8 working hours per day. see CMI, 1976-77, and 1984-85. We could have taken the number of shifts as well to estimate total working hours, but unfortunately there is no information on the number of shifts per day for the year 1976-77.

24 The estimated equation for the 1972-82 given by Irfan and Ahmed (1985) is:

$$\text{Log RW} = -2.669 + 0.754 \text{ Log PRTY} + 0.463\text{STK}$$
$$(2.736) \qquad (19.891)$$
$$R^2 = .975$$

where RW= real wage of production workers; PRTY = productivity; STK = stock of workers in the Middle East, and the figures in parenthesis are t-values.

25 ibid.

26 See Noman (1988), for elaborate discussion on economic development during the 1970s.

27 By now there is a voluminous literature on the concept of shadow price of labour. The concept was first introduced and discussed fully by Little and Mirrlees (1968), see also Harberger (1971), Dasgupta, Marglin and Sen (1972), and Edwards (1982).

APPENDIX TO CHAPTER 5

Appendix Table 5.1: The Market Cost of Capital

	Kf	Exchange rate/$	Kf Adjusted	Kf(1+T)	r+d	$u/S^n_1(d'_t/1+i)^t$	col. 5-6	col.7/1-u	P_k 4*8
	1	2	3	4	5	6	7	8	
1974-75	100	9.9	100	140	0.20	0.049	0.15	0.30	42
1975-76	100	9.9	100	140	0.21	0.050	0.16	0.32	45
1976-77	109	9.9	109	153	0.21	0.050	0.16	0.32	49
1977-78	125	9.9	125	175	0.22	0.050	0.17	0.34	60
1978-79	143	9.9	143	200	0.22	0.050	0.17	0.34	68
1979-80	158	9.9	158	221	0.22	0.050	0.17	0.34	75
1980-81	152	9.9	152	213	0.21	0.050	0.16	0.32	68
1981-82	146	12.7	187	262	0.21	0.050	0.16	0.32	84
1982-83	141	13.5	192	269	0.21	0.050	0.16	0.32	86
1983-84	137	15.2	210	294	0.21	0.050	0.16	0.32	94
1984-85	137	16.1	223	312	0.21	0.050	0.16	0.32	100
1985-86	163	17.2	283	397	0.21	0.050	0.16	0.32	127
1986-87	164	17.6	292	408	0.21	0.050	0.16	0.32	131

Kf is the cif index price of manufactured exports from developed countries taken from Monthly Bulletin of Statistics ((United Nations)
The adjusted Kf takes into account the devaluation in Pakistan's exchange rate.
T = 40% and u=0.5 throughout the years taken from Pakistan Economic Surveys of different years and World Bank (1984).
r is taken from table 4.1 in the text.
n=10, and d=d/t=10%
discount rate i varies with interest rate each year.

	$dt/(1+i)^t$	S^n_1
1974-75	.614,	6.148
1975-76 - 1976-77	.588	5.889
1977-78 - 1979-80	.563	5.653
1980-81 - 1986-87	.588	5.889

Appendix Table 5.2: The Policy Induced Rental Cost of Capital 1975-1987

	Kf 1	$\dfrac{r+d-u/Sn1 \dfrac{d't}{(1+i)^t}}{1-u(S^n_{h+1}/S^n_1)}$ 2	P_k 1×2 3
1974-75	100	0.188	18.8
1975-76	100	0.200	20.0
1976-77	109	0.200	21.8
1977-78	125	0.212	26.5
1978-79	143	0.212	30.3
1979-80	158	0.212	33.5
1980-81	152	0.200	30.4
1981-82	187	0.200	37.4
1982-83	192	0.200	38.4
1983-84	210	0.200	42.0
1984-85	223	0.200	44.6
1985-86	283	0.200	56.6
1986-87	292	0.200	58.4

1974-75 to 1986-87
Snh+1 $d't/(1+i)^t$= 0.589
u/S^n_1 $^n_{h+1}(d't/(1+i)^t$= 0.048
S^n_1=6.148, 5.889, 5.853 for different years
S^n_{h+1}= 2.355 $1-u(S^n_{h+1}/S^n_1)$ = 0.81
r+d taken from Appendix Table 4.1.
u=.5, d't= .25, i= ranges from .10 to .12, tax holiday (h)= 5 years
d=.10

Table 5.3: Employment Cost of industrial workers in the Large-Scale Manufacturing Sector (1974-75 to 1986-87)

(1975-76=100)

Year	Nominal Cost Value in Rs.	Index	CPI	**Real Cost** Value in Rs.
1974-75	4953	88	89.55	5531
1975-76	5645	100	100.00	5645
1976-77	7301	129	112.15	6510
1977-78	8391	149	120.92	6939
1978 79	9658	171	128.28	7529
1979-80	11107	197	139.19	7980
1980 81	12450	221	157.40	7910
1981-82	14224	252	178.40	7973
1982-83	17074	302	182.27	9367
1983-84	19248	341	197.96	9723
1984-85	21079	373	212.18	9934
1985-86	23984	425	217.33	11036
1986-87	27137	481	216.13	12000
Average Annual Growth Rate = 6.7%				

CPI: Consumer price index
The data on nominal costs and the consumer price indices have been taken from Economic Survey (1988-89).

Appendix Table 5.4: Real Employment Cost in the Manufacturing sector of Some Developing Economies[1]

(00)

Year	Sri Lanka	Bangladesh	India	Hong Kong	Korea	Singapore
1976	20.6	16.9	564.2	39.1	99.2	1.9
1977	29.8	15.2	565.0	40.9	120.5	1.9
1978	40.2	14.9	607.0	43.6	141.4	1.9
1979	31.3	14.7	589.2	45.3	153.8	2.1
1980	27.5	19.1	583.0	45.1	146.7	2.1
1981	23.9	18.7	546.9	45.8	144.4	2.3
1982	21.2	17.2	511.2	57.4	155.5	2.4
1983	21.5	15.8	517.2	57.2	168.0	2.6
1984	21.4	14.4	540.2	60.1	177.7	2.8
1985	24.4	-	474.5	63.4	191.2	3.0
1986	23.9	-	-	66.9	159.2	6.3
1987	24.4	-	-	71.1	220.6	6.7
GR (%)	-2.2	0.006	-1.90	5.7	5.2	11.0

1 Values are in their respective currencies.
Real wages have been calculated by dividing nominal wages by the consumer price index (1980=100).
GR is the trend growth rate
Source: ILO, and the United Nations Statistical Year Book of different years.

Appendix Table 5.5: Growth in Real Employment Cost and Capital-Labour Ratios (1977-78 - 1984-85)

(percentage)

Industries	Growth in real wages[1]	Growth in Capital-labour ratios
All Industries	**5.5**	**5.0**
1 Food Manufacturing	4.5	-3.3
2 Beverage industries	2.3	0.4
3 Tobacco industries	2.7	-5.0
4 Textiles	4.5	1.4
5 Wearing Apparel	7.2	-3.5
6 Leather & leather products	7.3	-6.3
7 Manufacture of footwear	3.0	2.5
8 Ginning, pressing & baling of fibres	4.1	-4.9
9 Wood and cork products	7.3	12.6
10 Furniture & fixtures	3.8	23.8
11 Paper & paper products	2.5	-4.2
12 Printing and Pressing	4.6	5.1
13 Drugs & pharmaceutical	4.6	5.3
14 Industrial chemicals	6.0	2.5
15 Other chemical products	8.3	2.1
16 Petroleum and coal	0.4	10.4
17 Rubber products	6.4	16.5
18 Plastic products	6.2	-4.6
19 Pottery China	3.0	-7.2
20 Glass & glass products	8.7	13.1
21 Non-metallic mineral products	7.8	5.9
22 Iron & steel	7.3	16.5
23 Fabricated metal products	4.0	-2.7
24 Machinery (non elec.)	10.5	-4.7
25 Machinery (electrical)	4.3	3.6
26 Transport	3.2	3.3
27 Professional Goods	21.1	4.1
28 Miscellaneous	2.2	-8.0

Notes: Real growth in employment cost has been calculated by deducting the growth rate of 8.1% per annum in WPI during this period from nominal employment cost.
Growth in capital-labour ratios have been calculated from Table 4.1 (Chapter 4) by using end points.
Souce: Table 5.3 (Chapter 5); Appendix Table A-14.

Appendix Table 5.6: Agricultural Wages of Casual Labour

Year	Nominal Wages Rs/Per Day	Real Wages Rs/Per day
1974-75	7.9	8.8
1975-76	7.5	7.5
1976-77	7.7	6.9
1977-78	9.1	7.6
1978-79	10.0	7.8
1979-80	11.3	7.9
1980-81	13.3	8.3
1981-82	19.5	11.1
1982-83	20.0	11.0
1983-84	25.0	12.6
1984-85	42.5	19.9

Notes: Real wages are arrived at by using the consumer price index 1975-76 =100
Nominal Wages have been taken from ILO year book for different years.

Appendix Table 5.7: Agricultural Productivity
(Rs in million)

Year	Value Added	Employed Labour (million)	Value Added Per Employee
1974-75	13074	11.12	1176
1975-76	13659	11.44	1194
1976-77	14004	11.76	1191
1977-78	14399	12.09	1191
1978-79	14845	12.43	1194
1979-80	15826	12.72	1244
1980-81	16405	13.01	1261
1981-82	16992	13.32	1276
1982-83	17637	13.63	1294
1983-84	16571	13.63	1216
1984-85	18600	13.63	1365
1985-86	19788	14.60	1355

Value added is at the constant factor prices of 1959-60.
Source: Economic Survey 1991-92.

Appendix Table 5.8: Labour Force Migration to the Middle East

(Number)

Year	Labour Force Stock in the Middle East	% change over preceding year
1971	3534	-
1972	4350	23.1
1973	12300	183.7
1974	16328	32.7
1975	23077	41.3
1976	41690	80.7
1977	140522	237.1
1978	130525	-7.1
1979	125507	-3.8
1980	129847	3.5
1981	168403	29.7
1982	142954	-15.1
1983	128206	-10.3
1984	100407	-21.7

Source: Pakistan Economic Survey 1984-85.

Appendix Table 5.9: Average Daily Nominal Wages of Construction Workers

(In Rupees)

Year	Carpenter	Mason	Unskilled
1976-77	35.18	35.92	15.05
1977-78	39.83	42.27	17.26
1978-79	45.17	45.67	18.83
1979-80	55.50	55.50	21.73
1980-81	59.67	61.17	23.60
1981-82	69.00	68.00	25.80
1982-83	68.52	69.46	27.82
1983-84	70.90	72.23	29.57
1984-85	75.13	75.85	30.12
1985-86	77.50	78.50	34.90
1986-87	81.00	81.00	36.33
1987-88	86.78	94.43	38.35
AGR	**8.6%**	**9.2%**	**8.9%**
AGR of CPI (1976-77 -1987-88) = 7.7%			
AGR of Real Wages	**1.0%**	**1.5%**	**1.2%**

Notes: AGR is the annual average growth rate
Average of daily wages is of five big cities.
Calculated from Economic Survey 1991-92.

Appendix Table 5.10: Trade Unions in Pakistan

Year	Number of Registered Trade Unions	Membership (Number)
1975-76	8196	338,092
1976-77	8611	304,739
1977-78	8332	331,894
1978-79	7894	320,446
1979-80	6869	289,070
1980-81	6551	346,511
1981-82	6227	327,704
1982-83	6344	287,445
1983-84	6253	305,078
1984-85	6271	289,501

Source: Statistical Year Book of Pakistan (1989).

Appendix Table 5.11: Industrial Disputes

(Number)

Year	Number of Disputes	Number of workers involved	Number of mandays lost (Thousands)
1975-76	171	77502	514.89
1976-77	81	49093	200.86
1977-78	85	58565	107.63
1978-79	65	38733	247.87
1979-80	59	24710	54.73
1980-81	64	47736	521.80
1981-82	26	22409	690.87
1982-83	63	29163	590.41
1983-84	81	30702	157.75
1984-85	58	35858	159.43

Source: Up to 1976-77 the figures have been taken from ILO, 1980. The rest of the figures have been taken from the Statistical Year book of Pakistan, 1989.

Appendix Table 5.12: Industrial Productivity

(Rs in million)

Year	**Value added (constant prices- of 1975-76)**	**Employment (000)**	**Productivity**
1975-76	10972	507	21641
1976-77	12511	457	27376
1977-78	14078	459	30672
1978-79	14446	451	32032
1979-80	17039	452	37698
1980-81	17528	452	38779
1981-82	19615	474	41382
1982-83	20547	465	44187
1983-84	22356	476	46966
1984-85	24685	493	50071
1985-86	24197	507	47726
1986-87	28748	532	54038

Calculated from Economic Survey 1991-92.

CHAPTER 6

ESTIMATES OF THE ELASTICITY OF SUBSTITUTION IN THE LARGE-SCALE MANUFACTURING SECTOR OF PAKISTAN: AN EMPIRICAL ANALYSIS

6.1 Introduction

In the previous chapter we have seen that government policy may have affected and distorted relative factor prices in the large scale manufacturing sector of Pakistan. Recalling Chapter 4, we have seen that, on average, capital intensity in terms of capital-labour (K/L) ratios has also increased in the large-scale manufacturing sector. From a neoclassical point of view this is consistent with an increased ratio of wages to capital cost and slow growth of employment. Hence the argument that removing factor price distortions may generate employment opportunities in the manufacturing sector (see Chapter 3) may not be realised in practice because it is contingent on the magnitude of the elasticity of substitution which determines the ease of substitution between capital and labour with respect to relative factor prices.

There are however two school of thoughts regarding the magnitude of the elasticity of substitution between capital and labour. As discussed in Chapter 3 the "technological determinists" or "the pessimists" believe that factor proportions are fixed and no choice of techniques is possible with respect to relative factor prices. Hence the magnitude of the elasticity is zero or near zero. In this case the production function is L shaped and permits no substitution between inputs. The neo-classicists, or the "optimists", on the other hand, believe manipulation of relative factor prices affects the choice of techniques because the elasticity of substitution is not equal to zero. Most of the empirical analysis is centred around these views.

Other things being equal, the higher the elasticity of substitution the greater is the possible rate of growth of product because relatively fast-growing labour can be substituted more easily for the relatively slow-growing capital in developing countries (Behrman, 1972). This has important policy implications for governments of developing countries regarding employment generation in the sector. Information on the elasticity of substitution is also important (Behrman, 1972) because:

(a) the size of the elasticity reflects the degree of the static flexibility of the economy in response to changes such as those that occur in the international market;

(b) low elasticities of substitution between capital and labour underlie one prominent explanation of the reputed existence of large quantities of unemployed and underemployed labour, i.e., because of the low elasticities, the scarcity of capital leaves other inputs unemployed;

(c) changes in relative factor shares between labour and capital are determined by the growth and the ease of substitution between capital and labour.

Although the elasticity of substitution between capital and labour is quite important in its own right, we are mainly concerned with its impact on employment. The motivation is to examine the scope and potential for the absorption of the growing labour force in different categories of industries and in the manufacturing sector in particular.

This chapter is mainly concerned with the estimation of the elasticity of substitution between capital and labour in the large-scale manufacturing sector of Pakistan. However, the impact of economies of scale on employment via their effect on techniques of production will also be estimated. These estimates will be made on an aggregated as well as a disaggregated basis for the period of 1984-85. A comparison of the elasticity parameter between two time periods; 1977-78 and 1984-85 will be also made.

6.2 The Elasticity Concept

As earlier mentioned in chapter 4, the elasticity of substitution between two factors, say capital and labour, is simply defined as the ratio of the proportionate change in the ratio of factor inputs (called "factor proportions") to the proportionate change in relative factor prices and may be written as:

$$\sigma = \frac{d(K/L)/(K/L)}{d(w/r)/(w/r)}$$

The elasticity of substitution thus measures how rapidly factor proportions change for a change in relative factor prices. It is therefore a measure of the curvature of the isoquants (see Intriligator, 1978, chapter 8).

The empirical estimation of the elasticity of substitution is mostly derived from the neoclassical theory of production, distribution and growth as embodied in the concept of the production function.

Neoclassical production functions are aggregate in the sense that they sum capital of different categories in an industry used in many different processes of production and deal with labour in a similar manner. This has led to a long and unresolved controversy about their validity in expressing underlying micro technology (see Robinson, 1962, Kaldor, 1966, and Bosworth, 1976, chapter 8 for details). We can only say that as micro data are extremely difficult to obtain and since empirical estimates of production functions give good results, aggregate production functions are still used to express production relations and underlying technology in industries.[1]

As mentioned already in Chapter 4, the production function expresses the relationship between the maximum level of output (Q) and a vector of given inputs (X): Q = f (X). At a point of time any level of output is associated with a particular technology indicating a ratio of capital to labour in aggregate terms. As the K/L ratio rises the technique is said to become more `capital intensive' and vice versa. However, factor intensity is a purely relative concept. It has no cardinal value (see Clark, 1985, pp. 80-91 for details). Thus the production function in conjunction with the marginal productivity theory of distribution provides the neoclassical analytical basis for explaining equilibrium factor prices and levels of factor utilisation. Econo mic growth within this framework is explained by making a distinction between a `shift' of the production function over time from that of a `movement' along the function. The former implies the impact of technical progress on economic growth, the latter describes the accumulation path of the growth (see Clark, 1985 for diagrammatical expressions).

Thus, the elasticity of substitution is one of the most important parameters of the neoclassical production function and provides an insight into the choice of techniques of production with respect to relative factor prices.

6.2.1 Ex Ante and Ex Post Substitution

In the analysis of substitution possibilities a distinction is usually made between ex ante (before actual investment is made) substitution and the ex post (after actual investment is made) substitution.[2] The former refers to the array of possible ways to produce a particular product - different configurations of output, labour and capital stock embodied in a physical plant. The selection of these alternative arrays ex ante, will mainly depend on relative factor prices. There may be four different cases explaining ex ante and ex post substitution possibilities. In the first instance (see Figure 6.1) we have the case of an ex ante "envelope" isoquant Ia representing the infinite array of alternative plants which may be chosen. Once a decision is made the relevant isoquant say, Ip, will determine factor combinations (Figure 6.1). In this case both ex ante and ex post substitution possibilities exist and this is sometimes also called as "putty putty" case (see Figure 6.1).

In the second case it is assumed that ex ante substitution possibilities between capital and labour with respect to relative factor prices exist as shown by the isoquant (Ia) while there are no ex post substitution possibilities (I_P, I_Q, and I_R). Hence, the ex ante elasticity of substitution is positive but zero ex post. This situation is illustrated in Figure 6.2. Each technique uses fixed proportions. Thus, once the investment is made, there is no ex post substitution possibility at all and there is no scope for increasing output by increasing only one factor say, labour. However, ex ante substitution possibilities exist. This extreme case of full ex ante and zero ex post substitution is called the "putty-clay" model (See Layard and Walters, 1987 for details). Capital in this situation is like the material used by an artist - before he has given it a form, it is as putty in his hands; but, once given form, it hardens as clay.

In the third case (Figure 6.3) ex ante there may be only one physical plant possibility, but in its ex post operation, substitution possibilities may exist with respect to relative factor prices. This may be referred to as "one plant and putty" case.

Finally, there may be extreme rigidity in the choice of techniques both ex ante and ex post (Figure 6.4). In this case there is only one way (plant) to make a product and, once the plant is built, there is only one way to operate it. Hence, no ex ante and ex post substitution possibility exists and it is referred as the "clay clay" case.

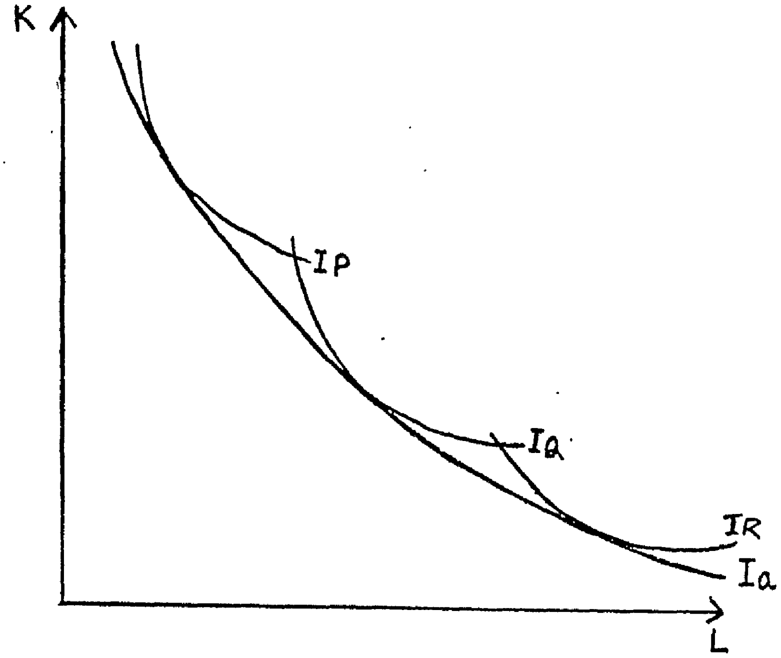


Figure 6.1: Putty Putty Case

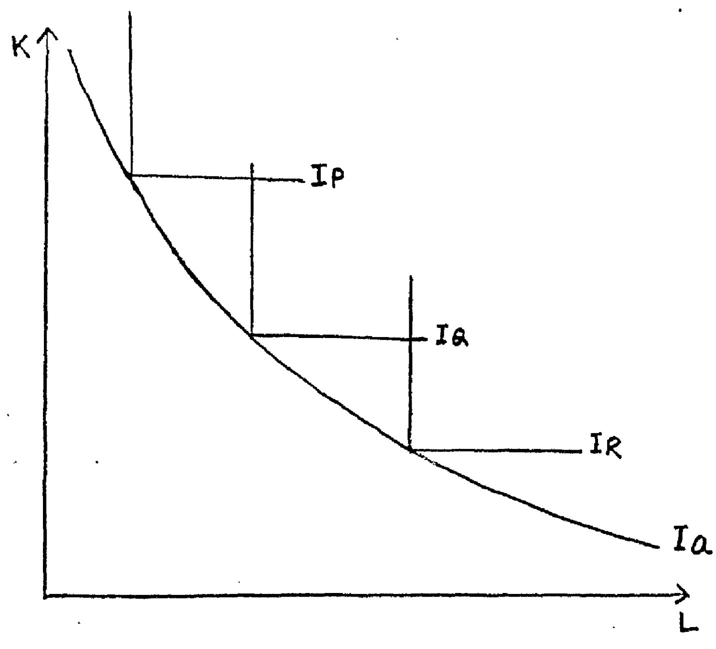


Figure 6.2: Putty-Clay Case

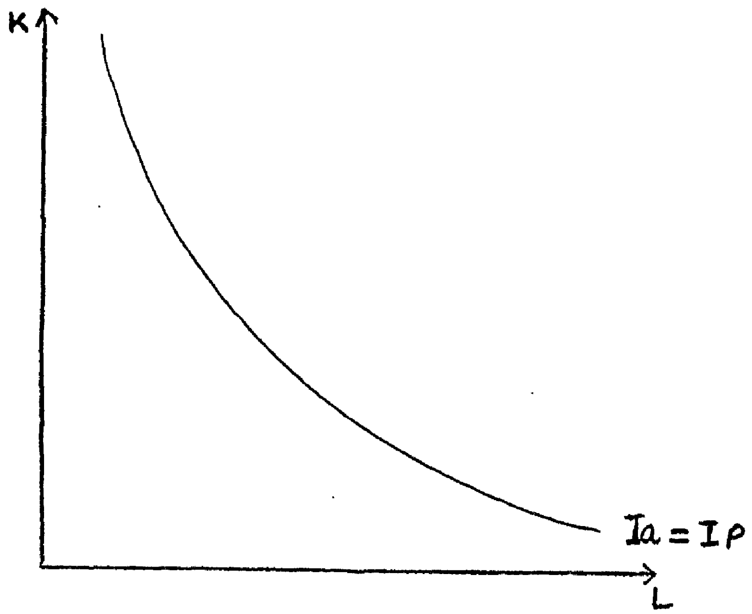


Figure 6.3: One plant and putty case

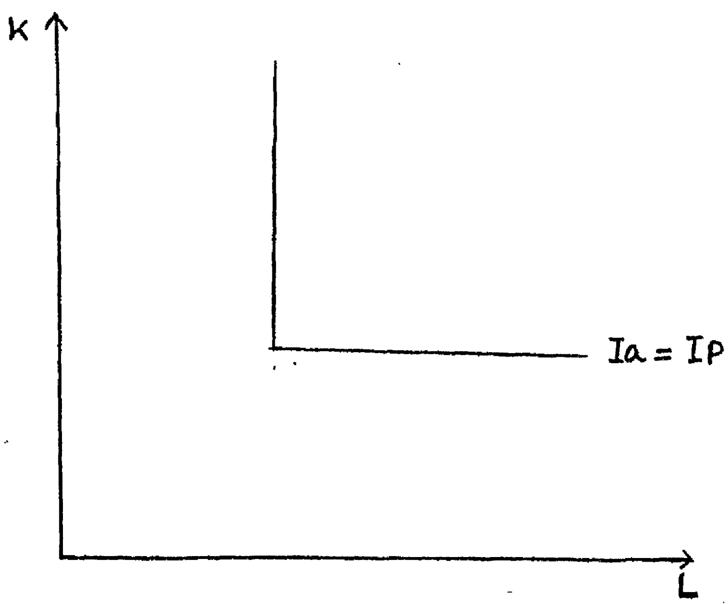


Figure 6.4: Clay-Clay Case

If ex ante and ex post elasticities of substitution are the same, there is no problem of summarising them in a single production function framework. But if these are different we cannot write them in a single production function. Usually the elasticity estimates are related to the ex ante investment decision. But in the real world it cannot be assumed that all the ouput/input observations we have lie on the ex ante function. This had led a number of economists to advocate the use of an engineering production function[3] which contains the analysis of alternative techniques for each step of production in any single industry and may lead to complex and tedious programming solutions.

