

The Structure of Employee Compensation in Saudi Arabia: The Case of Chemical and Petrochemical Industries

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A thesis submitted in partial fulfilment of the requirements of the
University of Hertfordshire for the degree of Doctor of Philosophy

The programme of research was carried out in the Department of
Accounting, Finance and Economics, Business School, University of
Hertfordshire

July 2005

ACKNOWLEDGEMENTS

My deep and sincere gratitude is due to my parents in their memorial.

I am indebted to my supervisors Dr Ya Ping Yin, Dr Jane Hardy, and Dr Ahmed A. Ahmed for their patient supervision, valuable advice, guidance, editing this thesis, and for their immense help to carry out this work. My thanks also go to Dr. Armand Barrientos for his previously supervision of the work and cooperation.

I would like also to express my thanks to all staff of the Business School for help and cooperation while I was in the school.

I am also extremely appreciative of my wife Maha, and children Ghassan, Nuha , and Mohamed for helping to get more time to finish the work.

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ABBREVIATIONS

CDS	Central Department of Statistics
SOCAL	Standard Oil of California
ARAMCO	Arab American Company
IPA	Institute of Public Administration
GCC	Gulf Cooperation Council
CPF	Civil Pension Fund
GOSI	General Organisation for Social Insurance
EURFLWC	European Foundation for the Improvement of Living Working Conditions
ISIC	International Standard Industrial classification
SABIC	Saudi Arabia Basic Industries Corporation
MUAQIB	Government Affairs Officer
ZAKHT	An Islamic tax on capital
SBT	Skill biased technology
AJANIB	Foreign workers or non-Saudis
KAFEEL	Saudi sponsor
IQAMA	Residency card
HCM	High Council for Manpower
SAMA	Saudi Monetary Agency

ABSTRACT

This study examines the wage differentials and wage discrimination among employees in the chemical and petrochemical industries in Saudi Arabia. The context of segmentation is discussed through a detailed examination of the distinct features of the Saudi labour market, with a special emphasis on the Saudisation labour policy that reflects government intervention in the labour market. Under the Saudisation labour policy, the government compelled private firms to attract Saudi nationals to join their services and to secure them permanent jobs. The present study discusses how this policy has distorted the structure and function of the Saudi labour market from both the demand and supply side perspectives.

Due to the lack of official data on the Saudi labour market and the restrictions by the Statistics Law in Saudi Arabia on access to any cross-sectional data, a purpose designed cross-sectional survey was conducted among a sample of six hundred Saudi and non-Saudi workers in these industries. Simple statistical analyses of the survey returns have revealed substantial differences in the pay and working conditions between Saudi and non-Saudi workers across a number of personal characteristics, such as levels of education, occupation, years of working experience and marital status. Regression analyses have further confirmed the significant differences in the effects of supply side factors on the monthly earnings on Saudi and non-Saudi workers.

Using the Oaxaca-Blinder technique to measure and to decompose differences in average monthly earnings between Saudis and non-Saudis in the chemical and petrochemical industries, the study reveals that the aggregate earnings differentials between the two groups of workers is 62.6% in favour of Saudi workers, while the explained portion of the earnings differential between the two groups of workers is estimated at 3%, and the unexplained portion is calculated at 97%, which indicates a significant level of discrimination in the chemical and petrochemical industries.

This study provides an original and systematic attempt at examining wage differentials and wage discrimination with emphasis on the sources of segmentation in the Saudi Arabian labour market between indigenous and migrant

workers. It contributes to bridging the gap in the studies on wage differentials and the labour market's segmentation in Saudi Arabia with a hope that the economic reforms that have started in the country will consider such issues to reform its labour market policy.

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The Saudi economy was transformed from a subsistence economy by the discovery of oil in 1938. In the next few decades, labour shortages