Nevertheless, the empirical estimates of the elasticity of substitution are generally based on the assumption that ex ante substitution possibilities exist while ex post substitution possibilities are zero (see Layard and Walters, 1987 for further details). Our empirical estimates also follow the more general case mentioned above and assume that ex ante substitution possibilities may exist with respect to relative factor prices but once the product technique is fully specified it may not be possible to change capital labour ratios. In reality, however, it may not be true and there are certain process where ex post capital-labour substitution may be possible (see Pack, 1974).

6.2.2 Earlier Estimates of the Elasticity of Substitution in Pakistan

There are a vast number of empirical estimates of the elasticity of substitution in the manufacturing sector for developing countries and they seem to suggest considerable potential for capital-labour substitution (see Bhalla, 1975, and White, 1978, for references to these studies, see also Chapter 3). In the case of Pakistan some attempts have been made to estimate the elasticity of substitution between capital and labour besides investigating the returns to scale for different manufacturing industries. Hussain (1974) using cross-section data for the periods 1959-60 to 1970 estimated the elasticity of substitution between capital and labour to be 0.76 and found it significant at the 5% level. The analysis was highly aggregated and there was no attempt on a disaggregated basis. Later, Kazi et al (1976), using the constant elasticity of production (CES) production function, estimated the production relationships in Pakistan's manufacturing sector at inter-industry level by fitting both cross-section and time-series data. The cross-section estimates for 1969-70 under the assumption of constant returns to scale showed a higher elasticity of substitution (1.17) for industries compared with time series estimates (0.72) (Kazi et al, 1976, p. 410). The study recognised the limitations of fitting production functions for time-series data such as multicollinearity, misspecification of adjustment lags and cyclical conditions, etc. The data was related to only two of the four provinces of Pakistan and hence may not be an unbiased estimate for the whole of Pakistan.

Kemal (1981) estimated the elasticities of substitution between capital and labour by fitting both CES and VES[4] production functions to 16 different industries and to the large-scale manufacturing sector as a whole. Time-series data was used for the period 1959-60 to 1969-70. In most of the industries substitution elasticities were found to be low. Apart from the customary weaknesses of time-series analysis Kemal (1981) was severely criticised by Ahmed (1982) for using his own adjusted data to allow for undercoverage.

Malik et al (1989) used cross-section data for six different years to estimate the elasticity of substitution in the textile industry of Pakistan and found the magnitude of the elasticity greater than one. As the study estimates were confined to one industry no clue can be obtained about the technological features of other industries.

Our analysis may provide better estimates than those of earlier studies on many accounts. First, no effort has yet been made to take into account the structure of industries in the estimation of the elasticity of substitution. In this study the elasticity of substitution for consumer, intermediate and capital goods industries along with some individual industries will be estimated. This analysis is useful because we think different groups of industries such as intermediate or capital goods industries may have different technological features. For example, we have already seen in Chapter 4 that capital intensity was the highest and had grown fastest in the intermediate group of industries between 1977-78 and 1984-85. Consumer goods industries on the other hand, on average had shown no increase in capital-labour ratios though inter-industry differences could not be rejected. A similar case is shown by capital goods industries (see Chapter 4). On the basis of this information we may say that different categories of industries may not be facing the same wage-rental ratio and the elasticity of substitution may be different in different categories of industries.

Second, earlier studies on Pakistan are mainly related to the era of 1960s which was characterised by the dominance of consumer goods industries mainly using imported machinery at that time (see Chapter 5). After the 1970s there were structural changes and the development of certain domestic industries may have reduced dependence on imported technology (which is mostly capital-intensive). Hence, the hypothesis to be tested is that the elasticity of substitution has increased over time indicating more flexibility in the choice of techniques in the manufacturing sector and providing more potential for employment creation.

Third, our data covers all industries established in Pakistan and is not confined to some provinces. Moreover, owing to difficulties in the time-series data (which will be discussed later), we have confined our analysis to cross-section estimates.

Fourth, we will also test some other hypotheses which have never been tested before in the case of Pakistan. For example, to analyse in depth the technological features of industries, inter-industry differences in efficiency at a point of time and changes in the elasticity parameter between two time periods, further estimates will be made.

6.3 Model and Assumptions

There are various classes of production functions (for surveys of production functions and their estimations see Walters, 1963, 1968, Hildebrand and Liu, 1965, Nerlove, 1967, and Ferguson, 1969) but for empirical estimates of the elasticity of substitution the most widely used production functions are the Cobb-Douglas (CD), and the constant elasticity of substitution (CES). It is well known that under the assumption of competitive conditions and constant returns to scale the CD production function invariably results in unitary elasticity of substitution (see Thirlwall, 1983a for mathematical proof).

Arrow, Chenery, Minhas and Solow (1961) however, found that the elasticity of substitution was significantly lower than one in their cross-country analysis and thus cast serious doubts on the appropriateness of the Cobb-Douglas production function (p.227). They developed the CES production function in which the elasticity of substitution can take any value from zero to infinity. It is therefore obvious that the CES production function includes the Cobb-Douglas production function as a special case.

In order to measure the degree of substitution between capital and labour, we will use the more general CES production function introduced by Arrow, Chenery, Minhas, and Solow (1961). First, the model will be used in its restrictive form where constant returns to scale are assumed (will be explained later). Later this restriction will be relaxed by allowing variable returns to scale. Other assumptions of the model are:

- Firms are profit maximisers.
- A range of alternative techniques of production is available to firms.
- There is no cost involved in the transfer of technology.
- Firms are on their production frontier.

The above mentioned assumptions of the model are very restrictive and have been criticised by many economists (see Clark, 1985 for details, see also Chapter 3). By assuming two factors of production, capital (K) and labour (L), the CES production function in its general form may be written as:

$$Y = \gamma[\delta K^{-\varrho} + (1-\delta)L^{-\varrho}]^{-v/\varrho} \qquad v = 1 \qquad (6.1)$$

where:

Y represents the total value of output
K is the actual inputs of capital services measured in money terms at constant prices
L is the actual inputs of labour measured in man-per year
γ is the efficiency parameter
δ is the distribution parameter
ϱ is the substitution parameter
v is the degree of homogeneity

The technology embodied in production function of the form 6.1 is depicted by three different parametersi.e.γ, δ, and ϱ, and is assumed to be constant. γ, "the efficiency parameter" measures the volume of output obtained from given quantities of inputs. δ "the distribution parameter" is a measure of the capital intensity of the technology, and it also indicates the distribution of income between capital and labour. v is "the degree of homogeneity" of the function. v will be 1 in the case of constant returns to scale, less than one for decreasing returns and greater than 1 for increasing returns to scale. The elasticity of substitution is a simple function of ϱ, the substitution parameter, and is written as;

$$\sigma = \frac{1}{1 + \varrho}$$

Possible values for ϱ range from $\varrho = \infty$ (where $\sigma = 0$ and substitution is impossible) to $\varrho = -1$ (where $\sigma = \infty$, the isoquants are straight lines and substitution possibilities are greatest). If $\varrho = 0$, then $\sigma = 1$ and the CES production function reduces to the Cobb-Douglas production function (see for further details Thomas, 1993; Wallis, 1979,).

Since the CES production function is highly non-linear, it cannot be estimated directly by Ordinary Least Squares (OLS) unless linearised. There are many direct ways to linearise the function but these require the measurement of the value of capital stock (see Intriligator, 1978 for details and references) which presents both conceptual and empirical problems (see Chapter 4). This can be avoided by using the indirect estimation procedure suggested by Arrow, Chenery, Solow and Minhas (1961). The indirect estimation of the CES production function however, is very restrictive. It is assumed that perfect competition and profit maximisation conditions prevail and factors receive shares equal to their marginal products. Such conditions also require the assumption of constant returns to scale (see for details, Intriligator, 1978). Hence, v is set equal to 1 in equation (6.1). The assumption of perfect competition in both factor and product market is very restrictive and may not be very realistic in the case of Pakistan. However, the element of imperfection in product and factor markets (which is discussed later) cannot be introduced in our model because of lack of data and thus our results may be biased upwards to some extent (this will also be discussed later).

The mathematical procedure of obtaining the estimation form of the CES production function is based on the marginal productivity of labour relation derived from equation 6.1 (see Katz, 1969, pp. 40-44) .

If Y/L = y, the production function (6.1) can be rewritten, as:

$$y = \gamma \; [\delta (K/L)^{-\varrho} + (1-\delta)]^{-1/\varrho} \qquad (6.2)$$

Raising both sides of equation (6.2) to the power ϱ and rearranging, we obtain;

$$y^{\varrho} \gamma^{-\varrho} = \delta[(K/L)^{-\varrho} + (1-\delta)]^{-1} \qquad (6.3)$$

If it is further assumed that the distribution of incomes is determined by competitive factor remuneration, then differentiating equation (6.1) with respect to labour, L, we obtain the product wage rate:

$$\delta Y / \delta L = w = \gamma (1-\delta) [\delta (K/L)^{-\varrho} + (1-\delta)]^{-1-1/\varrho} \qquad (6.4)$$

Substituting equation (6.2) into 6.4), we obtain:

$$w = y(1-\delta)[\delta(K/L)^{-\varrho} + (1-\delta)]^{-1} \qquad (6.5)$$

Substituting equation (6.3) into (6.5), we obtain, after transformation;

$$y^{1+\varrho} = \gamma^{\varrho} \quad (1-\delta)^{-1w} \qquad (6.6)$$

Taking logarithms of equation (6.6) and dividing by $(1+\varrho)$, we get:

$$\log y = \sigma \log \gamma^{\varrho} (1-\delta)^{-1} + \sigma \log w \qquad (6.7)$$

As ϱ, δ and γ are assumed to be constants (they are given features of the ruling technology), equation (6.7) can be written in estimating form as:

$$\log Y/L = a + \sigma \log w + u \qquad (6.8)$$

where $a = \sigma \log[\gamma^{\varrho}(1-\delta)^{-1}]$ is a constant and shows the features of technology, and qualitative aspect of inputs (which will be explained later). σ

is an estimate of the elasticity of substitution (which is equal to $(1/1+\varrho)$ and u is the error term. Y/L is labour productivity. Equation (6.8) expresses the functional relationship between the real wage rate and labour productivity. The σ is the elasticity of substitution which measures the impact of changes in factor prices on labour productivity via changes in factor proportions. Any increase in real wages will induce substitution of capital for labour thus raising labour productivity (see Chapter 4 for the functional relationship between K/L and V/L) and incurring a negative impact on employment.

The above indirect specification of the CES production function (equation 6.8) has been widely utilised in empirical studies for the estimation of the elasticity of substitution for developing countries. The advantage of this formulation despite its restrictive assumptions (as earlier mentioned) is that it does not require capital stock data, the estimation of which involves many problems especially in developing countries (see Chapter 4 for details).

6.3.1 Relaxation of Assumptions and Returns to Scale

The above equation (6.8) is very restrictive and assumes constant returns to scale. However, if economies of scale are present, output will increase more than proportionately to any increase in inputs. Hence labour productivity may be observed to increase, not wholly due to substitution of capital for labour induced by a rise in wages, but also due to the existence of economies of scale. In this case employment will be reduced by the degree of economies of scale via their effect on productivity.

By relaxing the assumption of constant returns to scale, Brown and Cani (1962) generalised the CES production function by allowing the parameter v to vary. The less restrictive form of the model, however, violates the principle of marginal productivity theory and the assumption of perfect product and factor market no longer remains valid.[5] The general version of the CES production function takes the following form for estimation purposes

$$\log Y/L = a + \sigma \log w + c \log V + u \qquad (6.9)$$

where a and σ have the same properties as in equation (6.8) and V is real value added while c measures the economies of scale and is equal to:

$$c = (1-\sigma)(v-1)/v \qquad (6.10)$$

Knowing the value of this expression and the value of σpermits the estimation of v, the degree of returns to scale in each industry.

According to equation (6.10) for any given value of v greater than unity (increasing returns to scale), c is a linearly decreasing function of the elasticity of substitution σ. The rationale of this negative relationship between c and σ is as follows. The term log w in equation (6.9) takes into account the neoclassical adjustment of factor proportions to factor prices, and therefore brings into the model the incidence of a marginally higher capital-labour ratio as an explanatory variable of part of the observed increase in the average productivity of labour. Given the cost of capital, an increase in wage rate (or of the marginal product of labour), calls for marginal change in capital intensity upward. The magnitude of these marginal changes will depend on the actual value of the elasticity of substitution in each particular industry. Large values of this parameter will allow for large changes in the K/L ratio, and therefore, a part of the observed changes in labour productivity will be accounted for by changes in factor proportions.

Equation (6.9) thus relates labour productivity to real wages and output. In this model the coefficient on log wages measures the elasticity of labour displacement by capital due to increase in real wages. Similarly, holding wages constant, any increase in output will increase productivity via returns to scale. Increasing returns to scale at a point of time may reflect the scale and size of firms.

Equations (6.8) and (6.9) can be also fitted to time-series data by adding another variable `t' (a time trend) reflecting the effect of technological progress on the efficiency of inputs (see Katz, 1969). The variable `t' however, may not be an appropriate measure of technological progress because over a period of time many other factors such as economies of scale, skill of labour etc. also change and affect labour productivity. Hence, a time trend may not reflect pure technological progress only. Moreover, there are many problems related to the time-series estimates such as the dominance of cyclical conditions, multicollinearities between scale and technology, mis-specification of adjustment lags between the inputs and the outputs etc. which may bias estimates of the elasticity (see Bhalla, 1975). With the increase in knowledge, processes which are technologically more efficient become available and the skill and quality of the labour force improves. The result is that factor input rates, substitutability between factors, efficiency parameters, and even the mathematical form of the production function change over time (Wynn and Holden, 1974, p. 58). Though the cross-section estimates also suffer from many problems (which are discussed later) these may be less severe than the time-series estimates.

Katz (1969) has also added another term $(1+E_{wL}/1+E_{pY})$ in equation (6.9) which allows for market imperfections (see Katz, 1969, pp. 70-71 for details). E_{wL} is the elasticity of wages with respect to the quantity of labour employed, and E_{py} is the elasticity of the industry's price with respect to quantity. If the assumption of perfect product and factor markets is not made, profit maximisation requires the marginal product of labour to be equal to the wage rate times $(1+E_{wL} / 1+E_{pY})$. Due to lack of data on E_{wL}

and E_{py} we have retained the assumption of perfect competition and ignored market imperfections in our model. However, the omission market imperfections may bias the coefficient on log w - the elasticity of substitution - upwards, if the log of such imperfections (i.e., log $1+E_{wL} / 1 +E_{pY}$) and log w are positively correlated. The omission of market imperfections in our analysis is one of the limitations of our model.

6.3.2 Output, Productivity and Returns to Scale

The statistical relationship between the growth of labour productivity and the growth of output in manufacturing industry was first considered by Verdoorn in 1956. He claimed that the average value of the elasticity of productivity with respect to output in different countries is stable and ranges from 0.45 to 0.60 (this is known as Verdoorn's Law) (see Verdoorn, 1956).

Verdoorn (1956), justified the relationship between productivity and output by saying that the expansion of output permits the introduction of more `roundaboutness' in the production process, which leads to a further division of labour and to a higher labour productivity because there are internal and external economies to be gained with the expansion of output.

Kaldor in his inaugural lecture (1966) first adduced the statistical relationship between the rate of growth of productivity and output earlier given by Verdoorn (see Thirlwall, 1983b). According to him, the faster the rate of growth of manufacturing output, the faster will be the rate of growth of labour productivity in manufacturing owing to static and dynamic returns to scale (Kaldor, 1966). Static returns are related to the size and the scale of production units which are a characteristic largely of the manufacturing sector (See Thirlwall,1983b). Dynamic economies refer to increasing returns brought about by "induced" technical progress, learning by doing, external economies in production and so on (see Thirlwall, 1983b, p. 350).

A number of empirical estimates have supported Verdoorn's Law by finding a high correlation between output and labour productivity (both in static and dynamic forms) for a number of countries (See Choi, 1983, p.157, Goldar, 1986, p.135, and Katz, 1969. p.114).

The interpretation of the statistical relationship between productivity and output given by Verdoorn (1956) rules out an alternative line of causation from fast productivity growth to fast output growth. This requires faster productivity growth to cause demand to expand through relative price changes. In this view, all productivity growth is autonomous. However, Kaldor (1966) argues that if this were so, it would be difficult to explain large differences in productivity growth in the same industry over the same period in different countries. Reverse causation also ignores the existence of dynamic scale economies and increasing returns to scale (Thirlwall, 1983b). On the basis of Kaldor's arguments (1966) we use Verdoorn's type of relationship because we think that differences in labour productivity in different industries in Pakistan may be partly due to the existence of scale economies. One can analyse the degree of increasing returns to scale through estimating Verdoorns' type of relationship between output and productivity. Hence, we assume that it is the level of output that determines the average productivity of labour rather than the other way round. Nevertheless, the more realistic approach is that there may be interaction processes at work through cost and price changes thus requiring simultaneous equation estimation for Verdoorn's coefficient (Kaldor, 1966).

6.3.3 Wages, Output, and Productivity

Wages, output, and productivity are interrelated. With any increase in output, the demand for labour may increase which in turn may affect wages depending on the labour supply situation. If labour supply is abundant there may not be any effect on wages. However, if the supply of labour, say skilled labour (in the case of developing countries), is limited, wages may rise. Now with any rise in wages, entrepreneurs may be induced to substitute capital for labour depending upon substitution possibilities between capital and labour. Employment may rise, stay constant, or fall depending on the extent of the capital-labour substitution. Similarly if the rise in wages is due to government wage policy, a similar substitution effect will take place depending upon the magnitude of the elasticity of substitution. The link between wages, output, and employment depends on the elasticity of the wage rate with respect to output and with respect to labour supply on the one hand and the elasticity of labour demand with respect to output on the other hand.

To understand the relationship among different variables we first derive some relations from equation 6.9 (see Appendix to Chapter 6 for derivation of these relations) as follow:

$$c = (1-\sigma)(v-1)/v \quad \text{or}$$

$$c = 1 - \delta L/\delta Y . Y/L = 1 - E_{YL}$$

$$c/\sigma = \delta \log w/\delta \log Y = \delta w/\delta Y . Y/W = E_{YW}$$

$$E_{YW} = (\delta L/\delta Y . Y/L) \; / \; (\delta L/\delta W . W/L) = E_{YL}/E_{WL}$$

and

$$\sigma = 1 - E_{YL}/E_{YW} \ldots . \qquad (6.11)$$

where E_{YL} = output elasticity of labour demand, E_{YW} = output elasticity of wage rate, and E_{WL} = wage elasticity of labour supply.

The "**optimistic view**" reflects the opinion of those who consider that there is a high degree of substitutability between capital and labour with respect to relative factor prices. This view in fact reflects the development of the economy in a dual system when output in the modern sector can be expanded by utilising the unlimited supply of labour in developing countries

(Lewis, 1954). The elasticity of substitution under this view in its extreme form can be explained by giving the following conditions to equation (6.11):

$$\text{if} \quad 0 < E_{YL} < 1 \text{ and } E_{YW} \rightarrow 0. \text{ then } \sigma \rightarrow \infty.$$

It is normally expected that manufacturing employment grows somewhat less rapidly than manufacturing output because of the general trend of capital deepening and technological progress which in turn implies that the output elasticity of demand for labour (E_{YL}) is less than unity. E_{YW} approaches zero (because of unlimited supply of labour) and the σ approaches to infinity. This case however is very extreme and may not be close to reality.

The other extreme is the **"technological determinists" or the "pessimistic" view** which is envisaged by Marx and analysed fully by Leontief (see Godfrey, 1986; and Colman and Nixon, 1986, for useful discussion on these development theories). Here there is no possibility of substitution between capital and labour with respect to relative factor prices (see chapter 3 for details). The view can be expressed as:

$$\text{if } 0 < E_{YL} < 1 \text{ and } E_{YW} \rightarrow \infty, \text{ then } \sigma \rightarrow 0.$$

Since E_{YW} approaches infinity because E_{WL} is near to zero (perfectly inelastic labour supply), the elasticity of substitution approaches zero. This is the situation where there is full employment, or in LDCs, it may be the shortage of skilled labour. This is the Leontief type relationship as earlier mentioned where it is assumed that any increase in output may require the more use of capital and labour. It was Eckaus (1955) who first avocated the hypothesis that industrial processes have fixed factor proportions and therefore result in disparity between the capital-labour requirements of modern industrial production and the factor endowments of the developing economies.

Between these two extremes, there is a view that if output elasticity of labour demand is less than unity but greater than zero (i.e $0 < EYL < 1$), or output elasticity of wage rate is not equal to zero ($EYW \neq 0$), and $EYL + EYW > 1$, then $\sigma < 1$. Similarly $EYL + EYW < 1$, then $\sigma > 1$ and $EYL + EYW = 1$ then $\sigma = 1$. Since $EYL + EYW = (g_L + g_W)/g_Y$ (g representing growth rate), the above condition can be rewritten as: if g_K-$g_L \leq g_W$,[8] then σ is ≤ 1. This implies that the elasticity of substitution is larger than (equal to or less than) unity if the growth rate of capital-labour ratio is larger than (equal to or less than) unity. If there is perfect substitutability between capital and labour and there is no constraint on labour supply (may be skilled labour), wage policy (restraining g_W) can stimulate substitution of labour for capital. However, it may be possible that the elasticity of substitution is high but the supply of skilled labour (if it is required) is inelastic. In this case, wage policy may not have any effect on factor proportions.

6.3.4 Methodology, Data and Variables

We estimate the elasticity of substitution between capital and labour for the large-scale manufacturing sector as a whole and then at the inter-industry level by using two specifications of the model which may be written as below:

$$\log Y/L = a + \sigma \log w + u \qquad (6.8) \quad \text{Model 1}$$

$$\log Y/L = a + \sigma \log w + c \log V + u \qquad (6.9) \quad \text{Model 2}$$

We have fitted the above mentioned two different specification of the CES function (equations 6.8 and 6.9) to the data on 144 five digit industries according to the Pakistan Industrial Standard Classification (PISC) and estimated the elasticity of substitution. Later we have grouped industries into three broad categories according to end use viz; consumer goods, intermediate goods and capital goods industries and estimated the elasticity of substitution among them. Later, we grouped the data of 144 industries into 26 industries at the 3 digit level and then again regrouped at the 2 digit level and estimated the elasticity of substitution among 9 industries. The choice of 9 industries is based on their importance in terms of value added on the one hand and on the availability of a reasonable number of observations on the other hand. Inter-industry analysis is based on the assumption that considerable differences among industries in respect of wages and productivity exist. The estimation procedure is summed up as follows:

(a) Aggregate estimates of 144 industries at five digit level.

(b) Disaggregate estimates of three broad categories of industries.

(c) Inter-industry estimates at two digit level.

Time-series data is available but insufficient to give good results. Moreover, there are many problems in time-series estimates (which have been mentioned earlier) due to which we have confined our analysis to the cross-section estimates. The period selected is 1984-85, which is the latest period on which data is available. However, to compare the elasticity parameter over time we have also estimated equations (6.8 and 6.9) for 1977-78.

Equations 6.8 and 6.9 have also been estimated with intercept dummy variables to estimate inter-industry differences in efficiency while maintaining the assumption of uniform slope.

The main source of data is the CMI which is the comprehensive and systematic record for the manufacturing sector. However, data in Pakistan like other developing countries suffer from many shortcomings. For example, to avoid taxes producers may give false information by underestimating the value of the product and overestimating the cost of production (see Kemal, 1976a for details). These difficulties should be kept in mind when deriving any conclusion based on these results. However, on the basis of our results, we would hope to be able to see whether there is any potential for labour absorption in the manufacturing sector of Pakistan or not.

The model has been estimated using the Shazam package.

The following are the definitions of the variables used in the study:-

Value-Added: Value-added is at constant factor cost of 1975-76. Value-added is deflated by the general wholesale price index. A true value-added deflator could not be used because of the non-availability of detailed information on intermediate inputs and their prices.

Employment: Employment is measured as the total number of production and non-production workers engaged in each industry. Since the CMI does not provide any information on man hours, the age/sex composition of the labour force, nor skill, no adjustments are possible in the employment variable for these factors. Failure to adjust for these factors may bias our estimates of the elasticity of substitution downwards because a high ratio of skilled labour in some industries will be associated with high productivity. Griliches (1963) and Denison (1962) proceeded to correct the inputs of capital and labour for quality changes in the case of United States. Katz (1969) however, argued that this approach is misleading. According to him it seems inappropriate to start correcting conventional measures of capital and labour, if we do not know in advance how increases in conventional total factor productivity actually were distributed between "labour augmentation" and "capital augmentation"(see Katz, 1969, p. 30). Nevertheless, it is generally recognised that a large proportion of the labour force in developing countries is unskilled and Pakistan is no exception to this.

Wage Rate: This is the average wage obtained by dividing total wages (including cash and non-cash benefits) by the number of workers. To ensure that real wages reflect employer's costs, these are deflated by the wholesale price index.

Productivity: This is simply the ratio of total value added to total numbers of workers.

6.3.5 Hypotheses

We test a number of hypotheses in our estimates. Our null hypothesis is that _ is equal to zero in the large-scale manufacturing sector of Pakistan.

Our alternative hypothesis is that the _ is different from zero and thus substitution possibilities between capital and labour with respect to relative factor prices exist.

Another hypothesis, that the size of the elasticity of substitution has increased over time reflecting the availability of indigenous technology in the manufacturing sector, will also be tested. For this purpose a comparison of the magnitude of the elasticity of substitution between two time periods; 1977-78 and 1984-85 will be made.

We will also test the joint significance of dummy variables on 26 industries at three digit level by introducing intercept dummies but maintaining the same slope. The constant term in our model 2 reflects the efficiency of inputs or the residual effect of quality of inputs on productivity. The efficiency of inputs at a point of time reflects skill composition, and the nature of technology. Initially it is assumed that all industries are the same on efficiency terms. But in reality, some industries may work more efficiently than others. In some industries, labour may be more skilled or there may be efficient management or the use of improved and better technology due to which efficiency of inputs may be higher. Dummy variables capture the differences in qualitative aspects of inputs. Our null hypothesis is that D = 0 if all industries are the same in efficiency terms. Our alternative hypothesis is that D $\neq$ 0 if inter-industry differentials do exist in efficiency terms.

As a rule of thumb in the interpretation of our results we assume in this study that if the magnitude of the elasticity of substitution is equal to or greater than 0.5 and significant, a substantial effect of factor prices on labour productivity and employment will take place, but if it is less than 0.5, it would indicate fixed factor proportion and rigid technology.

6.3.6 Results

We began by running simple OLS regressions using model 1 (equation 6.8) and 2 (equation 6.9) and then checking for the presence of heteroscedasticity in our models by applying different tests. The Glejser test (see Johnston, 1987), where the absolute values of the residuals are regressed on the independent variable to which the variance of the disturbance term is thought to be related confirms the presence of heteroscedasticity in first model for all industries at the 5 per cent level of significance.

The form which we have used to correct for heteroscedasticity in the first model is "dependent variable heteroscedasticity" and has been applied to cross-section studies of household expenditure by Prais and Houthakker (1955) and Theil (1971). After correcting for heteroskedasticity, the final results (Model 1) are shown in Table 6.1. However, tests for heteroscedasticity in the second model (equation 6.9) reject its presence at the 5 per cent level.

Table 6.1: Cross-Section Estimates of the Elasticity of Substitution For Pakistan's Manufacturing Sector (1984-85)

Model 1: $\log Y/L = a + \sigma \log w + u$

	a	σ	t ratio	R^2	No of Observations
All industries	**1.55**	**0.95**	**7.99***	**0.23**	**144**
Consumer Goods	6.89	0.37	2.08**	0.02	66
Intermediate Goods	-2.44	1.40	7.35*	0.59	39
Capital Goods	2.17	0.85	3.41*	0.24	39

* significant at the 1% level.
** significant at the 5% level.

Our first model (equation 6.8) gives highly significant results. For the whole manufacturing sector, the elasticity of substitution with respect to the wage rate is significantly different from zero at the 1 per cent level of significance. The sign of the coefficient coincides with our expectations. The elasticity is about unity which indicates a proportional relationship between real wage rate changes and labour productivity changes. The R^2 shows that 23 per cent of changes in labour productivity are explained by changes in real wages. The low R^2, however, shows that labour productivity changes are also explained by other unmeasured factors which cannot be considered in this specification of model.

Though our results are highly significant they are based on the assumption that a single production function exists for all industries and the same technological alternatives are available to all firms. According to Guade (1975) this would appear to be a particularly difficult condition to satisfy for a cross-section analysis of firms in less developed countries where transmission of technological change is slow, and one could expect to find different technologies being used simultaneously in the same sector. To overcome this limitation we have disaggregated industries into three groups, consumer goods, intermediate goods, and capital goods on the basis of the assumption that underlying technology may be the same within each group but different among different groups.

The elasticity of substitution in consumer goods industries is significant at the 5% level but the overall fit is not good in terms of very low R^2. The low elasticity of substitution implies that technology in consumer goods industries is not flexible and changes in real wages may not have any significant effect on employment through substitution of capital for labour. Consumer goods industries may not be responding to market signals due to imperfections in product and factor markets. It seems some other factors may be affecting labour productivity in consumer goods industries than wage increases alone.

Intermediate goods industries, however, give highly significant results. The elasticity of substitution is greater than unity (1.40) indicating a very strong effect of real wages on labour productivity. The R^2 shows that 0.59% of the changes of dependent variable are explained by the independent variables (Table 6.1).

The size of the elasticity of substitution (0.85) in capital goods is near unity. The effect of changes in real wages on labour productivity is significant and again shows substitutability between capital and labour.

The results of the second specification of model (equation 6.9) are shown in Table 6.2. The fit of the model has improved to a large extent which is shown by the rise in R^2 in all cases thus indicating that the alternative specification of the model has more explanatory power. The results show that both real wage rate changes and output changes affect labour productivity. The magnitude of the elasticity of substitution is low (0.51) in the second model compared to (0.95) in the first model. As output variable (V) is included in the second model and a part of the increase in labour productivity is now explained by the changes in output via scale effect hence, the estimates of the elasticity of substitution has fallen. Under this interpretation, the size of the elasticity shows that substitution possibilities between capital and labour due to change in relative factor prices are rather limited but the size of the elasticity is still significantly different from zero.

Table 6.2: Cross-Section Estimates of the Elasticity of Substitution For Pakistan's Manufacturing Sector (1984-85)

Model 2: $Y/L = a + \sigma \log w + c \log V + u$

INDUSTRY	a	σ	t ratio	c	t ratio	R^2
All industries	**4.98**	**0.51**	**3.06***	**0.19**	**4.53***	**0.42**
Consumer Goods	7.77	0.22	1.33	0.14	3.75*	0.21
Intermediate Goods	1.82	0.88	3.32*	0.15	2.63**	0.66
Capital Goods	6.24	0.32	1.04	0.25	2.73**	0.36

* 1% level of significance.
** 5% level of significance.
Note: number of observations are the same as shown in Table 6.1.

Value added changes have also a significant effect on the level of labour productivity. An increase in value added of 1 per cent, wages being constant, will raise labour productivity by 0.19 per cent. The t ratios show that both of these explanatory variables i.e wages and value added are significant at the 1% level of significance.

The R^2 indicates that 42 per cent of the variation of the dependent variable are explained by the independent variables. To test the overall significance of the model, F test has been conducted. The value of $F_{(3\ 144)}$ = 51.576 is significantly higher than the critical value of $F_{(3\ 144)}$ = (3.91) at the 99% level of confidence. This leads us to reject decisively the joint hypothesis of no effect from wages and value added on the productivity of labour. On the basis of these results, we may tentatively conclude that for the whole manufacturing sector, both wages and value-added have a strong effect on employment via changes in labour productivity. However, the coefficient of wages is larger than the coefficient of value added and implies a stronger effect on productivity than does value added.

The estimates of the second model show that the elasticity of substitution in different categories of industries is less than unity (Table 6.3). The elasticity of substitution is significant in the intermediate goods industries. The insignificant elasticity parameter in consumer and capital goods industries may be reflecting multicollinearity between real wages and value added. However, by looking at the correlation coefficient we have found no evidence of multicollinearity in consumer goods industries where the correlation coefficient between real wages and value added is 0.05. This means on average the scale effect is dominant in consumer goods industries and factor prices may not have any effect on labour productivity via substitution of capital for labour. In capital goods industries the correlation coefficient between real wages and value added is 0.72 which may have influenced the effect of real wage rate changes on labour productivity. The output induced effect on labour productivity is significant in all three categories of industries.

Our estimates of the elasticity of substitution are still aggregate. Some industries may be more flexible in response to changes in relative factor prices than others. Hence, we estimate the elasticity of substitution at a more disaggregate level taking 9 industries at the two digit level of industrial classification.

The inter-industry estimates of the elasticity of substitution of model 1 are shown in Table 6.3. At inter-industry level we have found no evidence of heteroscedasticity.

Our estimates for different industries (see Table 6.3) have the correct sign for the coefficients of wages and are in accord with expectations with the exception of one, viz non-metallic mineral industry. The σ is significant in 7 out of 9 industries. The value of the elasticity ranges from 0.67 (machinery) to 1.78 (textiles). In three industries the elasticity of substitution is greater than unity. These industries are textiles (1.78), chemicals, rubber and plastic (1.44) and basic metals (1.53). In the other four industries where the elasticity of substitution is significant, its magnitude is less than unity but the value is greater than 0.5 (i.e., not near to zero). These industries are paper, printing and publishing (0.77), metal products (0.92) machinery and transport (0.67), and miscellaneous industry (0.85). The value of R^2 indicates that in textiles (0.52), chemicals (0.60), basic metals (0.50), and in miscellaneous (0.54), the model has considerable explanatory power. But for the rest of industries, other unobserved variables play a major part in determining labour productivity as well as changes in real wages.

In general our estimates of the elasticity of substitution at aggregate and a disaggregated basis reflect the existence of the Cobb-Douglas production function because in most of the cases the elasticity of substitution approaches to unity.

Table 6.3: Inter-Industry Cross-Section Estimates of the Elasticity of Substitution (1984-85)

Model 1: ($\log Y/L = a + \sigma \log w + u$)

PISC	Industries	a	σ	t ratio	R^2	Observations
31	Food	5.81	0.52	1.52	0.15	24
32	Textiles	-5.77	1.78	4.22*	0.52	18
34	Paper, printing & publishing	3.01	0.77	2.99**	0.28	10
35	Chemicals, rubber & plastic	-2.75	1.44	6.97*	0.60	27
36	Non-metallic mineral products	14.70	-0.51	-1.37	0.19	10
37	Basic metals	-3.83	1.53	4.28*	0.50	5
38	Metal products	1.46	0.92	2.29**	0.21	17
	Machinery & transport[a]	3.91	0.67	1.73***	0.19	22
39	Miscellaneous	2.41	0.85	4.11*	0.54	7

a Machinery & Transport industries have been taken at the three digit level because of getting reasonable observations and are comprised of non electrical, and electrical machinery and transport industries (381, 382 and 383 respectively).
* significant at the 1 % level
** significant at the 5 % level
*** significant at the 10 % level.

In the second specification (Model 2) our inter-industry analysis shows that R^2 has improved to a considerable degree in all cases except two; food, and machinery where it remains the same (Table 6.4). The signs of the coefficients are as expected in all cases with the exception of non-metallic mineral products, basic metals, and metal product industries. No specific reason can be provided for the negative elasticity in these three industries. Some other studies however, have also reported a negative elasticities of substitution (see Katz, 1969, p.63; Kazi et al, 1976, p. 410).

Our estimates for the elasticity of substitution for 9 different industries show that there is considerable variation in the elasticity of substitution among different industries. However, with the exception of the textile industry the size of the elasticity has declined in all cases in model 2. The results show that in total 6 out of 9 industries the elasticity of substitution with respect to the real wage is significantly different from zero. In textiles, and chemicals, the elasticity is significant at the 1% level, while in food it is significant at the 10% level. The value of the elasticity ranges from as low as 0.29 in paper, printing and publishing to 1.90 in textiles. In textiles, the elasticity of substitution is greater than unity and highly significant. Malik et al(1989) in the case of Pakistan has also shown highly significant elasticity estimates greater than unity in the textile industry for different years. In all other industries, the elasticity of substitution is less than unity. The size of the elasticity is greater than 0.5 in three industries.

Out of 9 industries, 5 industries suggest a strong influence of output induced changes on labour productivity. These are paper, chemicals, basic metals, metal products, and non metallic mineral products industries. Elasticities with respect to output vary from a low of 0.13 (paper and printing) to a high of 0.49 (metal products).

Table 6.4: Inter-Indutrsy Cross-Section Estimates of the Elasticity of Substitution (1984-85)

Model 2 $Y/L = a + \sigma \log w + c \log V + u$

PSIC	Industry	a	σ	t ratio	c	t ratio	R^2
31	Food	6.96	0.49	1.81***	0.02	0.28	0.15
32	Textiles	-7.02	1.90	4.13*	0.05	0.98	0.55
34	Paper,printing & publishing	6.93	0.29	1.03	0.13	3.56*	0.60
35	Chemicals, rubber, & plastic	1.53	0.92	2.97*	0.16	2.45**	0.66
36	Non-metallic mineral products	-10.47	-0.13	-0.78	0.24	6.30*	0.85
37	Basic metals	15.75	-0.79	-8.05*	0.39	27.92*	0.99
38	Metal products	9.53	-0.08	-0.13	0.49	2.36**	0.57
	Machinery & transport[a]	3.07	0.79	2.01**	-0.06	-0.30	0.19
39	Miscellaneous	3.38	0.73	2.16**	0.07	0.36	0.55

a (see under Table 6.3).
*** significant at the 1% level.**
**** significant at the 5% level.**
***** significant at the 10% level.**

One of the interesting findings of this study is that for those industries (such as paper, metal products, and non-metallic mineral products), where the elasticity with respect to the real wage rate is not significant, changes in value added have significant explanatory power. In the case of food, textiles, chemicals, and miscellaneous the elasticity of substitution is highly significant while value added is not. Only the chemicals and basic metal industries show a significant effect of both real wages and output on labour productivity. On the whole, the alternative specification of the model, using equation 6.9 fits well with our data for a number of industries.

6.3.7 Comparison of the Elasticity of Substitution

The estimates of the elasticity of substitution for Pakistan's manufacturing sector can be best appreciated by comparing them with the similar estimates made for other developing countries. Since our estimates are cross-sectional we will only compare them with the cross-section estimates for other countries. Most empirical studies used the first form of the model, where returns to scale are assumed to be constant. So the results of the first model are compared with other studies made on the basis of the same specification at the two-digit level of industry classification. Table 6.5 summarizes the estimates of the elasticity by different economists for different developing countries. The aim of the comparison is to see whether magnitude of the elasticity of substitution in different industries in Pakistan is similar (i.e., greater than or less than unity) to the industries in other developing countries or not.

Table 6.5: Comparison of Results

	Industries	Pakistan 1984-85 (1)	Nigeria Oyelabi 1972 (2)	Korea Kim J. 1984 (3)	Philippines Sicat 1960 (4)	Argentina Katz 1954 (5)
1	Food	0.52	-	0.82	1.37	0.87
2	Textiles	1.78	1.35	1.27	0.44	-
3	Paper printing, & publishing	0.77	1.43	1.09	1.25	1.63
4	Chemical, rubber and plastic	1.44	1.60	1.61	1.09	1.01
5	Metal products	0.92	0.98	-	1.36	0.47
6	Machinery	0.67	0.81	0.82	0.87	0.68
7	Non-metallic mineral products	-0.51	-	0.97	1.35	1.20
8	Miscellaneous	0.85	-	0.47	-	-

Source: For Nigeria, Philippines, and Argentina see Guade (1975) in A. S. Bhalla ed., for Korea, see Kim (1984).

The elasticity of substitution in two industies viz; textiles, and chemical, rubber and plastic in Pakistan is comparable with Nigeria and Korea where this is also greater than unity. All countries show the similar estimates in the case of machinery industry where the magnitude of the elasticity is less than unity. In most cases the elasticity estimates in Pakistan are quite close to the estimates made for Nigeria and Korea. However, compared with other countries the elasticity estimates of Pakistan are quite different. The degree of market imperfections, differences in the structure of industries, and differences in factor endowments may be the cause of these different results. However, the analysis shows that inter-industry differentials in the elasticity parameter do exist in different countries and Pakistan is no exception to that.

6.3.8 Intercept Dummy Variables and Efficiency

In the above analysis we restricted our model and assumed that given the initial production techniques, the efficiency of each industry is the same. In reality, this may not be the case. Some industries may work more efficiently and utilise inputs in a better way and gain more in terms of higher productivity than other industries. The efficiency of inputs at a point of time may reflect the nature of technology, skill composition, and the efficient management etc. To test for inter-industry differences in efficiency, we have introduced 26 intercept dummy variables, one for each industry. Our object is to test the joint significance of these intercept dummies. We accept the null hypothesis that $\alpha 1 = \alpha 2 = \alpha 3 \ldots = \alpha 26 = 0$ if the F value is not significant with appropriate degrees of freedom. The results of the joint test for the significance of the intercept dummies are given in Appendix Tables 6.1 and 6.2 for both of these models respectively.

From Appendix Table 6.1 we can see that the joint test of dummy variables is highly significant and rejects the null hypotheses that the intercept dummies are equal to zero at the 5% level of significance. The major contribution to this overall significance is made by three industries, non-metallic mineral products (D17) fabricated metal products (D21) and machinery and transport equipment (D25). In alternative specifications, non-metallic mineral products (D17) and machinery and transport (D25) give significant results (Appendix Table 6.2). With the introduction of dummy variables the R has improved from 0.23 to 0.53 in model 1 and from 0.42 to 0.60 in model 2 (see Appendix Tables 6.1, and 6.2). The results show that given the techniques of production, some industries work more efficiently than others. Industries such as non-metallic mineral products, metal products and machinery where the dummy variables are significant may be using more skilled labour or they may be utilising improved technology. The non-metallic mineral industry seems to be highly capital-intensive in terms of high capital-labour (K1/L) ratios (see Chapter 4, Table 4.2). It may be possible that techniques of production in these industries are advanced and highly efficient. A further explanation may be differences in the efficiency of management.

6.3.9 Changes in the Elasticity Parameter Over Time

We have estimated equation 6.9 for an earlier year 1977-78 by following a similar procedure to that adopted for the year 1984-85. The aim is to compare changes in the magnitude of the elasticity in two years to see whether the choice of technique has become more rigid or flexible over time in different industries of Pakistan (Table 6.6).

Table 6.6: Changes in the Elasticity Parameter between 1977-78 and 1984-85

Model 2 $\log Y/L = a + \sigma \log w + c \log V + u$

Industry	1977-78 σ	1984-85 σ
All Industries	0.69	0.51
Consumer Goods	0.63	0.22
Intermediate Goods	0.92	0.88
Capital Goods	0.53	0.32
Food	1.09	0.49
Textiles	1.51	1.90
Paper printing & publishing	1.67	0.29
Chemicals, rubber & plastic	1.55	0.92
Non-metallic mineral products	1.51	-0.13
Basic metals	0.69	-0.79
Metal products	1.57	-0.08
Machinery & transport	1.16	0.79
Miscellaneous	1.43	0.73

Note: The figures for 1977-78 have been taken from Appendix Table 6.3.
The figures for 1984-85 have been taken from Table 6.4.

Table 6.6 shows that the size of the elasticity of substitution, with the exception of only one industry namely textiles, has fallen on an aggregate and a disaggregated basis. It implies that with the passage of time the choice of techniques has become more rigid with respect to relative factor prices in the large-scale manufacturing sector of Pakistan. Consumer goods and capital goods industries on average seem to be more affected where the magnitude of the elasticity of substitution has fallen significantly in 1984-85 and has become insignificant. In fact these group of industries may have some difficulty in substituting capital for labour. We have observed that these two groups of industries on an aggregate basis do not show any strong relationship between capital-labour (K1/L) ratios and value added per employee (V/L) over a period of time (see Chapter 4, Tables 4.2 and 4.6 respectively). K1/L ratios remained almost constant while V/L ratios increased substantially during 1977-78 and 1984-85 (see Chapter 4, Tables, 4.2 and 4.6 respectively). With the rise in real wages there may be a strong attempt by management to increase labour productivity in these two groups of industries. It may also be possible that with the rise in real wages, more output may be produced by utilising the existing stock of capital rather than increasing the physical capital intensity. This has also been confirmed by the analysis of capital-value added (K1/V) ratios in consumer and capital goods industries (see Chapter 4). These ratios have declined between 1977-78 and 1984-85 reflecting the possibility of increased utilisation of the existing stock of capital (see Chapter 4, Table 4.4). As the analysis is quite aggregated, no precise conclusion can be made on the basis of these estimates. Inter-industry analysis of the elasticity estimates shows that in some industries, substantial substitution possibilities do exist. For example, in the case of the food, textiles, miscellaneous and machinery and transport industries the size of the elasticity of substitution is positive and significant.

In the case of the intermediate group of industries however, substitution possibilities are quite high and there may be a strong effect of real wage rate changes on labour productivity via substitution of capital for labour.

On the basis of these results we may reject the null hypothesis that the elasticity of substitution has increased over time reflecting the development of more indigenous technology in Pakistan.

6.3.10 Returns to Scale

As earlier mentioned the coefficient of V is defined as:

$$c = \frac{(1-\sigma)(v-1)}{v}$$

Once the values of σ and c are known through the estimation of model 2 (equation 6.9), one can easily derive the returns to scale (v) parameter.

Our estimates of returns to scale show that the manufacturing sector of Pakistan is enjoying increasing returns to scale (Table 6.7). All three groups of industries are also indicating the presence of increasing returns to scale. However, at the industry level, considerable differences with respect to returns to scale exist. For example, only 5 out of 9 industries are showing increasing returns to scale. Three industries, food, chemicals, and textiles seem to have constant returns to scale where the v parameter is almost equal to unity, while in machinery and transport equipment industry there are decreasing returns to scale where the value of v is less than unity.

We may apply the results of increasing returns to scale (Table 6.7) to the estimated results of model 2 (Table 6.4) for the validity of the latter. For example, four industries (food, textiles, machinery and transport, and miscellaneous) in our model 2 show no effect of output changes on labour productivity. With the exception of miscellaneous industries all other industries are either showing constant or decreasing returns to scale (Table 6.7) which in turns means either no effect or a negative effect on labour productivity of changes in output respectively. Similarly as all other industries are showing significant effects of output changes on labour productivity (Table 6.4), these are also showing increasing returns to scale due to which output increases more than proportionately to the increase in inputs.

Economies of scale at a point of time reflect the scale of output. Large-scale industries may be enjoying internal and external economies to scale. These industries may be getting cheaper raw materials or may have easy access to credit compared to other firms. However, one of the explanations of the apparent existence of economies of scale is the presence of underutilised capacity. As Guade (1975) pointed out, the existence of idle capacity tends to give results showing increasing returns to scale in cross-section estimates (p.40). In this context any increase in output is obtained by utilising existing capacity. In other words, output growth can occur with little or minimal change in labour input; and productivity will grow despite the absence of any capital deepening. We think that the increasing returns to scale in the manufacturing sector of Pakistan may not be reflecting the true scale effect as was earlier supposed by Ahmed (1975, 1982). The most likely case is that industries in Pakistan may be suffering from the problem of underutilised capacity. A number of studies in Pakistan have shown that capital stock remains idle for most of the time.[8] Hence it may be possible that industries reflecting increasing returns to scale may instead have excess capacity which in turn may be due to development of new firms which take some time to utilise their existing capacity, or it may be either due to the lack of effective demand for product or due to the lack of certain other inputs which may hinder any further increase in output.

The increasing returns to scale in industries shows that employment is also affected without any change in relative factor prices. However, if underutilisation of capacity is the main reason for increasing returns to scale, then by increasing utilisation of idle capacity, employment may be increased. The best solution may be to analyse the magnitude of underutilised capacity if it is the major factor reflecting increasing returns to scale (this will be discussed in next Chapter).

Table 6.7: Returns to Scale at an Industry Level

	Industries	Pakistan v	India[1] v
	All industries	**1.63**	**-**
	Consumer Good	1.22	-
	Intermediate	3.14	-
	Capital Goods	1.48	-
1	Food	1.04	1.50
2	Textiles	0.95	1.45
3	Paper, Printing & Publishing	1.22	1.12
4	Chemicals,Rubber & Plastic	1.00	1.18
5	Non Metallic Mineral Products	1.27	1.25
6	Basic Metals		-
7	Metal Products	1.83	1.60
8	Machinery and equipment	0.78	1.45
9	Miscellaneous	1.35	1.45

1 Figures of India have been taken from Diwan and Gujarati (1968).

6.3.11 Limitations of the Analysis

Our statistical analysis is limited by a number of factors related to the theoretical and estimation problems of the production function. The production function analysis is based on very stringent assumptions. For example, it is assumed that there is perfect competition in both factor and product markets. This may not be a very genuine assumption in the case of Pakistan. But data scarcity does not allow us to include the elements of imperfect markets in the model as was introduced by Katz (1969). Our estimates of the elasticity then may be biased upwards and necessitate qualification of the results.

The data are assumed to represent points on the production frontier, which may not be a realistic assumption. It would have been useful to measure elasticity along the length of the technological production frontier, which is probably relevant to near-future investment decisions.

Ahmed (1982) while criticising earlier substitution elasticity estimates by Kemal (1981) (which covered the period of 1960-1970 in Pakistan) goes to the extreme by saying that production functions may exist in developed countries but are not very relevant in developing countries because in the latter development is a process of disequilibrium (see Ahmed, 1982). We may say that such kind of criticism was made in perspective of the development strategy of Pakistan in the 1960s when a deliberate disequilibrium was created in order to develop the industrial sector (see Lewis, 1969, Papanek, 1967). However, since 1972 the government policy of Pakistan has shifted towards equity and social justice and efforts have been made to liberalise the economy (see Chapter 5, see also Noman, 1988). Hence, we may say that the use of production functions in 1984 may not be unrealistic to express the technological features of industries. Only it may be better said that production function analysis ignores many other aspects related to the choice of techniques of production such as returns to scale, non-neutral technological progress, etc. We think its limitations are as binding in developing countries as in developed countries.

If we allow non-constant returns to scale in the model, the assumption of equality of the wage rate and the marginal product of labour is very likely to be invalid. Increasing returns to scale are therefore compatible with a profit maximisation model only if there are imperfections in product or factor markets.

Another limitation of our analysis is that variables are not adjusted for underutilisation of capacity because of the non-availability of information on this factor.

There are many other factors which may increase labour productivity irrespective of capital deepening which have not been taken into account. For example, the role of efficient management, and skilled labour, etc. The data on these factors is sparse and may bias our elasticity estimates downwards.

Certain problems relating to data also place a limitation on the analysis. The estimates are highly sensitive to the kind of data and to the level of aggregation used. The estimates made on a highly aggregated basis give very different results from the estimates made on a disaggregated basis.

6.4 Implications of the Results

The implication of results should be highly qualified by limitations of the model and data. However, these statistical results help in giving some crude idea about the features of ruling technology in the manufacturing sector of Pakistan and employment potential in industries. From our final results (equation 6.9), we may say that relative factor prices and the scale effect may be important factors determining the choice of techniques in Pakistan. The elasticity of substitution for all industries on an aggregated as well as on a disaggregated basis is not zero or near to zero as was supposed by the earlier development economists (see Eckaus, 1955). The results support our contention that substitution possibilities between capital and labour with respect to relative factor prices exist and employment can be increased by changing relative factor prices. Our results also indicate that if the government of Pakistan has artificially raised wage costs then it is partly responsible for reducing employment in the manufacturing sector.

The size of the elasticity is very high and significant in the textile industry which in turn indicates high flexibility in this sector with respect to relative factor prices. The textile industry holds a dominant position in terms of value-added and employment in Pakistan (see Table 4.9 in Chapter 4). Any rise in real wages may hamper employment opportunities substantially in this industry. Other industries such as chemicals, machinery and transport, and miscellaneous are also showing substantial effect of real wage rate changes on employment via substitution of capital for labour.

The low elasticity of substitution in the overall manufacturing sector indicates that mere removal of factor price distortions may not be sufficient to switch over from capital-intensive to labour-intensive techniques of production. Other measures may also deserve serious consideration. For example, there may be non-information on available alternative techniques of production due to lack of efficient management in different industries. This has also been reported by the Planning Commission (1987) who states that there is poor quality of information available on costs and benefits of alternative technologies in the industrial sector of Pakistan. At the same time Pakistan's industrial sector requires to develop its indigenous techniques of production.

Even if relative factor prices play a significant role in affecting techniques of production there are some other aspects which should be taken into account. For example, if demand for skilled labour increases with the change in relative factor prices, what are the possibilities of increasing its supply in the economy? If there is already a shortage of skilled labour which is very likely the case in less developed countries, then a change in relative factor prices would be of little use for employment generation unless due emphasis is given to the provision of training facilities to the labourers.

Moreover there are many other factors which affect employment generation irrespective of relative factor prices. For example, technological progress, and increasing returns to scale increase the level of output without having much impact on employment. At a point of time increasing returns to scale may indicate the existence of idle capacity. The question is, why are these economies of scale not reaped by increasing the level of output? In this regard there may be two possibilities. One is that demand may be deficient due to which output cannot be increased. The second is that the increase in output and more utilisation of idle capacity may not be possible mainly due to supply constraints in the economy (which will be discussed in the next chapter).

The empirical observations of increasing returns to scale should be qualified by the omitted variables such as managerial skill, and differences in the quality of entrepreneurship etc. However, the problems of defining and measuring management means that its inclusion as a separate factor of production is not possible.

From this analysis we might tentatively argue that the role of relative factor prices may not be rejected fully but at the same time Pakistan needs to develop its indigenous technology. The development of capital goods industries may play a strategic role in providing indigenous technology more suitable to domestic factor endowments. Moreover, increased expenditure on R & D may be helpful in searching for more alternative techniques of production (see Clark, 1985 for the role of R & D). Similarly the output induced effect on labour productivity reflects the importance of the development of small scale industries. We think that it may be useful to facilitate the development of small scale industries but, at the same time, exploitation of the increasing returns to scale in particular industries may be useful for the growth of the industrial sector.

To correct factor price distortions, two policy suggestions are usually given. One is related to lowering the cost of labour. The other is raising the cost of capital to its scarcity price. As regards the first suggestion the variation in wages has a two-sided role in industrial capitalisation. Higher wages mean more costs to the entrepreneurs but at the same time by providing more purchasing power to the workers, demand is stimulated. In its contradictory role the effect of changes in wage rates on employment and output becomes ambiguous and complex.[9]

Ideally it may be said that wages should reflect the scarcity price of labour. But in reality questions and issues may arise in formulating any wage policy. In developing countries political and social factors are considered in fixing and providing cash and non-cash benefits to the labourers. For example, in Pakistan the increase in wages since 1969 was mostly due to political and social factors (see Chapter 5). Similarly, in 1972 many fringe benefits to labourers were given mainly because of political reasons (see Noman, 1988). In any case the objective of providing sufficient employment opportunities in the manufacturing sector may not be realised in practice, if substantial increase in real wages continue to take place in a labour surplus economy like Pakistan. Rather a long run policy framework is required to appraise different aspects of real wage increases and its effect on technology choice, demand for the product, and employment in the economy.

The second policy suggestion is to raise the price of capital which is kept artificially low through different policy measures. If a large part of capital comes from abroad then maintaining the exchange rate in its equilibrium position with no tax or subsidies on capital will ensure the scarcity price of capital. However, other considerations are required here. For example, any increase in the cost of capital may hamper investment which in turn will lower output and employment. We may suggest that the solution is not as easy as it may be suggested by the simple neoclassical production function framework.

6.5 Conclusion

We have tested certain hypotheses in this Chapter while estimating the elasticity of substitution. We accept the alternative hypothesis that relative factor prices can play an important part in changing techniques of production and can increase output and employment in the manufacturing sector. When the elasticities of substitution of capital for labour are sufficiently different from zero, shifting from capital intensive to labour intensive production methods are possible without any loss of output. However, certain qualifications are required before reaching any conclusion because many other factors also affect labour productivity other than substitution of capital for labour.

The magnitude of the elasticity is less than unity in all industry estimates but varies in inter-industry estimates. Industries such as chemicals, machinery, and miscellaneous show a substantial effect of the real wage rate changes on labour productivity. In the textile industry, the high elasticity estimates indicate a great potential for output and employment growth via changing relative factor prices. A fall in the magnitude of the elasticity of substitution over a period of time shows that techniques of production have become more rigid. This may be explained by the use of more imported technology, the lack of efficient management, or the bias of technological progress towards labour-saving techniques.

The general conclusion which can be deduced from this analysis is that the elasticity of substitution between capital and labour for the whole manufacturing sector is significantly different from zero. In most cases $0 < \sigma < 1$.

We reject the null hypothesis of an Eckaus type relationship that the $\sigma = 0$. However, all the increase in labour productivity may not be attributed to substitution of capital for labour. There are many other factors affecting labour productivity and employment. For example, the scale factor may also be important in determining choice of techniques in Pakistan.

The removal of factor price distortions is helpful in lowering capital intensity in the manufacturing sector. But the mere removal of factor price distortions will not be sufficient to bring about a drastic change in moving away from capital intensive to labour intensive techniques of production unless other measures are also taken.

In the real world, all the stringent assumptions of neoclassical theory of production may be violated. The existence of underutilised capacity, economies of scale and the nature of technology all affect employment. Relative factor prices are one among all other factors affecting techniques of production and are not the sole factor responsible for changing techniques of production.

We can tentatively conclude that given the positive elasticity of substitution, employment opportunities in the large-scale manufacturing sector can be increased but the role of relative factor prices may not be strong if other measures such as to develop indigenous technology, to train labourers and to exploit the economies of scale are ignored.

Notes and References to Chapter 6

1 The number of such studies is so large that it is impossible to list all of them. However, for the reference of these studies see Bhalla, (1975), White, (1978). See also Fisher (1983) for theoretical and empirical development of production function.

2 Much of this discussion has been taken from Fitchett, (1976), Layard and Walters, (1987).

3 For diagrammatical expression of the engineering production function see Clark, (1985, p.82) and Layard and Walters, (1987, p. 289)

4 The variable elasticity of substitution (VES) production function allows the elasticity of substitution to vary with changes in capital-labour ratios and has been developed by Hildebrand and Liu (1965), Lu, and Fletcher (1968) and Sato and Hoffman (1968), etc.

5 The presence of increasing returns to scale is not compatible with the assumptions of perfect competition and profit maximisation since this would lead to factor payments being greater than total product. This is a limitation of the specification of the function.

6 Neutral technical progress does not affect capital-labour ratios, the same level of output however can be produced with less inputs or more output can be produced with given inputs, see for further explanation, Clark, (1985), Layard and Walters, (1987).

7 The neoclassical view expressed in equation 6.8 in the text is based on partial framework and it is implicitly assumed that gk = gy and gr=0 (gr representing growth rate of interest). Hence, the condition can be directly derived from the definition of elasticity of substitution i.e,

$$\sigma = \frac{d(K/L)}{K/L} . \frac{d(w/r)}{w/r} = (gk - gL)/gw.$$

8 For example Winston (1971) and Hogan (1967), Kemal and Alauddin (1974), Pasha and Qureshi (1984), all pointed out that there a large part of the industrial capacity is idle in the large-scale manufacturing sector of Pakistan.

9 This view has been expressed by Bhaduri and Stephen (1990).

APPENDIX TO CHAPTER 6

Derivation of Some Relationships

The estimation form of the CES production function may be written as:

$$\log Y/L = a + \sigma \log w + c \log Y$$

where c is the output elasticity of demand for labour and may be written as:

$$c = 1 - EYL$$

while;

$$\frac{c}{\sigma} = \frac{d\log w}{d\log y} = \frac{dw}{dy}\,\frac{y}{w}$$

$$\sigma = \frac{1}{\frac{dw}{dy}\,\frac{y}{w}}\; c$$

$$\sigma = \frac{1}{\frac{dw}{dy}\,\frac{y}{w}}\; 1-EYL$$

$$\sigma = \frac{1-EYL}{EYW}$$

Appendix Table 6.1: Joint Significance of Intercept Dummies
Model 1: (Log Y/L = a + blogw + u)

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO	
LWAGES	0.75910	0.12255	6.1943	
D1	0.41225E-01	0.26625E-01	1.5483	
D2	0.55289E-01	0.48734E-01	1.1345	
D3	0.84568E-02	0.62584E-01	0.13513	
D4	0.18933E-01	0.27730E-01	0.68278	R^2 = 0.53
D5	0.46206E-01	0.48383E-01	0.95500	$\bar{R}$ = 0.42
D6	0.76106E-02	0.62679E-01	0.12142	F(27 144)=
D7	0.27836E-01	0.64153E-01	0.43390	6.068
D8	-0.14121E-02	0.36936E-01	-0.38231E-01	
D9	-0.25744E-02	0.37054E-01	-0.69475E-01	
D10	-0.27338E-01	0.32720E-01	-0.83552	
D11	0.51098E-01	0.48778E-01	1.0476	
D12	0.54896E-01	0.32131E-01	1.7085	
D13	0.65764E-01	0.33557E-01	1.9598	
D14	0.66062E-01	0.65344E-01	1.0110	
D15	-0.81779E-02	0.32920E-01	-0.24842	
D16	0.22903E-01	0.47648E-01	0.48067	
D17	-0.14835	0.38823E-01	-3.8211 *	
D18	-0.82269E-02	0.46667E-01	-0.17629	
D19	0.22092E-01	0.34988E-01	0.63143	
D20	0.50670E-01	0.42125E-01	1.2028	
D21	-0.89982E-01	0.44111E-01	-2.0399 **	
D22	-0.28224E-01	0.26290E-01	-1.0736	
D23	-0.57811E-02	0.31700E-01	-0.18237	
D24	0.24263E-01	0.30771E-01	0.78850	
D25	-0.65695E-01	0.32030E-01	-2.0511 **	
CONSTANT	3.2100	1.0396	3.0877	
ALPHA	0.52094E-01	0.30780E-02	16.9250	

* Significant at the 1 % level
** Significant at the 5 % level

Appendix Table 6.2: Joint Significance of Intercept Dummies
Model 2: (LogY/L = a + blogw + clogv + u)

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 116 DF	
LWAGES	0.52433	0.14103	3.7179	
LVA	0.14470	0.34415E-01	4.2045	
D1	0.16485E-01	0.28513E-01	0.57816	
D2	0.13883E-01	0.49574E-01	0.28004	
D3	-0.45870E-01	0.65713E-01	-0.69803	
D4	-0.19853E-01	0.30603E-01	-0.64873	
D5	0.22882E-01	0.49539E-01	0.46190	
D6	-0.11562E-01	0.65494E-01	-0.17654	R^2 = 0.60
D7	-0.45531E-01	0.69612E-01	-0.65407	$\bar{R}$ = 0.50
D8	-0.60342E-02	0.38716E-01	-0.15586	F(28 144)
D9	-0.22402E-01	0.39000E-01	-0.57440	= 7.549
D10	-0.35139E-01	0.34745E-01	-1.0114	
D11	0.72608E-02	0.49589E-01	0.14642	
D12	0.32200E-01	0.33202E-01	0.96984	
D13	0.48644E-01	0.34244E-01	1.4205	
D14	0.39337E-01	0.64449E-01	0.61036	
D15	-0.17535E-01	0.34759E-01	-0.50449	
D16	0.45190E-02	0.49661E-01	0.90996E-01	
D17	-0.11796	0.44409E-01	-2.6562 *	
D18	-0.35038E-01	0.49256E-01	-0.71135	
D19	-0.28828E-02	0.36856E-01	-0.78217E-01	
D20	-0.84550E-02	0.44474E-01	-0.19011	
D21	-0.75248E-01	0.50147E-01	-1.5005	
D22	-0.36485E-01	0.28224E-01	-1.2927	
D23	-0.33176E-01	0.34114E-01	-0.97251	
D24	-0.28990E-02	0.32589E-01	-0.88956E-01	
D25	-0.10093	0.35224E-01	-2.8655 *	
CONSTANT	5.0673	1.1860	4.2724	

* Significant at the 5 % level.

Appendix Table 6.3: Estimates of the Elasticity of Substitution in 1977-78
Model 2: (log Y/L = a + σlogw + clogV + u)

Industry	a	σlogw	clogV	R^2
All Industries	3.25	0.69	0.22	0.51
	(3.60)	(6.54)*	(7.13)*	
Consumer Goods	3.78	0.63	0.23	0.43
	(2.72)	(3.86)*	(5.27)*	
Intermediate Goods	1.45	0.92	0.19	0.65
	(0.62)	(3.28)*	(3.14)*	
Capital Goods	4.44	0.53	0.24	0.52
	(3.16)	(3.18)*	(3.48)*	
Food	0.06	1.09	0.24	0.67
	(0.02)	(3.13)*	(3.81)*	
Textiles	-3.43	1.51	0.12	0.76
	-(1.23)	(4.60)*	(1.84)	
Paper, printing, & publishing	-4.72	1.67	0.09	0.64
	-(0.89)	(2.69)**	(0.67)	
Chemicals, rubber & plastic	- 3.83	1.55	0.14	0.57
	-(1.23)	(4.36)*	(2.25)**	
Non-metallic mineral products	-3.06	1.51	0.05	0.64
	-(0.64)	(2.71)**	(0.44)	
Basic metals	3.67	0.69	0.18	0.75
	(0.65)	(1.04)	(1.55)	
Metal products	-3.82	1.57	0.09	0.76
	-(1.38)	(4.81)*	(1.19)	
Machinery & Transport	-0.51	1.16	0.20	0.63
	-(0.17)	(3.37)*	(2.83)**	
Miscellaneous	-2.45	1.43	0.09	0.65
	-(0.37)	(1.86)***	(0.64)	

* significant at the 1% level
** significant at the 5% level.

CHAPTER 7

CAPACITY UTILISATION IN PAKISTAN'S MANUFACTURING SECTOR: AN EMPIRICAL ANALYSIS

7.I Introduction

Another important factor mentioned in the economic literature which affects industrial output and employment along with relative factor prices in developing countries is underutilisation of the existing capital stock (see Chapter 3 for theoretical discussion). Maximum utilisation of the stock of capital may not only reduce capital intensity but should increase output and employment because there is a positive relationship between output, employment and capital utilisation (see Chapter 3).

Our empirical analysis in the previous Chapter has shown that ex ante substitution possibilities between capital and labour are not zero and changes in relative factor prices can play an important role in determining the techniques of production. However, we have also noted that mere removal of factor price distortions may not be sufficient to provide ample employment opportunities in the large-scale manufacturing sector of Pakistan unless other measures are also taken. Hence, utilisation of the existing stock of capital is another factor that could conceivably play a significant role in generating more output and employment in Pakistan. Moreover, our statistical results have also shown the presence of economies of scale in most industries but as indicated in Chapter 6, this may reflect either the true scale effect or merely indicate the existence of underutilised capacity. In either of the cases it may be useful to analyse the possibilities of increasing output and employment and exploiting the economies of scale through increased utilisation of the existing stock of capital in Pakistan. Sometimes the impact of increasing the rate of capacity utilisation on employment may not be felt immediately, as the same workers may work overtime. However, in the long-run there may be positive impact on employment via the income distribution effect.

This chapter is concerned with the quantification of the rate of capacity utilisation and its major determinants in the large-scale manufacturing sector of Pakistan. We assume that initially equipment has been purchased and is operational, and there is the possibility of increasing the rate of capacity utilisation by increasing total number of working hours. In this perspective the main objectives of the chapter are:-

- To estimate the nature and extent of capacity utilisation in Pakistan industries.
- To list factors which are likely to affect capacity utilisation in Pakistan industries.
- To test empirically some of the hypotheses on capacity utilisation, such as dependence on imported raw-material, the structure of market, exports etc. In addition, we have generated a few of our own hypotheses relevant to Pakistan industries.
- To suggest some policy measures on the basis of analysis.

7.2 Nature and Extent of Capacity Utilisation in Pakistan's Manufacturing Sector

There are many ways to measure the rate of capacity utilisation (see Chapter 3, section 3.10.2 for details). Lim (1976) however, recommends a time measure, Ut, as a more reliable measure of capacity utilisation. In this method, the rate of capacity utilisation is expressed as the ratio of actual number of working hours of a plant to total number of working hours available in a year. This method is equivalent to the engineering concept of capacity utilisation (see chapter 3). The technique has one drawback in it that does not make any allowance for maintenance and repair of plants and machinery. As earlier mentioned in Chapter 3, a refinement to the Ut measure is the inclusion of an intensity measure Uit, which takes into account the intensity of the operation of the plant. For example, if the entrepreneur intends to run the plant at 100% of Ut, there would not be any difference between the Ut and Uit measures. However, if the entrepreneur's intention is to run the plant by only 50% Ut would be adjusted downward by half (see Chapter 3).

As no substantial difference in the rates of capacity utilisation based on Ut and Uit measures has been found by Lim (1976), Ut is still said to be a good approximation of capacity utilisation (see Chapter 3 for details). We have used the time measure Ut for estimating the rate of capacity utilisation in Pakistan's manufacturing sector by making an allowance for the maintenance and repair of plant and machinery. This technique has been selected mainly because of its simplicity. Many other economists such as Kemal and Alauddin (1974), Winston (1971) have also used this method in their analysis of capacity utilisation. This method can be simply written as:

$$Ut = \frac{DW.HW.SW}{DA.HA.SA}$$

where;

DW = Actual days worked per year by the firm
HW = Actual hours worked per shift by the firm
SW = Actual number of shifts operated by the firm
DA = Potential days available per year
HA = Potential hours per shift assumed
SA = Potential number of shifts per day

For the POTENTIAL values in denominator we have assumed total number of potential working days per year 300; number of potential working hours in each shift 8; and finally the maximum shift coefficient/number of shifts per day 3. An allowance of 65 days per year has been made for the maintenance of plant and machinery. Thus, the maximum capacity utilisation from our point of view is the level of output which firms achieve if they were working at 7200 total hours per year. In other words, capacity utilisation can be expressed as:-

$$Ut = \frac{DW.\ HW.\ SW}{300.\ 8\ .\ 3}$$

In the above formulation, variables that affect the rate of capacity utilisation are the number of days worked per year, hours worked per shift, and the number of shifts per day. The assumption of 3 shifts may not be realised in practice for many types of industries. For some industries such as chemicals, cement, minerals processing, and fertilisers which are continuous process industries, the assumption of three shifts may hold true. However, there are non-continuous process or batch making industries. Generally these industries produce several types of products in batches, operating generally in only one shift. However, some units may produce one type of product in several sizes in one or two shifts, and, a very small number operate three shifts. As the above formula is a theoretical measure of a plant's maximum capability, by definition, the capacity measure would be uniform for both continuous and non-continuous or batch process industries. According to Winston (1971) there is a wide variety in the number of shifts a firm considers normal, and therefore the level of operation it reports to any data-collecting agency as "full utilisation" of capacity (p. 41). Hence, it makes sense to accept self-imposed, subjective standards of full utilisation and ask whether performance measures up to them (Winston 1971, p.42). It is quite possible that the standard maximum working hours may conflict with the entrepreneurial standards of correct capital use. However, owing to the scarcity of capital in developing countries, the firm's idea of full utilisation of capital is generally disregarded and it is assumed that utilisation of the existing stock of capital through increasing total number of working hours/shift work is possible and relatively costless (see Winston, 1971 for theoretical discussion).

We have estimated capacity utilisation in the large-scale manufacturing sector of Pakistan for 68 industries at the five digit industrial classification according to the Pakistan Standard Industrial Classification (PSIC) for 1984-85. In this respect the selection of industries is quite disaggregated. These industries account for 82 per cent of total value added of the large-scale industries. The source of data is the Census of Manufacturing Industries (CMI) for the respective year. The quality of data is always a problem in developing countries, increasing the likelihood of measurement error in regression analysis and Pakistan is no exception to this (see Chapters 4, and 6).

The criteria for selecting industries is based on total demand for the product of each industry. Consideration of the demand element is important because demand constraints may be a major obstacle to full utilisation of capital stock in most industries. So we have selected those industries where demand deficiency is not a binding constraint i.e. following Kemal's technique (1974)[1], we have selected those industries where exports or imports are at least 10 per cent of their total output. The implicit assumption behind this is that these firms have no shortfall of demand. But in some industries even without significant exports or imports there may not be any demand constraint. For example, we have noticed that in vegetable ghee, starch, fertilizers, and cement industries the number of working days per year are more than our assumed number (see Appendix Table 7.1). Hence these may have sufficient domestic demand without having 10 per cent of exports or imports. Another possibility is that these industries may be doing their maintenance during the day rather than having to close the factory down.

Some provision is also made for seasonal industries. For the sugar industry, because of its seasonal nature, i.e, not working full year, we have assumed 6000 as the maximum total working hours during a year.

The details of capacity utilisation pattern in 68 industries is provided in Table 7.1 which shows that capacity utilisation ranges from very low 18 to very high 113%. The average rate of capacity utilisation is 43% per annum. However, average capacity utilisation is slightly more than 60% when weighted either by the value of fixed assets or by value added. Industries where capacity utilisation is very high are vegetable ghee, starch, cotton spinning, alkalies, glass, fertilizers, and cement. Only 19 industries out of total 68 industries show capacity utilisation above average while the remaining 49 industries are working below average. The simple average rate of capacity utilisation which is 43% in our analysis is the same as estimated by Kemal and Alauddin (1974) for the period of 1967-68. However they reported the weighted average (which is weighted by the value of fixed assets) of 55% in 1967-68 which is less than our own weighted average (63%). Winston (1971), gave the simple average of 33 per cent for the period of 1965-66.

Table 7.1: Capacity Utilisation in Large-Scale Manufacturing Sector of Pakistan (1984-85)

Industries	Capacity Utilisation
1 Canning of fruits & vegetables	0.31
2 Canning of fish & sea food	0.27
3 Vegetable ghee	1.04
4 Other vegetable oils	0.56
5 Sugar	0.58
6 Feeds for animal	0.27
7 Starch	1.13
8 Salt	0.33
9 Spirits & wine & fruit products	0.35
10 Other Soft Drinks	0.29
11 Cigarettes	0.67
12 Cotton spinning	1.07
13 Woollen textiles	0.48
14 Silk and art silk textiles	0.55
15 Finishing of textiles	0.38
16 Made up textile goods	0.45
17 Carpets & rug cotton	0.18
18 Carpets & rugs Woollen	0.30
19 Spooling & thread ball making	0.39
20 Other textiles	0.41
21 Tanning & leather finishing	0.32
22 Other leather products	0.43
23 Plywood & products	0.31
24 Medicines & drugs	0.31
25 Unani & other medicines	0.30
26 Alkalies	0.99
27 Acids, salts & intermediates	0.48
28 Dyes, colours, & pigments	0.48
29 Fertilizers	1.09
30 Paints, varnishes, & lacquers	0.39
31 Perfumes & cosmetics	0.26
32 Soap & detergent	0.39
33 Matches	0.54
34 Petroleum products	0.39
35 Tyres & tubes	0.44
36 Retreading tyres & tubes	0.31
37 Rubber foot-wear	0.30
38 Glass	1.08
39 Glass products	0.54
40 Bricks & tiles	0.30

cont.

Industries	Capacity Utilisation
41 Cement	1.13
42 Cement products	0.30
43 Other non-metallic mineral products	0.31
44 Iron & steel mills	0.41
45 Iron & steel foundries basic industries	0.43
46 Re-rolling mills	0.31
47 Cutlery	0.34
48 Metal furniture	0.33
49 Wire product	0.40
50 Metals barrels & drums	0.33
51 Bolts, nuts, rivets etc.	0.33
52 Engines & turbines	0.33
53 Agricultural machinery	0.32
54 Textile machinery	0.33
55 Other industrial machinery	0.36
56 Electrical industrial machinery	0.32
57 Radio & television	0.28
58 Electrical appliances	0.27
59 Insulated wires & cables	0.39
60 Ship & boat building	0.38
61 Rail road equipment	0.34
62 Motor vehicles	0.32
63 Motor Cycles, auto rickshaws	0.33
64 Cycles & pedicabs	0.33
65 Jewellery & musical instruments	0.33
66 Toys	0.45
67 Pens & office supplies	0.28
68 Other manufacturing	0.32
Simple Average	0.43
Weighted Average (weighted by the value of fixed assets)	0.63
Weighted Average (weighted by value added)	0.62

Source: Appendix Table 7.1.

We cannot compare our results directly with these studies because the selection of industries is different. However, it is very clear that more than 50% of the industrial capacity was lying idle in 1984-85 and there are large inter-industry variations in capacity utilisation.

Capacity utilisation in more than 50 per cent of industries ranges from only 20% to 40% implying the dominance of single shift operation in the manufacturing sector of Pakistan (Table 7.2). Only 7 out of total 68 industries work at full capacity.

Table 7.2: Extent of Capacity Utilisation in Manufacturing Sector (1984-85)

Capacity Utilisation %	Number of Industries
0 - 20	1
20 - 40	45
40 - 60	14
60 - 80	1
80 -100	7
	68

The correlation coefficient between capacity utilisation and the average number of shifts in our analysis is 0.99 which is positive and is very high. This implies that any increase in the number of shifts would be a means of increasing capacity utilisation in the manufacturing sector of Pakistan.

7.3 Determinants of Capital Utilisation in Large-Scale Manufacturing Sector of Pakistan

The theoretical model on the basis of which the existence of underutilisation of capacity is explained is the marginal cost of production of firms in different shifts. If a profit maximising firm faces increasing marginal costs by increasing utilisation of its capital equipment, it will not normally use the equipment fully in the sense of feasible output from it (see Betancourt and Clague, 1975, pp. 70-71; Winston, 1974b, pp. 523-525).

A wide variety of plausible explanations of low capacity utilisation in developing countries have been provided in the economic literature (see Chapter 3). These reasons can be formed into two groups. The first group is related to the ex ante determinants of capacity utilisation, where a rational entrepreneur builds a certain amount of idle capacity as a part of his intended investment decision (see Chapter 3 for details). The second group is concerned with ex post factors where unintended or unforeseen factors force the entrepreneur to leave his existing stock of capital underutilised. Though a clear demarcation cannot be made between these two groups, our analysis is basically related to the ex post factors and is concerned with the question of why the existing stock of capital is not fully utilised in large-scale manufacturing sector of Pakistan. A brief mention however, is also made on ex ante factors determining capacity utilisation.

7.3.1 Ex-Ante Factors Responsible For Idle Stock of Capital

There are a number of ex ante factors at the time of investment responsible for underutilisation of the capital stock. These may be summarised as follows:

7.3.1.1 Factor Prices

Factor prices may play a pivotal role in determining capacity utilisation ex ante. Given the positive elasticity of substitution between capital and labour if factor prices are distorted in favour of more use of capital, capital intensity will increase and more capital stock may be installed than is actually required. Winston (1971, 1977), and Betancourt and Clague (1975) argue if the price of capital is artificially low, then over-investment will take place and much of the capital is likely to remain idle.

Winston's analysis (1974a) based on input costs, suggests that, with relatively high capital prices, ceteris paribus, capital costs will be a larger part of total costs and their reduction through higher utilisation will be more urgent (p. 1306). Expensive capital will reflect high levels of utilisation; cheap capital will result in low levels of capacity utilisation.

We have discussed in Chapter 5 a number of incentives such as the over-valued exchange rate, tax holidays, subsidized credit etc. given to industries in the 1960s which lowered the rental cost of capital in Pakistan. The cheap price of capital relative to labour may have induced businessmen to install large plants and may have encouraged them to import much more machinery and capital than was actually required to meet production needs. As profits in these industries were highly protected, entrepreneurs might have kept on installing new plants and machinery particularly if new machines incorporated new technology or lowered cost per unit of output. A similar situation may have occurred since the 1970s when industrial real wages grew rapidly (see Chapter 5). Bhatia (1979) also says that the low cost of capital permitted investors to over-capitalize their industrial units and afforded a considerable idle capacity of plant in Pakistan (p.112). After 1970, nevertheless, the policy of the government towards the provision of generous investment incentives changed. Devaluation of the domestic currency in terms of the dollar in 1972 raised the cost of capital substantially (see Chapter 5 for details). Our estimation of the rental cost of capital showed an increase in its index from Rs 60 to Rs 100 between 1977-78 and 1984-85 (see Chapter 5, Table 5.5). Moreover, many investment incentives were taken back from the investors. On the other hand, the decline in capital-output ratios over a period of time may reflect increase in utilisation of the existing stock of capital (see Chapter 4). Our estimates have shown that on average capital-value added (K1/V) ratios declined in the manufacturing sector from Rs 3.19 in 1977-78 to Rs 2.59 in 1984-85 (see Chapter 4, Table 4.4) and confirm the positive effect of increase in real cost of capital on increasing utilisation of capital. Kemal and Alauddin (1974) also pointed out that the cost of capital can play a very strong role in determining capacity utilisation in Pakistan because the higher the cost of capital, the greater may be the relative profitability of working on the second shift (see pp. 234, 235).

7.3.1.2 Government Policy

In Pakistan in the 1960s, imports were restricted through a rigid import licensing system (see Chapter 5). There were difficulties in obtaining sanctions for imports of raw materials and spare parts, and the availability of import licences was conditioned to capacity level of the plant. The firms where capacity of the plant was below that limit could not get import licences (see Islam 1970b). It led manufacturers to expand the size of plants to obtain more import licences which had a high premium because of the over-valued exchange rate (see Islam, 1970b).

Government policy may also have been responsible for the creation of excess capacity in another way. Sanctioning and the initial funding of new plant are long and costly procedures in Pakistan and takes from one to eight years on average, during which cost, price, market, and all other elements change (Planning Commission,1987). So entrepreneurs deliberately create excess capacity in the first instance, to avoid any future difficulties in getting sanctions (Planning Commission, 1987).

The role played by the money market may also affect the decision to over-build capacity. It has been pointed out that short-term working capital funds are difficult to obtain (Planning and Development Division Report, 1987). These funds are regulated and controlled by different agencies of government and a quota is set for the private and public sectors, for different types of industries. Investment funds on the other hand, for new plant or plant expansion are relatively cheap in both financial and economic terms and are easier to obtain (Planning and Development Division Report, 1987). The result is that the capacity of any given machine is not maximized because the net additions to working capital to pay the labour and buy raw-material for more hours/shifts is too difficult and too expensive to obtain (Planning and Development Division Report, 1987, p. 68). The data on sanctioned loans by one of the major financial institutions (PICIC) show that a high ratio of these sanctioned loans is given for building and expansion of new plants as compared to balancing, modernisation and replacement (BM &R) of the existing plants (Appendix Table 7.2). This may also be one of the factors of underutilisation of the existing capacity.

7.3.1.3 Some Other Factors

Hogan (1967), develops an alternative explanation for the creation of excess capacity. He argues that with the expansion of manufacturing into the more technologically complex industries the length of time to install and test plant is certain to increase. This phenomenon will contribute to the appearance of excess capacity. It will be more pronounced in those sectors where the growth rate is highest.[2] Looking at the growth rate of different categories of industries we can observe that the intermediate group of industries were showing the highest growth rate (9.8%) followed by capital goods (7.8%) and consumer goods industries (4.8%) during 1970-85 (Annex Table A-1). As government policy in Pakistan has shifted towards the development of intermediate and capital goods industries since 1972, it may take some time for these industries to utilise their existing capacity fully. We have estimated the average rate of capacity utilisation in three broad categories of industries by the end use (Table 7.3). The average rate of capacity utilisation in consumer and intermediate goods industries is the same (46%) while in capital goods industries it is 35% in 1984-85 (Table 7.3). It may be possible that development of some basic key industries will take some time to utilise the existing capacity fully. Nevertheless, the low rate of capacity utilisation in consumer goods industries show that there may be other factors affecting underutilisation of capacity in the manufacturing sector of Pakistan.

Table 7.3: Average Rate of Capacity Utilisation By The End Use in 1984-85

Industries	Average Rate
Consumer Goods	0.46
Intermediate goods	0.46
Capital goods	0.35

Source: Table 7.1.

Non-familiarity with the engineering and technical requirements of manufacturing plants may also create excess capacity. The report published by Planning and Development Division of Pakistan (1987), states that a very large percentage of entrepreneurs, traders, wealthy farmers, and business speculators and are not well versed in the more practical and technical requirements of engineering and chemical processes (p.69).

Owner-operated firms of small size may face certain problems associated with the extension of the number of shifts. These firms may have the shortage of working capital, trained labourers and limited credit facilities, etc.

There is the possibility that management may be scarce and costly at night time and may affect the rate of capacity utilisation. Unfortunately the lack of data on management costs in different shifts is not available and no precise conclusion can be made.

7.3.2 Ex Post Determinants of Capacity Utilisation

Unanticipated events and misfortunes may occur after a plant is built and may prevent the entrepreneur from utilising his stock of capital fully. These events may come both from the demand and the supply side, which are briefly discussed below.

7.3.2.1 Demand Side Factors

Demand for the product may play a very significant role in determining capacity utilisation. It is generally argued that high demand for the product allows for more capacity utilisation (Winston, 1971). It may be possible that initially a large capacity is built with the expectations that demand would be high but actual demand falls short of this thus leading to underutilised capacity. If however, utilisation is below full capacity due to weak domestic demand, exports may be increased. Winston (1971) hypothesized a positive relationship between exports and capacity utilisation as exports add to current demand for the product (p. 43). However, if there is a recession in the external market, exports may not expand depending upon the elasticity of demand for exports. Winston (1971), Kim (1982), and Islam (1978), have emphasised this aspect. Indivisibility of plant and the economies of scale also play a central role in the significantly positive correlation which some researchers Marris (1964), Winston (1971), Kemal and Alauddin (1974), Lecraw (1978), and Islam (1978), have found between average firm size and capacity utilisation. According to Marris' (1964) analysis, if the maximum permitted output is very large, and other conditions are suitable, maximum utilisation can be achieved without any difficulty. However, if output is restrained due to limited markets, the maximum permitted output will be at low levels, and the rate of capital utilisation will also be low. This may happen because of the indivisibilities of capital equipment relative to the size of the market. Demand for the product may be less than the output capacity of a single unit of equipment. Indivisibility of the equipment leaves no other alternative for the entrepreneur than to install the equipment and leave it idle for part of the time.

Winston (1971) suggested some other explanations for the positive correlation between size and utilisation. According to him, if high rates of utilisation indicate efficiency, then efficient firms would probably grow larger than inefficient firms. Large-scale production increases the division of work which may result in declining per unit costs of production by enhancing productivity per person. Lower costs in turn may encourage more utilisation of capital. The organisation theorists such as Willmore and Acheson (1974), also indicate the existence of such a positive relationship.

7.3.2.2 Supply Side Factors

There are many factors which come from the supply side like shortage of raw materials, lack of infrastructure facilities and lack of credit, etc. which may hinder more utilisation of existing capacity. Many studies have concluded that supply side factors are the major obstacles in increasing the rate of capacity utilisation in developing countries (see Afroz and Roy, 1976, Islam, 1978, Pasha and Qureshi, 1984). These factors can be summarised under 4 headings as:

Dependence on imported raw-materials: Dependence on imported raw-materials is considered one of the most important factors limiting capacity utilisation (Winston, 1971, Kemal and Alauddin, 1974). It is generally hypothesized in the literature that greater dependence on imported raw materials imposes constraints on higher capacity utilisation. This may be because of the non-availability of foreign exchange or costly foreign exchange in developing countries.

From the very outset, in Pakistan, imports were controlled by government. In the 1960s, imports were regulated through a licensing system (see Chapter 5 for details). A step towards gradual liberalisation of the economy has been taking place since 1980 (Ministries of Industries, 1984). Some industries such as fertilizer and cement have been allowed duty free imports of plant and machinery to boost production (Economic Survey 1990-91, pp. 85-86). Nevertheless, despite liberalisation measures, capitalists may have difficulties in getting imported raw materials in time.

Electricity Shortage: In our opinion another important factor currently affecting ex post capacity utilisation in Pakistan industries may be load-shedding where the electricity power is shut-down for a number of hours during a day. Due to the increased demand for electricity, the government has used a load-shedding programme since the 1980s. Industries may be reluctant to increase total working hours in view of the possibility of power shut down at different periods of time. An example of the seriousness of the matter can be observed by the shortage of electricity in summer when there is a wide gap between the supply and demand for electricity (Table 7.4).

Table 7.4: Power Balance (Month of May)

(MW)

	Installed capacity	System capability in May	Maintenance spinning reserves	Net Supply	Demand	Deficit/ Surplus
1982-83	3954	2747	314	2433	3015	-582
1983-84	3979	2747	314	2433	3303	-870
1984-85	4454	2822	314	2508	3616	-1108
1985-86	6094	4455	314	4141	4640	-499
1986-87	6794	5099	314	4785	5087	-302
1987-88	8024	5979	314	5665	5581	84

Source: Planning Commission (1983), The Sixth Five-Year Plan (1983-88), p. 215.

It can be observed from Table 7.4 that for most of the years in the month of May electricity supply falls short of demand. This is for the lean month when the water availability in the rivers considerably reduces the potential of the hydro-generation units (Economic Survey, 1990-91). The available information on load shedding however shows that power is shut down throughout the year and for most of the months the actual maximum load shedding by WAPDA exceeded its target (see Table 7.5).

Table 7.5: Load Shedding in 1988-89

(MW)

	Load shedding (target)		Actual maximum load shedding	
	WAPDA	KESC	WAPDA	KESC
July	-432	-38	-380	-36
August	-108	-23	-584	-77
September	-353	-16	-947	-149
October	-456	-05	-276	-144
November	-485	-53	-242	-24
December	-780	-95	-700	-158
January	-701	-14	-550	-34
February	-728	-83	-761	0
March	-699	-28	-1101	-7
April	-785	-40	1350	-134
May	-798	-52	-2103	-113
June	-806	-84	-1800	-96

Source: Energy Year Book, 1989, p. 68.

The seriousness of electricity shortage may also be observed by a WAPDA press release.[4] During 1990-91, industrial units were advised to reduce the use of electricity during 5 pm to 8 pm. This timing was selected because of the increased demand for electricity at this time of day. The main points are stated below:-

All steel furnaces which get electricity from separate feeders, the supply of electricity to them is shut down from 5 to 8 p.m.

All steel and re-rolling mills which are supplied from mixed feeders, the supply of electricity will shut down from 5 to 8 p.m.

All textile mills are directed to reduce the consumption of electricity voluntarily between 5 to 8 p.m. If they didn't, WAPDA will be forced to stop supplying electricity.

Continuous process industries such as cement,chemical plant, medicine making units, fine paper, glass, and pottery etc. which get electricity from feeders separate from WAPDA, are advised to cut down the electricity load by 25% between 5 to 8 p.m.

Comparatively less important industries,i.e. industries which work in one or two shifts, will be closed between 5 to 8 p.m.

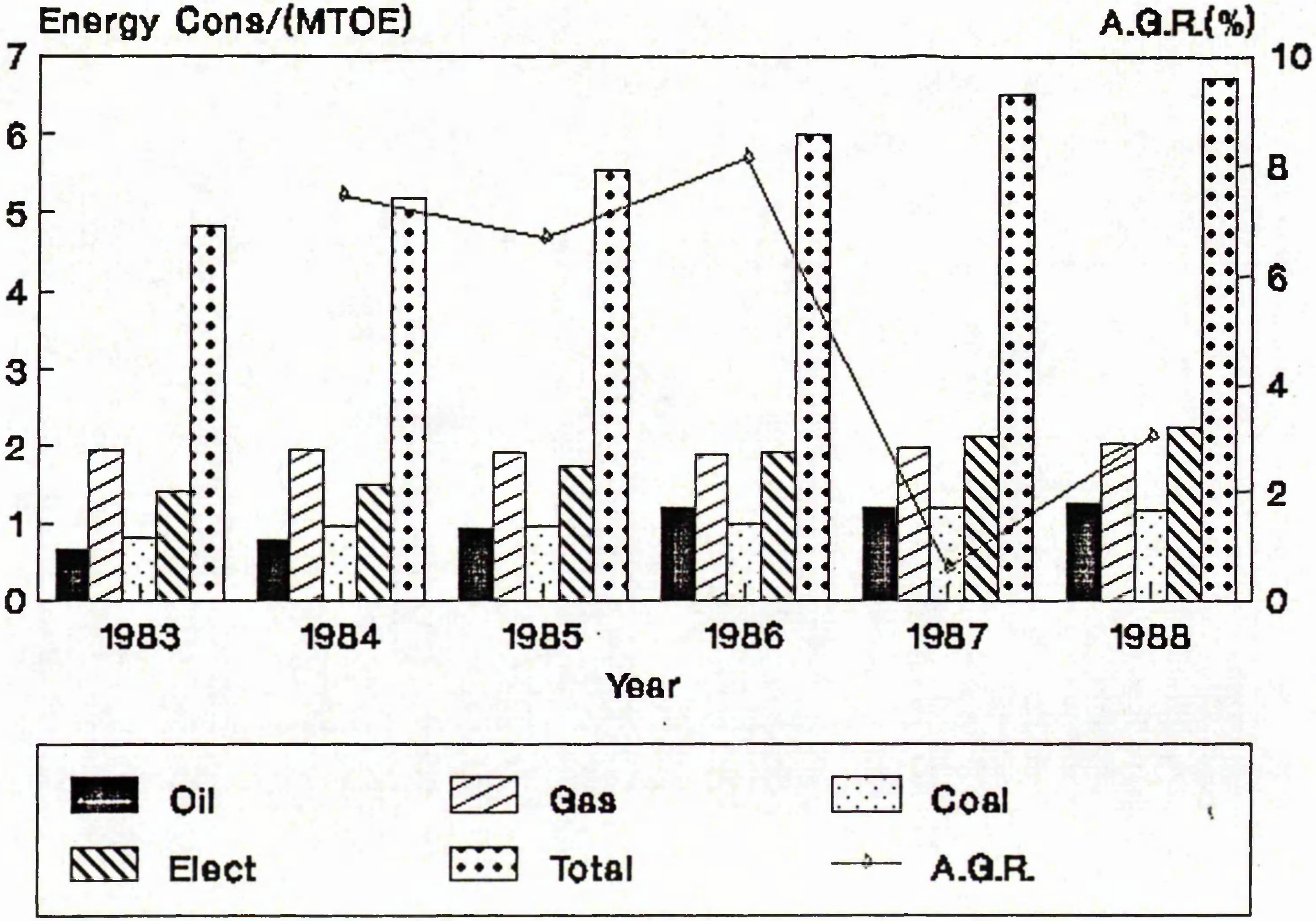
It seems from the above WAPDA statement that power will be cut down only for three hours a day in different industries. But in reality it may not be the case. The overall electricity situation in the economy (which is mentioned above) reflects the severity of the problem. Even if we accept that electricity is not supplied only for three hours a day from 5 to 8 p.m. to different industries, it may be that firms perceive these timings of the day as appropriate/feasible for the second shift and may be reluctant to introduce a second shift due to the risk of power cuts. Load shedding is likely to continue, and even increase in the future. It has been forecast that by the year 2010 the country will require generation of more than 34,191 MW electricity and installed capacity will not be higher than 19,000 MW.[3] Thus Pakistan is likely to face an energy shortage in the future.

Pakistan meets its energy requirements both from commercial and non-commercial resources. Commercial resources are oil, natural gas, coal, and liquid petroleum gas. Non commercial energy resources (wood, cow dung, etc.) mostly meet the requirements of the rural sector. Pakistan in fact has poor indigenous energy resources. The country is heavily dependent on imports of energy to run its economy and spends more than 1000 million $(US) in importing crude oil every year (Economic Survey, 1990-91). The consumption of energy resources by the industrial sector is shown in Figure 7.1. The Figure has two Y axes. The left hand side Y axis represents energy consumption in million TOE[5], while the right hand side depicts average annual growth rate in energy consumption. Gas consumption was higher than electricity until 1986-87 since when the situation has been reversed

The main sources of electricity generation in Pakistan are: hydro, thermal and nuclear. The Water And Power Development Authority (WAPDA) and the Karachi Electric Supply Corporation (KESC), are the two main agencies engaged in generation and transmission of electricity, sharing 83.4% and 16.5 % respectively during the year 1988-89 (Energy Year Book, 1989, p. 51).

Generation of electricity in Pakistan by all sources in 1988-89 is recorded at 34,562 GWH[6] against 33,091 GWH in 1987-88 showing an increase of 4.5% (See Appendix Table 7.3). The total consumption of electricity in the country was recorded as 26,722 GWH which was 6.6% more than that of 1987-88 showing an annual compound growth rate of 11.2% over the base year 1983-84 (Appendix Table 7.4). The industrial sector remained the highest power consuming sector (35.2%) followed by the domestic (32.5%) and agriculture sector (16.4%) in 1988-89 (see Appendix Table 7.4).

Figure 7.1: Energy Consumption in Industrial Sector (Million TOE)



Source: Energy Year Book 1989.

The Planning and Development Division Report (1987) pointed out that a substantial loss of industrial output is taking place due to power failure in the economy. UNIDO (1990) has referred to a study report by the United States Agency for International Development (USAID), according to which Pakistan is losing about $500 million annually of value added in manufacturing due to load-shedding (p.90). It has been also reported that hydro-season induced load-shedding results in an 18 per cent loss of manufacturing value added for small industries, compared with 5.5 per cent for large industries (UNIDO, 1990, p.90). Pasha and Qureshi (1984) have also reported that the percentage of days to total days lost due to power failure was the highest (27%) during 1971-76 (p. 41).

On the basis of all this information we hypothesize that power shortage may be a major factor hindering capacity utilisation and introducing more shifts into the system. The major difficulty which we face is the lack of data on the actual and desired consumption of electricity in industries to substantiate the effect of shortage of electricity on capacity utilisation. Nevertheless, we assume some functional relationships between output and electricity consumption on the one hand and capacity utilisation and electricity consumption on the other hand. We assume that output is a function of electricity consumption. As the former is also a function of capacity utilisation hence a positive relationship may also be postulated between capacity utilisation and electricity consumption.

Our hypothesized positive relationship between electricity consumption and capacity utilisation in fact stems from some other studies where the consumption of electricity has been proxied to measure capacity utilisation in industries. For example, Kim and Kwon (1971) used electricity consumption as a measure of capacity utilisation. Taylor (1967) reported a high correlation between electricity consumption and active capital stock across regions in the UK. Hence, after establishing this positive relationship in the manufacturing sector of Pakistan we implicitely assume that as power is shut down, there may not be any consumption of electricity by industries, thus both output and capacity utilisation may be affected. However, the limitation of this assumption is that if firms get electricity supply from some other sources e.g., they use their own generators etc. output and capacity utilisation may not be affected largely.

We have run a regression to quantify the functional relationship between output and electricity consumption in both linear and log linear form for 68 industries (the details of these industries is given in Table 7.1) for the year 1984-85. The statistical results are as follows:

$$Q = \underset{(2.878)}{191.58} + \underset{(4.432)^{*}}{2.984\,Ele}$$

$$R^2 = 0.23 \qquad F = 19.637$$

where Q is value added at constant factor prices of 1975-76, Ele is the consumption of electricity in different industries.

$$\log Q = \underset{(16.750)}{2.913} + \underset{(11.152)^{*}}{0.735\log ele}$$

$$R^2 = 0.65 \qquad F = 124.363$$

where Q is value added at constant factor prices of 1975-76, and ele is the consumption of electricity. Both values are in log terms. The statistical results show a positive and highly significant relationship between output and electricity consumption in industries at the 99% level of confidence. The coefficient of log ele shows that 1% increase in electricity consumption is associated with a 0.7% increase in output. It means that for any given increase in output more than proportional increase in consumption of electricity is required. This implies that more generation of electricity would be required to produce any given output.

The major limit to our analysis is however the lack of data on load shedding and its impact on value added. The second relationship between capacity utilisation and electricity consumption will be tested later.

Labour Productivity: A positive relationship is assumed between labour productivity and capacity utilisation. The basic argument is that the more capital intensive the production is (high labour productivity), the more important are capital costs and there is greater incentive to economize on them through higher utilisation (Winston, 1974b). In contrast, in a highly labour-intensive process (low labour productivity), low utilisation will be justified to avoid high labour costs at night (Winston, 1974b).

Market Power: Winston (1971) has used the number of firms in an industry as an index of competition within an industry. He argues that oligopolistic industries can substitute either inventory accumulation or excess capacity for price adjustments when faced with demand fluctuations. Competition on the other hand tends to force a higher utilisation of capital (Winston 1971, p.45). As competitive pressure increases, X-efficiency increases, and the free pool of information on optimal capacity utilisation increases. In other words, in countries at higher levels of development, the competitive, profit maximising model of the firm may be a closer approximation to reality than in countries at low levels of development.[7] Lecraw (1978), asserts that the presence of more firms in an industry facilitates a greater flow of information about the production process and thereby generates higher efficiency. Similarly, if political power is greater for larger firms - influencing political-economic decisions such as licensing of imports (and if capacity use were constrained by their shortage) then larger firm would operate at higher rates of utilisation. Lecraw (1978), in the case of Thailand's manufacturing sector found a significant positive relationship between the number of firms and capacity utilisation.[8] Winston (1971) also argues that there is a positive relationship between the number of firms and capacity utilisation. In reality the use of number of firms as a proxy for market power may not be appropriate because a large number of firms in an industry may not necessarily mean the presence of competition. Nevertheless, other explanations such as free pool of information, etc. for a positive relationship between number of firms and capacity utilisation may be valid.

Summing up, in the words of Winston (1971)," Diverse though these causes are, they all derive from errors in planning, accidental by-products of government policies or a type of technological determinism; in other words from inefficiencies and rigidities of one sort or another" (p.38).

7.4 A Model of Capacity Utilisation in Pakistan

Following a large number of potential explanations described in section 7.3 our model of capacity utilisation in Pakistan attempts to estimate a multiple regression equation (explaining inter-industry differences in capacity utilisation) using cross-sectional data for 68 industrial groups for the year 1984-85. The main question under consideration is why the existing stock of capital is not fully utilised in Pakistan's manufacturing sector. The model to test the various hypotheses regarding factors affecting capacity utilisation is specified in the following form;

$$Cu_i = a_1 + b_1x_{1i} + b_2x_{2i} \dots b_nx_{ni} + u_i \quad (7.1)$$

Where Cu_i is a capacity utilisation in industry i and x_{1i} $x_{2i}..x_{ni}$ are the explanatory variables for industry i. u_i is the error term.

7.4.1 Hypotheses and Variables

Following the discussion of 7.3 the following are the variables included in the model:

Exports/Demand Pressure (lexp/lag): A positive relationship is hypothesized between exports and capacity utilisation. It is generally expected that higher exports would enable a firm to utilise more of its production capacity because of higher demand for the product (see Winston, 1971). The proportion of exports to total output[8] **(lexp)** has been taken to reflect demand for the product. Alternatively we have also tested total demand pressure on an industry with the assumption that higher demand for a product would lead to more capacity utilisation and vice versa. Following Goldar and Renganathan (1991) we have taken the annual average growth rate of production between 1977-78 and 1984-85 (**lag**) in each industry to reflect total demand pressure on industries.

Imported Raw Material (lim): This variable is taken as the ratio of imported raw material to total inputs and reflects industry's dependence on imported raw materials. An inverse relationship is expected to prevail between capacity utilisation and imported raw-materials. The logic behind this negative relation is that the difficulties in getting foreign exchange or import licences in time create problems for the availability of raw materials and reduce capacity utilisation.

Electricity (lel): This variable is taken as the proportion of electricity consumed to value added. Following Kim and Kwon (1971) a positive relationship is expected between capacity utilisation and the consumption of electricity. In the presence of any positive and strong relationship between these two variables we may implicitly assume that load shedding may reduce consumption of electricity and may affect capacity utilisation. It would have been better to test the relationship by taking into account the actual and desired consumption of electricity and its impact on capacity utilisation but the major limitation in our statistical relationship is the lack of data on the shortage of electricity in each industry and it is not possible for us to test the direct effect of power shortage on capacity utilisation. This factor has not been taken into account before in the case of Pakistan's empirical studies.

Average size of the firm (ls): This variable can be measured either in terms of value of fixed assets per firm or total employment per firm. We have used both of these measures. A positive relationship between capital utilisation and size of the firm is hypothesized. Larger firms are more capable of maintaining a high level of capacity utilisation and vice versa.

Number of firms (ln): The number of units in the industry is taken as a proxy for the extent of competition or market structure within the industry. It is positively related to capacity utilisation. The assumption is that more the number of firms are, the greater will be the degree of competition and hence, more inducement to utilise the stock of capital would be.

Labour Productivity (lvl): This is taken in terms of total value added per employee. A positive relationship is assumed to prevail between labour productivity and capacity utilisation.

Capital-value added ratio (K/V): This variable is the ratio of fixed assets to value-added by industry. It corresponds to the capital-output ratio for a firm. The basic hypothesis emanates from the work of Marris (1964), who hypothesizes a positive relationship between the capital-output ratio and the rate of capacity utilisation. We have already estimated the capital stock data for the large scale manufacturing sector of Pakistan (see Chapter 4). We have found that the CMI's capital stock data on average is 17% higher than our own estimated data (see Chapter 4). Nevertheless, it is extremely difficult to get time series data on investment at a disaggregated level to measure capital stock in each industry, hence by assuming that capital stock is underestimated by the same ratio estimated by us (see Chapter 4 for details), we have adjusted the CMI's capital stock data for all selected industries.

Although it may not be plausible to assume that all industries are affected by the same ratio the difficulties in the measurement of capital stock data suggest that our method may provide the best alternative.

A different type of relationship between the capital-output ratio and the rate of capacity utilisation has been given by Malcolmson (1973). It is emphasised that capital-intensive undertakings are characterised more by plant indivisibilities, implying concave costs of adjustment of capacity. In such cases there will be a greater tendency to create capacity ahead of demand. This implies that, in the initial years of a plant's life, there may be some built-in excess capacity. The other reason is that capital-intensive investment frequently embodies the transfer of complex technology, and it takes a longer time for managements in developing countries to master the operations of such plants. These arguments imply a negative relation between the capital-output ratio and capacity utilisation. We support Malcolmson's (1973) arguments and hypothesize a negative relationship between capital value added ratio and capacity utilisation.

7.4.2 Methodology and Data Collection

We have estimated the model using the Shazam package. The model has been corrected for heteroscedasticity wherever applicable. Due to lack of time-series data we have used cross-sectional data for the year 1984-85. The source of data is the CMI (1984-85) and Pakistan Statistical Year Book (1989). The data on capacity utilisation has been taken from Table 7.1. The CMI data have the usual shortcomings (see Chapters 4 and 6). The data on capacity utilisation may be underestimated depending upon the validity of the assumed potential values. All variables are expressed in logs.

The industries in our model are heterogeneous. Some produce consumer goods while others are intermediate goods industries (fertilizers, industrial chemicals etc.). Some of the industries (fertilizers, cement), are highly capital-intensive.

7.4.3 Results

Our model has two sets of data. The first set takes the average size of the firm in terms of total employment per firm (ls). The second set measures the average size of the firm in terms of total value of fixed assets per firm (lsa). We have checked all our estimates for the presence of heteroscedasticity by applying different tests but found no element of heteroscedasticity.

Initially we have tested our model by taking into account all variables in the model. Four variables out of the seven are insignificant and do not seem to have any impact on capacity utilisation. These are number of firms (ln), capital value added ratio (lk/v), exports (lexp) and imported raw material (lim). On the other hand average size of the firm (ls), labour productivity (lv/l) and electricity (lel) are highly significant at the 1% level. All the significant variables have the correct expected signs. The R is 0.58 (Table 7.6).

Table 7.6: Regression Results (First set of data))

Variable	Estimated coefficient	T-ratio	
ln	-0.129	-0.414	R^2 = 0.58
ls	0.156	4.986*	$\bar{R}$ = 0.53
lvl	0.167	3.099*	
lel	0.230	5.569*	$F_{(8\ 60)}$ = 11.915
lkv	-0.074	-1.310	
lexp	0.024	1.197	
lim	0.014	0.745	
cons	-1.793	-7.585	

* significant at the 1% level.

We have also measured total demand pressure in industry by taking average growth rate of output between 1977-78-1984-85 (lag) and tested the model by using the first set of data. The average growth rate (lag) is insignificant and overall statistical results are not different from the earlier ones (see Table 7.7).

Table: 7.7: Regression Results (First set of data)

Variable	Estimated coefficient	T-ratio	
ln	-0.017	-0.573	R^2 = 0.71
ls	0.976	2.670*	$\bar{R}$ = 0.67
lvl	0.172	3.108*	
lel	0.203	4.951*	$F_{(8\ 60)}$ = 17.712
lkv	-0.051	-0.895	
lag	-0.005	-0.216	
lim	0.028	0.251	
cons	-1.932	-1.232	

* significant at the 1% level.

In the second set of data, labour productivity (lvl) has become insignificant along with number of firms (ln), exports (lexp), and imported raw material (lim) while capital value added ratio (lkv) is significant at the 1% level (Table 7.8). The correlation coefficient between lkv and lvl is 0.647 implying multicollinearity between capital value added ratio and labour productivity. This may be one of the reasons for an insignificant effect of labour productivity on capacity utilisation.

Table 7.8: Regression Results (Second set of data)

Variable	Estimated coefficient	T-ratio	
ln	-0.095	-0.289	R^2 = 0.54
lsa	0.127	4.114*	$\bar{R}$ = 0.48
lvl	0.065	0.893	
lel	0.240	5.507*	$F_{(8\ 60)}$ = 9.998
lkv	-0.178	-2.405*	
lexp	0.019	0.088	
lim	0.013	0.658	
cons	-1.767	-7.103	

* significant at the 1% level.

Finally, dropping all insignificant variables we have reported our final results by using both sets of data (Tables 7.9 and 7.10).

Table 7.9: Final Regression Results (First set of data)

Variables	Coefficients	t-ratio	
ls	0.139	4.686*	R^2 = 0.56
lvl	0.188	3.928*	$\bar{R}$ = 0.53
lel	0.199	5.787*	$F_{(4\ 63)}$ 26.66
Constant	-1.931	-9.796	

* 1 % level of significance

Our final results show all the three variables viz; average size of the firm (ls), labour productivity (lvl) and electricity consumption (lel) are highly significant at the 1% level (Table 7.9). The value of R^2 indicates that 56 per cent of the variation of dependent variable is explained by the independent variables. The value of F test shows that the model is well specified.

The regression results using the second set of data are reported in Table 7.10. In this model all variables viz: average size of firm (lsa), electricity consumption (lel) and capital value added ratio (lkv) are significant at the 1% level. There is a negative relationship between capital value added ratios and capacity utilisation. The F test shows that the overall fit is good. The value of R^2 shows that 52 per cent changes in capacity utilisation are explained by average size of firm, electricity consumption and capital-value added ratio.

Table 7.10 : Final Regression Results (Second set of data)

Variables	Coefficients	t-ratio	
lsa	0.142	6.818*	R^2 = 0.52
lel	0.227	5.564*	$\bar{R}$ = 0.50
lkv	-0.204	-3.808*	$F_{(4\ 63)}$ 23.135
Constant	-1.710	-8.950	

* 1 % level of significance

The number of firms (ln) appears insignificant, implying that market structure does not affect capacity utilisation in the manufacturing sector of Pakistan. A similar result has been found by Kemal and Aluaddin (1974)[9] and Pasha and Qureshi (1984) in their empirical studies. Winston (1971) however, reported the number of firms significant at the 95% level of confidence (see p.47).

Imported raw materials also appear insignificant in our statistical results. However, earlier Winston (1971), reported the significance of imported raw material at the 99% level of confidence for the year 1965-66. During the sixties, the import policy of Pakistan was highly restricted and licenses were issued for imports of raw materials and machinery (see Chapter 5). But gradual liberalisation of imports may have reduced the significance of this variable. Still many industries such as transport, drugs and pharmaceuticals, agricultural machinery, industrial machinery, steel, motor vehicles such as car industries etc. depend on imported raw materials (CMI, 1984-85), but because of a more liberal import policy it may no longer be a hindrance to capital utilisation.

The size of firm measured either in terms of employment or value of fixed assets is highly significant at the 1% level (Tables 7.9 and 7.10). There is also no significant difference in the coefficient of average size of firms in terms of two measures (Tables, 7.9 and 7.10). Thus, other things being equal, larger units have higher rates of capacity utilisation. Our result is in conformity with the]results of Pasha and Qureshi (1984) who quoted the significance of average size of firm at the 5% level (see p.48). Islam (1978), also provides similar evidence for the manufacturing sector of Bangladesh.

The electricity variable is significant at the 1 per cent level. The sign of the coefficient is consistent with our expectations. The magnitude of the coefficient shows that a 1 percent change in electricity consumption will bring about a 0.20 per cent change in capacity utilisation. Given the positive and strong relationship between electricity consumption and capacity utilisation, we may say that any uncertainty in power supply may affect further utilisation of idle capacity.

Labour productivity (lvl) is significant at the 1% level (Table 7.9). There may be many explanations for the positive relationship between capacity utilisation and labour productivity. If high labour productivity is reflecting high capital intensity then it may be said that capital intensive firms have high rate of capacity utilisation. However, in our regression anlysis a negative relationship has been found between capital-value added ratios and capacity utilisation and a contradiction exists in capital intensity in terms of high labour productivity and high capital-value added ratios. One plausible reason may be that the functional relationship among different variables under production function analysis are based on many stringent assumptions (see Chapter 3) which in reality may be difficult to sustain. High labour productivity may be reflecting economies of scale and efficiency of firms and these firms may have more tendency to utilise their capacity.

The capital-value added ratio is also significant at the 1 per cent level. The negative relationship between the capital-value added ratio (lkv) and capital utilisation confirms Malcolmson's (1973) type of argument that capital-intensive plants may have a tendency to remain idle for most of the time due to indivisibility of plant.

7.5 Industrialists' Perception of Factors Affecting Capacity Utilisation in Pakistan: A Survey Analysis

Our statistical results based on the published data in the previous sections are limited by the lack of information on many important factors. For example, there is no data available on the magnitude of load shedding in different industries and its effect on the consumption of electricity. Similarly, there is no information available on the shortage of skilled labour nor the effect of high management costs or labour costs on capacity utilisation, etc.

In these circumstances it was considered worthwhile to conduct a survey of industrialists to explore their perceptions of the factors responsible for underutilisation of the existing stock of capital. This may also help in testing some of our hypotheses on underutilisation of industrial capacity made on a priori grounds. No previous survey on capacity utilisation has been reported for the 1980s or 1990s when problems such as load shedding appeared nationwide and may have affected capacity utilisation of industries in Pakistan. The survey was conducted in a very short period of time and it could have been possible to collect data from 80 firms at the five digit level of Pakistan Industrial Standard Classification. These firms account for 40% of value added in the large-scale manufacturing sector.

The methodolgy of survey and the questionnaire is enclosed in Annex-B.

7.5.1 Survey Results

The survey results indicate that 51% of industries are working on one shift, 29% on two shifts and only 20% are working on three shifts. These results support our earlier calculations made in Table 7.2 where over 50% of industries are working on one shift basis. The major source of energy used by 98% of industries is electricity (Appendix Table 7.7). Overall 73% reported the use of gas, 20% oil in addition to electricity (Appendix Table 7.7).

Almost all firms (99%) acknowledged that they are facing load shedding problem since 1985 (Appendix Table 7.8). Only 1% of firms never used load shedding problem mainly because electricity was not used by them as a source of energy. The average frequency of load shedding was 883 hours per annum in all firms during the period of 1985-1993.

Only 27% reported the use of gas as an alternative fuel during load shedding. It is quite possible that the use of alternative sources of energy such as gas may not be economical to firms. The effects of load shedding on consumption of electricity, output, and employment in industry was also investigated. The majority (81%) reported that the consumption of electricity is reduced in their plants due to load shedding. This indicates that firms do not use their own generators for power supply and are heavily dependent on the Public Department. The results support our hypothesis mentioned earlier (see section 7.4.1) that consumption of electricity is reduced by power cut down. A high proportion of firms (91%) said that output is reduced, 36% claimed that labour is declared redundant due to load shedding (Appendix Table 7.9). The adverse effects on output and employment of load shedding may be only because of the heavy dependence of firms on electricity as a major source of energy.

The importance of each factor affecting utilisation of capacity in firms was also considered and ranked. The survey results are shown in Table 7.11. The results supported our claim that at present load shedding problem is the major factor affecting capacity utilisation in industries (see section 7.3.2.2). In the case of demand side factors, 10% consider the lack of domestic demand and domestic competition as important factors. On the supply side, 63% of firms ranked load shedding as a very important factor affecting capacity utilisation. Among other factors shortage of imported raw material (15%), high management costs (12%) and lack of credit facilities (11%) are considered fairly important factors. On average supply side factors seem to be dominant in perceptions of factors affecting capacity utilisation. These results imply that supply side factors are mostly of a domestic nature and a suitable government policy may be effective in increasing capacity utilisation.

Political instability does not seem to be a problem related to capacity utilisation.

The data on factors affecting capacity utilisation has been also analysed by dividing firms into two groups on shift basis. Group 1 includes 64 of those firms which are working on 1-2 shift basis. Group 2 covers 16 of those firms working on 3 shift basis. Our survey results in two groups show that load shedding/electricity shortage is very important factor for both of these groups. Overall capacity utilisation is affected in two ways due to load shedding. (1) Of those firms which are already working 3 shifts, total working hours are reduced mainly due to load shedding and their maximum installed capacity is not fully utilised. (2) Capacity utilisation in firms working on one or two shifts is affected mainly because (a) their total actual working hours are affected due to power failure and (b) they want to increase their total working hours by introducing more shifts, but due to frequent power cut down are reluctant to do so. Group 1 reports lack of domestic demand (14%) and domestic competition (10%) as fairly important factors. On the other hand, with the exception of import policy/ competing imports a larger proportion of Group 2 reports non significance of these factors. 14% of firms in Group 1 said that shortage of imported raw material is very important factor while 18% of firms acknowledged lack of credit facilities as less important factor (Table 7.12). Generally, all factors are mostly considered important by Group 1 than Group 2.

Table 7.11: Relative Frequency Distribution of Factors Affecting Capacity Utilisation: All Firms

Factors	Relative Frequency Distribution (%)			
	1	2	3	4
Demand Side Factors				
Lack of domestic Demand	3	10	6	9
Lack of demand for exports	1	2	8	11
Domestic Competition	7	10	10	8
Import Policy / competing imports	4	7	6	10
Total	15	29	30	38
Supply Side Factors				
Load shedding	63	13	1	-
Shortage of imported raw materials	11	4	15	7
Shortage of Skilled Labour	2	11	9	9
High Management Cost	1	8	12	9
High Labour Cost	1	8	6	10
Lack of credit facilities	3	16	11	8
Transport problems	1	4	8	10
Total	82	64	62	53
Other Factors				
Political instability	3	7	8	9
Overall Total	100	100	100	100

1 = Very important
2 = Important
3 = Fairly important
4 = Not at all
Source: Our Survey

Table 7.12: Relative Frequency Distribution of Factors Affecting Capacity Utilisation (%): Different Groups

	Group 1 Industries working on 1-2 shift basis				Group 2 Industries working on 3 shift basis			
Factors	1	2	3	4	1	2	3	4
Demand Side Factors								
Lack of domestic Demand	4	14	6	9	-	-	12	10
Lack of demand for exports	-	1	8	8	6	-	8	9
Domestic Competition	8	10	11	7	6	10	4	9
Import policy/ Competing imports	4	8	5	10	5	5	12	8
Total	16	33	30	34	17	15	36	36
Supply Side Factors								
Load shedding	64	11	-	-	70	30	-	-
Shortage of imported raw materials	14	4	14	7	-	10	14	10
Shortage of Skilled Labour	2	10	9	9	-	14	13	8
High Management Cost	-	9	15	9	-	10	9	10
High Labour Cost	-	7	7	11	2	9	5	9
Lack of credit facilities	1	18	16	9	6	9	8	10
Transport problems	1	6	8	11	-	-	8	13
Total	82	65	69	56	78	71	57	60
Other Factors								
Political instability	2	2	1	10	5	14	7	4
Overall Total	100	100	100	100	100	100	100	100

Notes: Group 1 contains 64 firms; Group 2 covers 16 firms.
1 = Very important; 2 = Important; 3 = Fairly important; 4 = Not at all
Source: Our Survey

We have also grouped firms into different employment sizes to analyse the degree of importance of different factors affecting capacity utilisation. Following Naqvi and Kemal (1984), all of those firms employing 10-50 employees are classified as small scale, 51-100, medium scale and all of those employing 101 and above are defined as the large-scale firms. Results are provided in Appendix Table 7.10). Results show that on average all demand side factors are ranked more important by the small-scale firms than medium or large-scale firms. Among supply side factors a high proportion (52%) of small scale firms assign a great degree of importance to load shedding. Besides load shedding other factors which small scale firms perceive less or fairly important are lack of credit facilities (24%) and high management costs (33%) respectively (see Appendix Table 7.10). As earlier mentioned in Chapter 5 that credit policy in Pakistan favours large scale firms and a high proportion of credit is given to larger firms. If more credit facilities are provided to small scale firms these may be able to increase utilisation of the existing capacity. Medium scale industries appear to perceive demand side factors more important than the large-scale firms. Overall, supply factors seem to be equally important to both medium and large scale firms. To the large-scale firms load shedding appears to be a very important factor (71%) while medium scale industries alongwith load shedding (47%) give importance to other factors as well as the shortage of imported raw material (20%), high labour costs (22%) and lack of credit facilities (28%). These results imply that the degree of importance of factors affecting capacity utilisation differ in different size groups. Generally small and medium scale industries appear to perceive domestic competition, shortage of imported raw material and the lack of credit facilities important factors affecting capacity utilisation.

The results have been also analysed by categorising firms in terms of capital intensity. The average capital-labour ratio (K/L) of all these firms is Rs 48,000 thousands per employee. All of those firms where K/L ratios are below average are categorised as labour-intensive while firms having K/L ratios above average are classified as capital-intensive firms (see Appendix Table 7.11).

Among demand side factors, greatest importance is given to domestic competition by labour intensive firms (Appendix Table 7.11). The degree of importance to domestic competition is 17% (very important), 6% (less important and 7% (fairly important) reported by the small scale firms (see Appendix Table 7.11). It is quite possible that small scale firms may be more labour intensive firms. If it is the case that it may be said that labour intensive or small scale firms operate in a more competitive market. Capital intensive firms however, on average give less importance to demand side factors. Among supply side factors load shedding is given high importance by both labour intensive (65%) and capital intensive firms (60%). Capital intensive firms on average perceive load shedding as more important than do labour intensive firms. It may be possible that these firms are large scale firms and are more affected by power cut down. Our data show that the frequency of load shedding is the highest in large scale firms (i.e., the average frequency of load shedding was 1000 hours per year as compared to 700 hours per year in small and medium scale firms during 1985-1993). 14% of large scale firms assign shortage of imported raw material a very important factor. However, its overall importance is less than that considered by labour intensive firms. Another important factor perceived as more important by capital intensive firms is high labour cost compared to labour intensive firms. There is possibility that capital intensive firms may require skilled labour which is usually costly and affects capacity utilisation.

Political instability is also ranked a very important factor by 10% of capital intensive firms compared to labour intensive ones (3%).

Generally our results suggest that on average, supply factors are more important in determining capacity utilisation in the manufacturing sector of Pakistan as compared to demand side factors. Among supply side factors load shedding appears to be a very important factor affecting capacity utilisation in all firms irrespective of their shift work, size, and factor intensity. However, the degree of importance of different factors differ among firms of different categories in terms of employment and factor intensity. Overall, supply factors are statistically significant at the 5% level of significance (see Annex-B for details).

7.6 Implications of Results

Our empirical analysis based on regression and our survey results expose some important factors associated with under-utilisation of the existing stock of capital in the manufacturing sector of Pakistan. However, a margin of error always remain in statistical analysis and results should be interpreted with caution.

It has been observed in our regression analysis that supply factors are mainly responsible for underutilisation of capacity and demand has no significant role in determining capacity utilisation in industries. Earlier Kemal and Alauddin (1974), and Pasha and Qureshi (1984) reported similar findings. In our regression analysis the consumption of electricity, labour productivity, average size of firm, and the capital-value added ratio are the key ex post variables affecting capacity utilisation in industries.

We have noticed that one of the key factors which affects capacity utilisation is related to electricity power rationing. Our regression results show that the consumption of electricity is positively related to capacity utilisation and the former is affected by load shedding. Our survey results support the point that the consumption of electricity is reduced by load shedding. Moreover load shedding is considered a very important factor in affecting capacity utilisation by all firms irrespective of their size or factor intensity. If it is desired to increase the number of shifts in different industries, provision of electricity is imperative for both output and employment growth. Frequent power shut-downs may be a hindrance to increasing the rate of capacity utilisation. A serious planning effort may be required to meet the increasing demand for energy in the economy.

In our opinion there is need to explore alternative sources of energy. The potential is promising with large hydro-power resources, substantial deposits of oil and natural gas, plenty of coal and abundant sunshine (Energy Year Book, 1987). For example, solar energy may be the best alternative sources of energy. It is a unique source of energy which is convertible into mechanical and electrical energy and which can and has been used successfully to meet domestic needs for lighting, water heating, space heating and cooling, as well as for industrial process heat (Energy Year Book, 1987). The development of solar cells which convert light into electricity has opened new avenues of its utilisation as the electricity has wide application in all the productive and non- productive sectors.

The Energy Research and Development Administration (ERDA), in United States has established a programme in Agricultural and Industrial Process Heat that embodies the direction, funding, and management of projects applying the direct conversion of solar energy to useful output for agricultural and industrial processes.[10] Such projects may provide a viable option to Pakistan to meet its deficiency in energy sources. But at the same time, this would certainly require a large amount of capital to finance the project. However, a detailed appraisal of the project may be made to compare the cost and benefit of the project. If benefit is high, foreign loan or aid from IMF or World Bank may be obtained to meet the expenditure.

The Water and Power Development Authority (WAPDA) should also give priority to industries in the provision of electricity even at the cost of cutting down domestic supply of electricity.

The regression analysis has demonstrated a positive relationship between labour productivity and capacity utilisation. High labour productivity may reflect high capital intensity. If we suppose that high labour productivity is partly a reflection of more use of skilled labour as capital-intensive projects require specific skill to operate the machines in developing countries, then the importance of the availability of skilled labour cannot be ignored. In this regard a shortage of skilled labour may affect the rate of capacity utilisation. Our survey results also indicate that capital intensive firms give importance to high labour costs compared with labour intensive firms (Appendix Table 7.11). As earlier mentioned skilled labour may be required by capital intensive firms which is usually more costly.

Keeping in view our significant results on the average size of the firms, we can say that it confirms Marris' contention of economies of scale. Small firms may experience many difficulties as compared to large units in utilising their capacity. For example, small firms may be facing high management costs for night shifts which may make it difficult for these firms to increase the rate of capacity utilisation. Survey results also support this point where small scale firms acknowledge high management costs as an important factor affecting capacity utilisation (Appendix Table 7.10).

Our survey results show that the lack of credit facilities is also an important factor for small and medium scale firms. If credit non-availability or its shortage is a problem preventing small firms utilising their existing capacity, then a minimum quota of credit may be fixed for such firms. It is generally recognised that large scale firms have privileged access to infrastructure, and credit facilities (Planning and Development Division Report, 1987). These firms can get more credit from the lending institutions. However, small-scale enterprises have less access to bank credit. The available information on the provision of credit to small scale industries shows that its share of total credit provided to the manufacturing sector is only 4.4% (Appendix Table 7.6). In Pakistan, there is also a problem of effective credit delivery mechanisms. This in fact is the result of bureaucratic collateral-based lending policies, the inability of small industrialists to comprehend banking procedures, and the large administrative overheads that make lending to small industry non-profitable (Khan, 1970, p. 238). Policy measures may take the form of liberalisation of bank credit which could reduce the competitive disadvantage of small firms and make them efficient in utilising capacity.

The positive correlation between the average size of firm and capacity utilisation in regression results can also be explained by taking the efficiency criteria of firms. If high rates of utilisation indicate efficiency, then we may say that most firms in Pakistan may be working less than efficiently. The high degree of effective protection during the 1960s encouraged inefficient industries, some even contributing negative value added at world prices.[11] Due to this, economies of scale could not be reaped by most of the industries.

To remove ex ante bottle-necks to capacity utilisation there is a need to manipulate relative factor prices to reflect scarcity prices. This may provide a good deal of scope for employment and output at the initial stages of investment. An increase in the price of capital relative to labour may improve the utilisation of capacity. Kemal and Aluaddin (1974) express the view that capital cost is one of the major determinants in a choice of installing a plant vis-a-vis greater capital utilisation.

Generally, both regression and survey results provide consistent conclusions about the impact of different factors affecting capacity utilisation. Both highlight the importance of supply factors compared with demand side factors. Our survey results point out that the degree of importance of various factors vary among different size groups in terms of employment and factor intensity.

It may be said that designing of the appropriate policy mix to reduce the margin of excess capacity however, should be based on a clear ranking of social priorities in terms of raising the rate of capacity utilisation in various industries. We think that if government sanction is required for investing in new units in a sector, it should be granted only on the basis of the past achievements in capacity utilisation in that sector.

From a welfare point of view, any increase in capacity utilisation will provide jobs and in consequence any economic and social unrest due to unemployment can be minimised. Some points however, need serious consideration. For example, more utilisation of capacity may require more skilled labour which is usually in short supply in developing countries. Supervisory staff may be needed for second or third shifts which may not be easily available.

Similarly some negative aspects of night shift working may appear such as health and social problems of workers working at night (See Farooq and Winston, 1978). The physical conditions of work are not always favourable for multiple shift work. Domestic problems such as separation from the family and change in sleeping schedule may disturb workers psychologically. However, these issues may be solved in perspective of the benefits of utilisation of the plant through shift work in Pakistan where workers prefer to have employment irrespective of working time to unemployment (see Farooq and Winston, 1978). We think a deliberate and comprehensive policy framework may be designed to appraise all the aspects related to more utilisation of the existing idle capacity.

7.7 Capacity Utilisation and Employment

How much employment may be created by increasing utilisation of capacity in Pakistan? Theoretically it is assumed that on each shift, the same number of crew size would be required to operate the plant (see Chapter 3). However, in practice this may not be possible. Winston (1974b) says that increase in employment in the second shift also depends on the ex post elasticity of substitution between capital and labour. Theoretically, if the ex post elasticity of substitution is zero, employment levels will be doubled by the introduction of the second shift (see Chapter 3, Table 3.1) because the same number of workers would be required with the available capital stock. However, normally the elasticity of substitution ranges from zero to one. The lower the size of the elasticity ex post, the less it would be possible to substitute capital for labour with any increase in relative factor prices. Hence the impact on employment will be strong (see Winston, 1974b).

Our estimates of the elasticity of substitution between capital and labour (Chapter 6) however, are assumed to reflect the ex ante elasticity of substitution (before actual investment is made) while the ex post elasticity of substitution is assumed to be zero. On the basis of zero ex post elasticity of substitution we may say that with any increase in relative factor prices, substitution of the existing stock of capital for labour would not be possible. Thus, theoretically it may be said that the same `crew size' may be required in the second shift. In practice, however, it may not be realised. There is always some ex post possibility of substituting capital for labour (see Pack, 1974). Hence, it may be possible that less workers are required in the second shift to produce more output. There is another possibility that capacity utilisation may increase by increasing total working hours but the same workers work over time. Thus, output will increase but total employment will remain the same. In this case there would not be any positive impact of increased capacity utilisation on employment. However, total income of workers will increase due to working overtime, income and distribution effect may increase employment by increasing the demand for different products in the long-run.

We have run a simple regression in a log form to investigate the functional relationship between employment and capacity utilisation for 68 five digit industries for the period of 1984-85. The statistical results are:

$$lemp = \underset{(20.739)}{8.707} + \underset{(3.553)^{*}}{1.4911cu}$$

$$R^2 = 0.16 \qquad F = 12.626$$

where lemp is the log of employment and lcu is the log of capacity utilisation.

A positive relationship is found between capacity utilisation and employment. The coefficient of lcu shows that 1% increase in capacity utilisation will increase employment by 1.49%. The t ratios show a strong relationship at the 1% level of significance between employment and capacity utilisation.

7.8 Conclusion

Our findings demonstrate that a sizeable capacity in manufacturing remains unutilized mainly because of supply constraints. These factors are of domestic nature and appropriate government policies may help to boost output and employment through increasing utilisation of the existing stock of capital in the large scale manufacturing sector of Pakistan. There exists a substantial scope for changes in the supply response of these factors to industrial revival. Our regression analysis shows that important ex post determinants of capacity utilisation in Pakistan are, average size of the firm, consumption of electricity, labour productivity and capital output ratio. However, the empirical analysis is limited by the lack of data on many variables such as the ratio of skilled workers to total, power failure and its demand in different industries.

Relative factor prices also play an important role in determining ex ante capacity utilisation. Due to the distorted structure of factor prices there is a tendency towards investment planning than production planning in Pakistan.

Our survey results are consistent with the regression results and highlight the importance of factors affecting capacity utilisation from an industrialists' point of view. These results suggest that load shedding is a major problem to all firms. Overall, supply factors are more important than demand side factors.

It can be tentatively concluded that removal of supply constraints may increase production and employment through increasing capacity utilisation in the manufacturing sector of Pakistan.

Notes and Reference to Chapter 7

1 Kemal and Aluaddin (1974), have only considered export for the demand analysis in different industries see p. 236.

2 See Hogan (1967), who estimated empirically the determinants of capacity utilisation in Pakistan's manufacturing sector.

3 MW stands for Mega Watt.

4 WAPDA Press Release (1991) is written in the official language of Pakistan (Urdu).

5 TOE stands for Tons of Oil Equivalent.

6 GWH stands for Gega Watt Hour.

7 Bergsman (1974), White(1976), Shapiro and Muller (1977) and Morley and Smith (1977a, 1977b), have come to the similar conclusion concerning the competitive environment and its effect on the behaviour of firms in LDCs.

8 See Lecraw (1978) who gave reasons for the positive relationship between the size of the firm and capacity utilisation in the case of Thailand's manufacturing sector. According to him in more competitive industry, profits were lower and competition more intense. As the number of firms increased, the free pool of information was available to new entrants about efficient technology, hence, capital utilisation increased, see especially p. 38.

9 Kemal and Aluaddin (1974), used two explanatory variables, viz., the number of firms in an industry and the concentration ratio to measure the competitiveness of the market. Both variables were insignificant in their statistical analysis, see p.238.

10 See for details, Solar Energy for Agricultural and Industrial Process Heat Programme Summary (1977).

11 See Naqvi N. H., (1970), p. 64.

APPENDIX TO CHAPTER 7

Appendix Table 7.1: Capacity Utilisation in the Large-Scale Manufacturing Sector of Pakistan (1984-85)

Industries	Total days worked per year DW	Average number of shifts SW	Total Hours worked[1] per year HW	Average Rate of Capacity Utilisation Ut
1 Canning of fruit and vegetables	277	1.0	2216	0.31
2 Canning of fish and sea food	243	1.0	1944	0.27
3 Vegetable ghee	313	3.0	7512	0.89
4 Other vegetable oils	263	1.9	3998	0.56
5 Sugar	218	2.0	3488	0.58
6 Feeds for animals	247	1.0	1976	0.27
7 Starch	340	3.0	8160	0.97
8 Salt	297	1.0	2376	0.33
9 Spirits & wine & fruit products	259	1.2	2486	0.35
10 Other soft drinks	238	1.1	2094	0.29
11 Cigarettes	275	2.2	4840	0.67
12 Cotton spinning	322	3.0	7728	0.92
13 Woollen textiles	289	1.5	3468	0.48
14 Silk & art silk textiles	289	1.5	3930	0.55
15 Finishing of textiles	284	1.2	2726	0.38
16 Made up textile goods	296	1.4	3315	0.45
17 Carpets and rugs cotton	223	0.7	1320	0.18
18 Carpets & rugs woollen	271	1.0	2168	0.30
19 Spooling & thread ball making	295	1.2	3832	0.39
20 Other textiles	281	1.3	2922	0.41
21 Tanning & leather finishing	290	1.0	2320	0.32
22 Other leather products	297	1.3	3089	0.43
23 Plywood & products	277	1.0	2216	0.31
24 Medicines & drugs	277	1.0	2216	0.31
25 Unani & other medicines	274	1.0	2192	0.30
26 Alkalies	332	2.7	7171	0.99
27 Acids, salts & intermediates	290	1.5	3480	0.48

cont.

Industries	Total days worked per year DW	Average number of shifts[1] SW	Total Hours worked per year HW	Average Rate of Capacity Utilisation Ut
28 Dyes, colours, & pigments	242	1.8	3485	0.48
29 Fertilizers	327	3.0	7848	0.93
30 Paints, varnishes, & lacquers	293	1.2	2813	0.39
31 Perfumes & cosmetics	264	0.9	1901	0.26
32 Soap & detergent	292	1.2	2803	0.39
33 Matches	284	1.7	3862	0.54
34 Petroleum products	289	1.2	2774	0.39
35 Tyres & tubes	285	1.4	3192	0.44
36 Retreading tyres, & tubes	281	1.0	2248	0.31
37 Rubber foot-wear	266	1.0	2128	0.30
38 Glass	346	2.8	7750	0.92
39 Glass products	286	1.7	3890	0.54
40 Bricks & tiles	274	1.0	2192	0.30
41 Cement	339	3.0	8136	0.97
42 Cement products	271	1.0	2168	0.30
43 Other nonmetallic mineral products	281	1.0	2248	0.31
44 Iron & steel mills	285	1.3	2964	0.41
45 Iron & steel foundries basic industries	295	1.3	3068	0.43
46 Re-roling mills	281	1.0	2248	0.31
47 Cutlery	302	1.0	2461	0.34
48 Metal furniture	295	1.0	2360	0.33
49 Wire product	279	1.3	2902	0.40
50 Metals, barrels, & drums	295	1.0	2360	0.33
51 Bolts, nuts, rivets etc.	297	1.0	2376	0.33
52 Engines & turbines	298	1.0	2384	0.33
53 Agricultural machinery	287	1.0	2296	0.32
54 Textile machinery	296	1.0	2368	0.33
55 Other industrial machinery	296	1.1	2605	0.36
56 Electrical industrial machinery	292	1.0	2336	0.32
57 Radio & television	281	0.9	2023	0.28
58 Electrical appliances	270	0.9	1994	0.27
59 Insulated wires, & cables	293	1.2	2813	0.39
60 Ships & boats building	293	1.2	2707	0.38

cont.

Industries	Total days worked per year DW	Average number of shifts[1] SW	Total Hours worked per year HW	Avereage Rate of Capacity Utilisation Ut
61 Rail road equipment	305	1.0	2440	0.34
62 Motor vehicles	288	1.0	2304	0.32
63 Motor cycles, auto rickshaws	296	1.0	2368	0.33
64 Cycles & padicabs	295	1.0	2360	0.33
65 Jewellery & musical instruments	298	1.0	2384	0.33
66 Toys	288	1.4	3226	0.45
67 Pens & office supplies	275	0.9	1980	0.28
68 Other manufacturing	291	1.0	2328	0.32

1 Average number of shifts has been multiplied by assumed number of hours per shift (8).
Source: The number of days worked (DW) and shifts worked (SW) per year has been taken from the CMI (1984-85).

Table 7.2: Cumulative Sanctioned Loans by PICIC (1959-89)

(% to total)

	Industries	For New Plants Loans Sanctioned	B.M. & R[1] Loans Sanctioned
1	Food Products	77	23
2	Paper and paper products	93	7
3	Textiles	76	24
4	Leather & rubber	78	22
5	Engineering	90	10
6	Chemical & petro-chemical	98	2
7	Minerals	99	1
8	Cement, clay, ceramics & glass	94	6
9	Transport & shipping	100	0
10	Miscellaneous	82	10

1 Balancing, Modernisation and Replacement.
Source: PICIC 32nd Annual Report, 1989.

Appendix Table 7.3: Generation of Electricity by Agencies
UNIT: GWH[1] (numbers)

Agencies	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	A.C.G.R. (%) 1983-84 to 1988-89
WAPDA	17994	18129	20577	23429	27310	28810	9.87
KESC	3555	4528	4582	4772	5527	5722	9.99
KANUP	324	346	430	502	254	30	-37.87
Total	21873	23003	25589	28703	33091	34562	-9.58
A.G.R (%)		5.17	11.24	12.17	15.28	4.45	

Source: Ministry of Petroleum and Natural Resources (1989), Energy Year Book, 1989. p. 59.

Appendix Table 7.4: Consumption of Electricity by Sectors GWH[1] (numbers)

Sector	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	A.C.G.R (%) 1983-84 to 1988-89
Domestic	4535	5076	5845	6806	7900	8682	13.87
Commercial	1287	1413	1526	1713	1868	1921	8.34
Industrial	5884	6249	7288	8012	8973	9416	9.86
Agriculture	2673	2798	2900	3471	4415	4379	10.38
Street Light	101	105	131	146	167	187	13.11
Traction	38	37	36	38	40	35	-1.63
Other Government	1212	1906	1939	1511	1712	2102	11.64
Total	15730	17584	19665	21697	25075	26722	11.18
A.G.R (%)		11.79	11.83	10.33	15.57	6.57	

Source: Ministry of Petroleum and Natural Resources (1989), Energy Year Book, 1989. p. 62.

Appendix Table 7.5: Fixed Industrial Credit Provided by Commercial Banks and Financial Institutions

(Rs in million)

	1982-83	1983-84
1 Credit		
(a) Total credit	4,753	9,683
(i) For fixed investment	3,436	3,939
(11) For working capital	1,317	5,747
2 Credit provided to large-scale manufacture sector:		
(a) Total	3,122	7,977
(i) For fixed investment	3,118	3,506
(ii) For working capital	94	4,471
3 Credit provided to small scale sector:		
(a) Total	1,541	1,706
(i) For fixed investment	318	430
(ii) For working capital	1,223	1,276
(b) Percentage share of fixed investment credit to small scale out total credit provided to manufacturing sector	6.69	4.44

Source: Planning Commission, Government of Pakistan (1987), Report of the Working Group on Industrial Policy and Strategy.

Appendix Table 7.6: Private Investment in Manufacturing 1980-81 to 1987-88
(billions of rupees)

Year	Large and medium scale	Small	Total
1980-81	3.3	1.1	4.4
1981-82	3.3	1.2	4.5
1982-83	4.1	1.3	5.4
1983-84	5.5	1.5	7.0
1984-85	7.3	1.6	9.6
1985-86	9.4	1.7	11.1
1986-87	11.7	2.1	13.8
1987-88	12.2	2.5	14.7

Source: UNIDO, 1990, P. 27.

Appendix Table 7.7: Sources of Energy Used by Industries

Source	Number of Industries	Frequency (%)
Gas	57	73
Electrcity	78	98
Oil	16	20
Coal	2	3
Wood	3	4

Appendix Table 7.8: Frequency of Load Shedding Faced by Industries

Response of Industries	Number of Industries	Frequency (%)
No	1	1
Yes	79	99

Appendix Table 7.9: Adverse Effects of Load Shedding

	Response of Industries (%)
Reduction in the cosumption of electrcity	81
Loss of Output	91
Loss of Employment	36

Appendix Table 7.10: Relative Frequency Distribution of Factors Affecting Capacity Utilisation in Firms in Different Size Groups (%)

Factors	Small 10-50				Medium 51-100				Large 101 and Above			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Demand Side Factors												
Lack of domestic demand	11	11	9	7	-	6	-	12	-	6	5	11
Lack of demand for exports	3	-	14	9	-	-	5	12	2	4	6	10
Domestic Competition	17	6	7	7	7	16	14	6	4	11	8	9
Import policy/ competing Imports	-	11	9	8	7	11	5	9	3	6	4	11
Total	31	28	39	31	14	33	24	39	9	27	23	41
Supply Side Factors												
Load shedding	52	24	-	-	47	6	14	1	71	6	2	-
Shortage of imported raw materials	11	3	7	9	20	-	5	9	13	4	17	6
Shortage of skilled Labour	-	9	7	9	6	11	4	9	1	11	10	9
High management cost	-	9	33	9	-	-	18	9	-	9	11	9
High Labour Cost	3	-	-	12	-	22	4	8	-	9	11	9
Lack of credit facilities	-	24	9	6	7	28	4	6	1	10	8	9
Transport problems	-	3	5	11	6	-	13	9	1	11	8	9
Total	**66**	**72**	**61**	**56**	**86**	**67**	**61**	**51**	**87**	**60**	**67**	**51**
Other Factors												
Political instability	3	-	-	13	-	-	14	10	4	13	10	8
Overall Total	100	100	100	100	100	100	100	100	100	100	100	100

1 = Very important; 2 = Less important; 3 = Fairly important; 4 = Not at all.
Source: Our Survey

Appendix Table 7.11: Relative Frequency Distribution of Factors Affecting Capacity Utilisation According to Capital Intensity (%)

Factors	Labour Intensive[a]				Capital Intensive[b]			
	1	2	3	4	1	2	3	4
Demand Side Factors								
Lack of domestic demand	3	7	5	10	2	10	6	10
Lack of demand for exports	-	2	9	10	2	3	8	7
Domestic competition	6	9	14	7	10	3	6	9
Import policy/ Competing imports	5	6	6	10	5	10	6	10
Total	14	24	34	37	12	26	26	36
Supply Side Factors								
Load shedding	65	9	-	-	60	21	1	-
Shortage of imported raw materials	11	5	17	6	14	5	13	7
Shortage of skilled labour	3	18	8	8	-	5	10	10
High management Cost	-	9	10	9	-	8	13	9
High labour cost	-	7	4	11	2	10	8	10
Lack of credit facilities	2	18	10	8	2	13	13	8
Transport problems	2	5	10	10	-	-	7	12
	83	71	59	52	78	62	65	56
Other Factors								
Political instability	3	5	7	11	10	12	9	8
Overall Total	100	100	100	100	100	100	100	100

a These include all of those firms where capital-labour ratios (K/L) are below average i.e., Rs. 48,000 thousands.

b These include all of those industries where capital-labour ratios (K/L) are above average i.e., Rs. 48,000 thousands.

1 = Very important; 2 = Important; 3 = Fairly important; 4 = Not at all.

Source: Our Survey

CHAPTER 8

SUMMARY AND CONCLUSIONS

This study was designed to explore the employment potential in the large-scale manufacturing sector of Pakistan. This sector has played a very significant role in raising GNP in Pakistan. However, it has not generated employment for a large proportion of labour force. High labour productivity and low employment in the sector reflected its expected use of more capital-intensive techniques of production. The analysis of capital intensity in Pakistan has shown that overall capital intensity is high and substitution of capital for labour had been taking place between 1977-78 and 1984-85. Our calculations have shown that the overall labour displacement effect is quite substantial due to an increase in capital intensity over time and employment could have been created if factor combinations remained at their 1977-78 level.

The theoretical arguments for the use of capital-intensive techniques in developing countries are numerous. However, in pursuing the special features of Pakistan's economy, we have discussed the role of factor price distortions and underutilisation of industrial capacity in relation to the choice of techniques and the effect on employment in the large-scale manufacturing sector of Pakistan.

Initially between 1950 and 1972, an import substitution industrialisation strategy was adopted in order to achieve a high industrial growth rate in Pakistan. The strategy was associated with distortions in relative factor prices. Capital was heavily subsidized through various measures such as the overvalued exchange rate in terms of domestic currency, low interest rates, tax concessions and the accelerated depreciation allowances, etc. All such measures may have produced a bias towards capital intensity and encouraged overinvestment in the large-scale manufacturing sector of Pakistan.

After 1972, government industrial and development policy changed and efforts were made to remove the distortions in both product and factor markets. The first step towards removal of factor price distortions was to devalue the domestic currency in terms of the dollar in 1972. Many other investment incentives such as tax concessions, low interest rates, and a low tariff on imported machinery were also removed. Protection rates to some industries were also reduced. All such measures helped to raise the rental cost of capital (Chapter 5). Nevertheless, absolute distortions in factor markets could not be removed because the labour policies of the government after 1969 accelerated the real cost of industrial labour substantially. The end result of these labour policies was that relative factor prices shifted back again towards the use of capital-intensive techniques of production.

Similarly, underutilisation of existing capacity remained an important feature of the large-scale manufacturing sector of Pakistan. Due to underutilisation of the stock of capital, not only employment but also output was affected. Initially, the capital stock may have been installed on a private profit maximisation basis in Pakistan. Nevertheless, the ex post circumstances were such as to hinder the rate of capacity utilisation in the industrial sector of Pakistan. To determine the effect of relative factor prices on employment, regression techniques have been used to estimate the elasticity of substitution between capital and labour. An effort was also made to diagnose the magnitude of underutilisation of capacity in the large-scale manufacturing sector of Pakistan. A model of capacity utilisation was developed to incorporate all those possible factors affecting capacity utilisation in Pakistan. Examined in this context the major findings of the thesis are as follows:

(a) Our analysis of factor price distortions lends support to the view that various forms of government industrial, trade, fiscal and monetary policies were responsible for distorting relative factor prices in the large-scale manufacturing sector of Pakistan. However, industrial strategy in Pakistan was influenced mostly by the fashionable ideas of the time. During the 1960s, government policy was influenced by the common belief at that time that growth and equity are complementary and not competitive objectives. High priority was given to the industrial strategy brought a serious misallocation in the use of resources in the economy. Neglect of many other aspects of development which were necessary for the smooth functioning of the economy created economic, social, and political crises. For example, the mobilisation of domestic resources through financial institutions could not be realised in accordance with investment requirements and the economy became dependent on foreign aid. High protection to industries created an inefficient industrial structure which even after a long period of development, could not stand on their own feet. Excessive subsidies of capital encouraged excess capacity and a wastage of scarce resources in the economy.

However, since 1972, the chief aims of the government policy are to gain equity and social welfare and to increase employment opportunities in different sectors of the economy. Since then many policy reforms have been undertaken to remove factor price distortions in order to reflect the scarcity price of inputs. Unfortunately, the real cost of industrial labour has increased substantially. Although other factors may also be at work, government labour policies seemed to have played a major role in raising the real cost of industrial workers. The high real cost of labour has again shifted the balance of relative factor prices in favour of more use of capital. We may conclude from the analysis of factor price distortions that the policy objectives of the government are contradictory.

(b) To determine the role of relative factor prices on employment we have used the CES production function and estimated the elasticity of substitution between capital and labour. If the elasticity is high, a change in relative factor prices will change capital-labour ratio significantly. A low magnitude of the elasticity of substitution in manufacturing reflects rigidity in the choice of techniques of production. The form which we have used for estimation of the elasticity of substitution relates real wage rate changes to labour productivity. The effect of output induced changes on labour productivity has been also taken into account in our empirical estimates.

The estimation of the elasticity of substitution between capital and labour in the large-scale manufacturing sector of Pakistan for the year 1984-85 revealed that for the whole manufacturing sector the elasticity of substitution is positive and significant and there is a possibility of substituting capital for labour. Nevertheless the magnitude of the elasticity of substitution is low in the whole manufacturing sector implying that mere removal of factor price distortions may not provide sufficient employment opportunities. However, the magnitude of the elasticity varies between industries and some sectors such as industrial chemicals, textiles, and miscellaneous, show a substantial effect of relative factor price on the choice of techniques. In the textile industry, a major sector of the economy, high elasticity estimates indicate a great potential for increasing output and employment via changing relative factor prices. The results we obtained from the empirical exercise were found to be broadly consistent with widely held a priori views.

On the basis of our empirical results we accept the hypothesis that any change in relative factor prices will affect employment in the sector.

However, there are many other factors which may also affect techniques of production and employment irrespective of changes in relative factor prices. For example, economies of scale may determine specific techniques of production and may affect employment opportunities in the sector. Similarly, the nature of technology, and the type of labour used may also affect employment potential in the sector via their effect on productivity.

The magnitude of the elasticity of substitution between capital and labour between two time periods have shown that elasticity has fallen. A high magnitude of the elasticity of substitution between capital and labour in 1977-78 suggests that distortions in relative factor prices may have considerably affected choice of techniques and produced a bias towards capital intensity in the intermediate group of industries which were the top priority at that time. However, estimates of the elasticity of substitution are lower in 1984-85, implying that techniques of production have become relatively rigid with the passage of time. The use of imported technology may have limited choice and reflects the lack of indigenous technology in the industrial sector. We may conclude that on the one hand Pakistan needs to keep an eye on factor price distortions, and on the other that the development of indigenous technology is required. Many prerequisites such as the availability of trained and efficient labour, the innovative capacity and ability of the investors, increase in expenditure on R & D etc. are necessary for the development of indigenous technology.

We may conclude only tentatively that the large scale manufacturing sector of Pakistan has a great potential to generate employment opportunities. If factor price distortions can be eliminated or minimised, there is scope for generating more employment opportunities.

(c) Turning to the magnitude of the under-utilisation of the existing stock of capital we have seen that it is another important characteristic of the industrial sector of Pakistan. There is not only a wastage of scarce resources but also many jobs are not realised due to the low utilisation of the stock of capital. Hence, an increase in capacity utilisation through increasing total working hours provides an optimistic hope to generate employment opportunities. Even if there is no immediate impact of increased capacity utilisation on employment, it may have an indirect effect via its effect on income distribution. We have calculated that the manufacturing sector of Pakistan is utilising only 43 per cent of its capacity. Our model of capacity utilisation shows that several supply factors obstruct full utilisation of the existing stock of capital. Power failure, size of firms, labour productivity etc. all influence the rate of capacity utilisation. Our survey analysis was aimed at discovering factors affecting capacity utilisation from an industrialist's point of view. The survey results support many of our earlier hypotheses relating to the utilisation of capacity. They show that load shedding is considered a very important factor in determining capacity utilisation by all firms irrespective of their number of shift working, size and factor intensity. Other important factors are lack of credit facilities, high labour cost and shortage of imported raw material.

The nature of these factors is domestic and appropriate government policy may help in increasing utilisation of the existing capacity. For example, the availability of regular power supply will encourage more utilisation of the idle stock of capital which in turn may exert a positive influence on employment.

(d) Finally, we may say that the solution to the employment problem is not as simple as it may seem. It requires not a single policy but simultaneous interlinked policies at a time to solve the problem. In fact a prudent policy is required if the government of Pakistan is serious in solving the employment problem.

This study suggests altering the present level and structure of incentives to reduce the degree of capital intensity and import dependence and making the package of concessions more specific in character. Employment in the manufacturing sector can be increased if imperfections in factor markets are removed. Moreover, capacity utilisation provides an option to absorb more labour in the manufacturing sector. Firms could be given incentives which would lead to higher levels of capacity utilisation.

Many aspects of employment however have not been considered in the present study. There is scope for further research on many other issues. For example, if factor price distortions are removed, what would be the impact on productivity and output? Which type of labour will be demanded? What would be the overall impact on the rate of saving? What role do TNCs play in affecting techniques of production and how far can employment be affected by these corporations?

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ANNEX-A

Annex Table A-1: Composition of Manufacturing Value-Added, 1970-1985

(1975-76=100)

INDUSTRIES	VALUE-ADDED (in millions)		SHARE OF VA (% to total)	
	1970	1985	VA 1970	VA 1985
1	2	3	4	5
Total Industries	9688	24684	100.0	100.0
Consumer Goods Industries	6568	13301	67.8	53.9
1 Food manufacturing	1432	4421	14.8	17.9
2 Beverage	58	563	0.6	2.3
3 Tobacco	771	2834	8.0	11.5
4 Textiles	3129	3926	32.3	15.9
5 Wearing apparel (except footwer)	0	135	0.0	0.5
6 Leather & leather products(except footwear & wearing)	191	265	2.0	1.1
7 Footwear(except ruber and plastic)	137	23	1.4	0.1
8 Ginning, pressing & baling of fibres	0	358	0.0	1.5
9 Wood & Cork products	8	69	0.1	0.3
10 Furniture and fixture (except primary metal	14	43	0.1	0.2
11 Paper & paper products	127	252	1.3	1.0
12 Printing, pressing & allied industries	143	274	1.5	1.1
13 Pottery China	0	57	0.0	0.2
14 Miscellanous	558	81	5.8	0.3
Intermediate Goods	2290	9088	24.5	36.9
15 Drugs & Pharmaceutical	0	984	0.0	4.0
16 Industrial Chemicals	0	2139	0.0	8.7
17 Other chemicals	864	771	8.9	3.1
18 Petroleum Refineries	0	344	0.0	1.4
19 Products of petroleum & coal	773	128	8.0	0.5
20 Rubber products	0	310	0.0	1.3
21 Plastic products	83	157	0.9	0.6
22 Glass & glass products	0	130	0.0	0.6
23 Non-metallic minerals	419	1516	4.3	6.1
24 Iron & steel	234	2604	2.4	10.6
25 Non-ferrous basic metal industries	0	5	0.0	0.0
Capital Goods	747	2295	7.7	9.3
26 Fabricated metal	173	250	1.8	1.0
27 Machinery non-elect.	117	607	1.2	2.5
28 Electrical machinery	322	746	3.3	3.0
29 Transport equipment	135	634	1.4	2.6
30 Professional goods	0	58	0.0	0.2

Source: Economic Survey, 1991-92.

Annex Table A-2: Growth and Structure of Manufacturing Employment in the Large-Scale Manufacturing Sector, 1970-85

INDUSTRIES	EMPLOYMENT (in millions)		SHARE OF EMPLOYMENT (% to total)	
	1970	1985	1970	1985
1	2	3	4	5
Total Industries	418	493	100.0	100.0
Consumer Goods	296	308	70.8	62.5
1 Food manufacturing	34	64	8.1	13.0
2 Beverage	2	5	0.5	1.0
3 Tobacco	11	10	2.6	2.0
4 Textiles	198	175	47.4	35.5
5 Wearing apparel (except footwer)	-	7	-	1.4
6 Leather & leather products(except footwear & wearing)	5	5	1.2	1.0
7 Footwear(except ruber and plastic)	7	1	1.7	0.2
8 Ginning, pressing & baling of fibres		-14	0.0	2.8
9 Wood & cork products	1	2	0.2	0.4
10 Furniture and fixture (except primary metal	2	2	0.5	0.4
11 Paper & paper products	6	8	1.4	1.6
12 Printing, pressing & allied industries	9	9	2.2	1.8
13 Pottery china	-	3	0.0	0.6
14 Miscellaneous	21	3	5.0	0.6
Intermediate Goods	58	118	13.9	23.9
15 Drugs & pharmaceutical	-	15	0.0	3.0
16 Industrial chemicals	-	17	0.0	3.4
17 Other chemicals	22	8	5.3	1.6
18 Petroleum refining	-	3	0.0	0.6
19 Misc. products of petroleum & coal	2	1	0.5	0.2
20 Rubber products	3	10	0.7	2.0
21 Plastic products	-	4	0.0	0.8
22 Glass & glass products	-	4	0.0	0.8
23 Non-metallic minrals	17	16	4.1	3.2
24 Iron & steel	14	40	3.3	8.1
25 Non-ferrous basic metal industries	-	-	-	-
Capital Goods Industries	64	67	15.3	13.6
26 Fabricated metal	18	9	4.3	1.8
27 Non-elec. machinery	13	18	3.1	3.7
28 Electrical machinery	16	18	3.8	3.7
29 Transport equipment	17	19	4.1	3.9
30 Professional goods	-	3	-	0.1

Source: Economic Survey, 1991-92.

Annex Table A-3: Implicit Exchange Rates For Industrial and Agricultural Goods and Domestic Agriculture Terms of Trade. Implicit exchange rates (Rs per $)

	Manufactured goods (weighted by agricultural purchases)	Agricultural goods (weighted by marketings)	Agriculture's domestic terms of trade relative to world price standard (%)
1951 - 1953	8.62	3.43	39.8
1952 - 1954	9.21	3.48	36.7
1953 - 1955	9.39	3.40	36.2
1954 - 1956	8.94	3.84	43.0
1955 - 1957	9.98	4.38	48.8
1956 - 1958	8.87	4.78	53.9
1957 - 1959	8.81	4.77	54.1
1958 - 1960	8.58	4.94	57.6
1959 - 1961	8.55	5.05	59.1
1960 - 1962	8.37	5.19	62.0
1961 - 1963	8.27	5.12	61.9

Note: The fiscal year starts from 1st July of each year and ends on 30th June.
Source: Lewis S.R., (1970), Pakistan - Industrialisation in Trade Policies, OUP London, pp. 64-65.

Annex Table A-4: Growth Rates in Key Sectors (at 1959-60 prices)

	Agriculture	Large-Scale Manufacturing	Per Capita Income	GDP
1950-55	3.8	23.7	0.7	3.1
1955-60	- 0.6	7.6	0.5	3.1
1960-65	3.8	16.8	3.8	6.8
1965-70	6.5	9.9	3.8	6.7
1970-75	0.8	3.8	1.2	4.3
1975-80	3.9	5.7	3.3	5.3
1980-85	3.3	9.8	3.4	6.8
1985-88	4.3	7.2	2.4	6.2

Calculated from Economic Survey, 1991-92.

Annex Table A-5: Annual Rates of Growth of Manufacturing and its Principal Sectors

Sector	1963-64-1970-71 (Current-Prices)	1963-64-1970-71 Constant Prices of 1963-64
Large Scale Manufacturing	12.9	9.0
Consumer goods	14.5	11.0
Intermediate goods	11.2	5.7
Investment goods	7.2	1.7

Source: Guisinger, (1976), table 2.

Annex Table A-6: Foreign Aid

	Foreign Aid (US $ Million)	Grant and Grant Like Assistance (%)	Loans Repayable in Foreign Exchange (%)
1950-55	337	70	30
1955-60	1075	80	20
1960-65	2911	46	54
1965-70	2937	31	69
1970-78	6967	12	88
1978-83	7233	22	78
1983-88	11907		
1983-84	1989	25	75
1984-85	2311	22	78
1985-86	2294	22	78
1986-87	2626	23	77
1987-88	2687	25	75

Source: Economic Survey, 1988-89.

Annex Table A-7: Investment in Large-Scale Manufacturing Sector (at current prices)

(Rs in million)

Years	Private Sector	Public Sector	Total
1969-70	1208	177	1385
1970-71	1224	69	1293
1971-72	2026	97	1113
1972-73	763	110	873
1973-74	697	375	1073
1974-75	990	1057	2047
1975-76	1309	3160	4469
1976-77	1526	4488	6014
1977-78	1539	6133	7672
1978-79	1569	6638	8207
1979-80	2177	6573	8750

Source: Economic Survey, 1980-81.

Annex Table A-8: Comparison of Protection Rates: Manufacturing Activities (1963-64, 1970-71,1972-73)

(Percentage)

Sector	1963-64 Nominal Protection	1970-71 Nominal Protection	1972-73 Nominal Protection
Simple average of Consumer goods	**157**	**128**	**63**
Sugar	215	266	57
Edible Oils	106	54	62
Cotton Textiles	56	76	0
Other Textiles	350	141	88
Printing and Publishing	28	43	57
Soaps	94	43	34
Motor Vehicles	249	270	61
Simple average of Intermediate goods	**85**	**66**	**43**
Wood and Lumber	73	85	108
Leather Tanning	56	76	0
Rubber Products	153	55	48
Fertilizers	15	25	na
Paints and varnish	102	56	34
Chemicals	81	56	34
Petroleum products	107	121	65
Paper products	94	57	69
Simple average of Capital goods	**90**	**86**	**50**
Non metallic mineral products	154	76	70
Cement	75	76	70
Basic metals	66	96	32
Metal products	95	102	64
Non-electrical machinery	89	81	44
Elec. machinery	60	83	47
Simple average of all Industries	**110**	**92**	**52**

Source: Guisinger S., and M. Irfan, (1981), Trade Policies and Employment: The Case of Pakistan, in Trade and Employment in developing countries, in Krueger et al (ed) (1981), p.313.

Annex Table A-9: Effective Protection rate1 and domestic resource cost ratio by market orientation, 1980-81

Market Orientation of industries	Effective Protection Rate	Domestic Resource Cost
Export-oriented	551	8.5
Export-oriented and import-competing	76	2.9
Import-competing	42	6.8
Import non-competing	-7	3.1

1 Effective protection is the percentage differential between the value added at domestic prices and at world prices, thus indicating the combined effects of various protective policy measures (tariffs, quotas, subsidies, etc.)

Source: Naqvi, S.N.H. and Kemal A.R., The Structure of Protection in Pakistan: 1980-81, Islamabad 1984, p.9 (vol. 11).

Annex Table A-10: Nominal Protection Rates, Excise Duties and Export Subsidies, 1983-84

Industry	Nominal Protection Rate	Excise Duties	Export Subsidies
Cigarettes	300	61	28
Cotton yarn	60	Rs1/kg	12
Cotton fabrics	115	10	22
Silk and art silk	218	15	43
Tents and Tarpaulins	87	15	17
Made-up textiles	164	15	27
Knitting mills	275	30	33
Carpets and rugs	200	30	17
Wearing apparel	275	30	28
Leather goods	135	10	29
Leather footwear	164	15	13
Printing other than books	212	30	13
Pigment and Dyes	104	22	15
Paints and Varnishes	104	22	36
Talcum Powder	100	39	24
Soaps and Detergents	140	50	19
Matches	300	6	-
Tyres and tubes	108	30	38
Rubber products	131	10	17
Plastic products	142	10	37
Sewing machine	160	-	Rs41/machine
Electric fans	68	Rs1-2/fan	55
Cycles	122	10	-
Surgical instruments	10	-	35
Sports equipment	63	10	41

Nominal protection rate is tariffs plus sales tax on imports as percentage of cif values.

Source: Economic Survey, 1984-85, p. 128.

Annex Table A-11: Major Manufactured Exports
(Rs in million)

	1969	1974	1979	1984	1989
Textiles					
Cotton and Cotton Products (excluding cotton garments)	512	2227	4524	8684	29982
	(58)	(50)	(40)	(46)	(45)
Garments and Hosiery	19	245	731	2662	15341
	(2)	(6)	(6)	(14)	(23)
Synthetic textiles	17	22	54	636	4556
	(2)	(0.5)	(0.5)	(3)	(7)
Non-textiles					
Leather	109	367	1264	2325	6002
	(12)	(8)	(11)	(13)	(9)
Footwear	23	126	106	248	504
	(3)	(3)	(1)	(1)	(0.8)
Cement	19	280	-	-	37
	(2)	(6)	-	-	(0.05)
Tobacco raw and manufactured	17	133	81	158	213
	(2)	(3)	(0.7)	(1)	(0.3)
Drugs and Chemicals	12	116	122	127	476
	(1)	(3)	(1)	(0.7)	(0.7)
Surgical instruments	15	129	240	774	1502
	(2)	(3)	(2)	(4)	(2)
Carpets and rugs	55	456	2198	2031	4923
	(6)	(10)	(19)	(11)	(7)
Sports goods	30	205	245	674	2311
	(3)	(5)	(2)	(4)	(3)
Petroleum & products	49	139	1764	525	235
	(6)	(3)	(16)	(28)	(0.4)
All manufactured Exports	877	4425	11329	18844	66082

The values in parenthesis are the percentage to total.
Source: Pakistan Economic Survey 1991-92.

Annex Table A-12: Disbursement of Loans by Development Finance Institutions

(Rs in million)

Institutions	1984-85	1985-86	1986-87
1 Investment Corportaion of Pakistan	130	208	218
2 Equity Participation Fund	13	20	26
3 Bankers Equity Limited	645	654	818
4 Pak-Libya Holding Company	146	230	309
5 Pak Kuwait Investment Corporation	28	42	46
6 Saudi-Pak Investment & Agricultural Investment Company	69[r]	91	162
7 Pakistan Industrial Credit and Investment Corporation	415	672	571
8 Industrial Development Bank of Pakistan	539	563	916
9 National Development Finance Corporation[1]	3410	5648	8436
10 National Development Leasing Corporation[2]	41	167	218
11 Regional Development Finance Corporation[3]	52[r]	68	122
12 Small Business Finance Corportaion	62	72	198
Total:	**4377**	**8435**	**12040**

r Revised figures
1 Including Public Sector Financing by NDFC.
2 Started operation in January,1985.
3 Started operation in May, 1984.
Source: Pakistan Industrial Credit and Investment Corporation LTD. (1986) and (1987).

Annex Table A-13: Investment Sanctions and Disbursements of Loans to Major Group of Industries by PICIC, IDBP, and NDFC (1983-84 to 1985-86)

(Rs in Million)

Industry Group	Sanctions (1983-march 1986)	Disbursements (1983-85)
Food Manufacturing and Tobacco	4242	1973
Textiles	5163	911
Leather & leather products	143	9
Rubber & Rubber Products	255	20
Paper, Pulp & Wood Products	2361	208
Chemical, Synthetic Fertilizers Petro-chemicals and Petroleum	12884	948
Electronics	581	-
Basic Metals	2053	15
Metal Products	1637	62
Machinery other than electronics	7883	902
Electrical machinery, equipment and apparatus	1002	19
Transport equipment/Automobiles	1472	653
Miscellaneous	2292	1355
Cement & Non metallic & other products	4829	1134
Ceramic	-	105
Total:	**46797**	**8314**

The sanctions exclude the figures by NDFC.
Source: Government of Pakistan, Planning Commission (1987), Seventh Five Year Plan (1988-93) and Perspective Plan (1988-2003). p.34.

Annex Table A-14: Employment Cost of Industrial Workers in Major Group of Industries (1974-75- 1986-87)
(in current prices)
(Value in thousands of Rs)

Industries	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Food Manufacturing	7.0	8.8	10.2	10.9	12.7	13.8	17.0	19.1	20.4	23.4	26.5	27.8
2 Beverage industries	6.1	7.8	10.5	11.5	13.2	14.5	18.4	18.4	18.4	20.9	23.2	26.7
3 Tobacco industries	7.4	9.7	9.7	10.8	11.9	10.4	15.7	16.1	19.3	19.9	19.0	21.7
4 Textiles	5.1	5.5	6.2	6.8	8.4	9.4	10.4	11.8	12.6	14.1	16.1	18.1
5 Wearing Apparel	9.5	9.6	7.2	9.6	12.7	14.3	14.9	18.7	22.2	19.6	22.1	23.1
6 Leather and leather products	1.3	6.0	7.3	8.2	10.3	8.9	12.8	13.7	16.9	19.7	18.2	22.8
7 Manufacture of footwear	5.8	7.0	8.1	8.6	10.9	13.1	10.1	13.2	15.0	17.0	17.0	36.3
8 Ginning, pressing & bailing of fibres	3.1	4.5	5.2	5.4	6.7	8.1	8.2	8.6	9.3	11.7	15.4	17.3
9 Wood and cork products	5.0	6.0	6.6	7.9	10.2	10.7	13.4	14.2	13.8	18.0	17.8	20.3
10 Furniture & fixture	6.1	6.7	7.3	7.6	10.3	13.5	12.7	13.1	15.4	16.1	16.2	17.7
11 Paper & paper products	6.7	8.9	10.5	10.7	13.6	15.6	17.2	18.5	20.2	21.3	23.8	26.4
12 Printing and Pressing	4.5	7.4	9.2	10.4	10.5	10.1	15.7	18.8	20.6	21.2	29.1	26.4
13 Drugs & pharmaceutical	5.4	14.9	15.2	17.4	19.9	20.4	24.5	26.9	32.2	35.0	37.2	45.4
14 Industrial chemicals	10.6	12.7	15.5	15.4	21.1	24.0	29.4	31.3	35.9	38.9	38.6	47.3
15 Other chemical products	2.3	9.4	10.9	14.0	15.2	15.6	20.5	22.0	22.9	28.6	26.1	31.1
16 Petroleum and coal	12.5	11.0	11.5	17.4	24.4	15.7	24.4	11.3	29.5	20.5	25.0	35.1
17 Rubber products	6.4	7.2	8.1	10.6	9.2	12.0	15.9	17.1	19.8	20.9	25.2	25.5
18 Plastic products	5.9	7.7	9.4	12.5	14.0	14.8	20.8	18.1	18.8	23.8	26.7	26.8
19 Pottery China	5.8	6.1	7.1	8.0	9.0	10.9	10.9	10.9	11.0	14.8	16.9	24.1
20 Glass & glass products	5.1	5.3	6.3	7.6	8.7	10.5	12.7	15.0	16.5	18.8	23.0	24.4
21 Non-metallic mineral products	3.8	9.3	12.5	16.0	17.3	17.4	25.0	26.7	31.3	35.0	40.7	42.3
22 Iron & steel	7.0	9.4	10.0	10.8	11.9	14.2	8.2	24.8	28.0	27.3	32.5	42.0
23 Non-ferrous metal	7.0	6.2	7.8	8.6	9.6	131.1	9.1	17.0	17.0	17.4	20.7	30.0
24 Fabricated metal products	6.3	7.0	9.0	10.0	11.6	12.5	12.9	14.1	17.2	37.8	19.1	23.8
25 Machinery (non elec.)	6.8	7.2	7.1	9.9	11.0	14.7	16.3	17.9	21.8	23.5	26.4	28.6
26 Machinery (electrical)	8.1	8.8	10.5	12.8	13.3	15.2	16.5	17.6	22.0	23.7	26.9	33.0
27 Transport	8.6	11.0	13.1	17.9	16.3	18.2	22.2	30.0	27.0	27.8	31.2	33.6
33.6												
28 Miscellaneous	27.1	25.4	20.0	25.0	41.1	35.0	47.0	54.8	59.3	87.3	59.4	58.9

Note Fiscal year of Pakistan starts from 1st July of each year and ends on the 30th June of next year, hence 1975 will be read as 1975-1976 and so on.
Source: CMI, (1977-78) and Economic Survey, (1991-92).

ANNEX-B

Survey Methodology

For survey purpose, the province of Punjab was selected mainly because over 50% of all kind of industries are established in this province (CMI, 1984-85). Moreover, limitations involved in terms of finance and time obliged the enumerators to confine the scope of the present research to only this province. A list of all zones within the Punjab province having industries was made and two zones (Lahore, Faisalabad) where 80% of industries are located were selected. These zones are considered to be highly industrialised and contain all kinds of industry. A list of industries at the five digit level was obtained for each zone and a total sample of 84 firms was selected on the basis of their largest share in total value added in the manufacturing sector. As these firms have a high share in total manufacturing value added so any change in their value added may have great impact on the overall manufacturing sector. The example can be given of the textile industry which has a high share of value added in manufacturing and any change in its output changes the whole structure of manufacturing sector. On the basis of this we may hope that these firms are representative of the manufacturing sector of Pakistan. Altogether these firms accounted for 40% of value added in the industrial sector in 1984-85. These firms produce different type of products such as garments, soap, sugar, metal, paper and ghee etc. The names and addresses of these firms were obtained from the Yellow Pages of Pakistan (1993) which is the only available source and is widely used.

The questionnaire (which is enclosed) consists of two parts. The first part deals with the number of shifts worked, sources of energy and the frequency of load shedding during 1985 and 1993. Our object was to test specific hypothesis concerning factors affecting capacity utilisation particularly the load shedding problem. Hence we start asking specific questions about the load shedding problem in the first part.

The second part is designed to investigate the problems confronted by owners/managements in the full utilisation of their plant capacity. A list of 12 factors was presented to the firms to determine the degree of importance of factors affecting capacity utilisation. The list contains demand side factor, supply side factors and other factors drawn from both the theory of capital utilisation and with particular reference to Pakistan's economy (see Section 7.4 for details). The questionnaire was vetted by experts working in similar areas and questions were added or deleted as considered necessary. The questionnaire was translated into "Urdu" national language. This helps the interviewee to clearly understand questions and reply in an effective manner.

The survey was conducted by the enumerators by interviewing the executive management of industries personally. However, some of the managers were happy to answer the questionnaire by themselves and in this case the questionnaire was handed over to them. The survey results were collected from them on the agreed date later on. The response rate was 95% and since those non-respondents were not replaced, data on 80 firms was obtained. In general the survey was completed satisfactorily.

The data was analysed using basic statistical techniques. Frequency distribution tables were developed.

Statistical Significance of Results

The significance of survey results has been tested statistically as follows:

Let p be the proportion of All industrialists who say that load shedding is very important. If load shedding is very important then

$$p > 0.5$$

Null hypothesis

$$H_o: p < 0.5$$

Alternative hypothesis

$$H_1: p > 0.5$$

n = 80

If Ho is true with p = 0.5

then observed proportion

$$X \sim N\left(p, \frac{(1-P)}{n}\right) \text{ (approximately)}$$

Reject Ho if

$$X > 0.5 + 1.645\sqrt{\frac{0.5 \quad 0.5}{80}} = 0.59$$

where 1.645 is the value at the 5% level of significance.

If 100X% > 59% then observed proportion is significant at the 5% level.

Overall Observed proportion of supply side factors is greater than 59%, hence these are statistically significant.

QUESTIONNAIRE

EVALUATION OF THE CAUSES OF UNDERUTILIZATION OF CAPACITY IN THE MANUFACTURING SECTOR OF PAKISTAN DURING 1985-93

SECTION (A): GENERAL INFORMATION

1. Name & Address of Industry______________________________
   ____
   ____
2. Name of the person contacted______________________________
3. Position(Proprieter/Director/Manager)____________________
4. Period since Production started_________________________
5. Initial Investment cost(Rs.)_____________________________
6. Total employees___________
7. Average total cost of production per year(Rs.)__________
8. Average cost of labour per year(Rs.)____________________
9. Average annual production/output(Rs.)___________________
10. What are the main energy sources being utilized in your industry since 1985. Please tick ( ) as appropriate.

ENERGY SOURCE	YEAR 1985	1986	1987	1988	1989	1990	1991	1992	1993
Gas									
Elect.									
Oil									
Coal									
Wood									
Other Specify									

12. Have you ever faced energy/load-shedding problem since 1985? YES/NO

13. What is the frequency of load-shedding since 1985?

YEAR	FREQUENCY Total No. of days during the year	Average No. of Hours per day
1985		
1986		
1987		
1988		
1989		
1990		
1991		
1992		
1993		

14. Do you think that load-shedding has the following effects?

(a) Output is reduced (in terms of money/year) ----------

(b) Workers are reduced as redundant (No.) ------------

(c) Anyother. ---------------------------------------

15. Does your electricity consumption is reduced due to load-shedding? YES/NO

16. What are the alternative sources of energy during load-shedding?

(a) Generator (b) Anyother___________ (c) None

17. Does load-shedding affect total working hours of industry? YES/NO

SECTION (B): CAPACITY UTILIZATION

1. Do you work on shift basis? YES/NO

2. If yes, please tell us the following:-

(a) Total No. of shifts (1 / 2 / 3)________________

(b) Total No. of hours per shift (8 / 9 / 10)_______

(c) Total No. of workers per shift________________

3. Are you utilizing maximum installed capacity of your industry since last 5 years? YES/NO

4. Are you interested to increase the No. of shifts to maximise total output of your industry? YES/NO

5. Do you think that following are the major reasons for underutilisation of your industrial capacity since 1985?

Please rank using the following numbers:

Most important	1	Important	2
Less important	3	Not at all	4

For example, if you think shortage of electricicity is the most important factor, put number 1, and if you think second important reason high management costs give number 2.

Reasons	Years 1985	1986	1987	1988	1989	1990	1991	1992	1993
DEMAND SIDE FACTORS									
Lack of domestic demand									
Lack of demand for exports									
Import policy/competing imports									
SUPPLY SIDE FACTORS									
Shortage of electricity/ load-shedding									
Shortage of imported raw-materials									
Shortge of skilled-labour									

continued

Reasons	Years 1985	1986	1987	1988	1989	1990	1991	1992	1993
High managment cost									
High labour cost									
Lack of credit facilities									
Transportaion problems									
RANDOM FACTORS									
Political unrest									

6 If the above mentioned obstacles which you face are removed, would you like to increase total working hours/shift and increase capacity utilisation of your industry to produce more? YES/NO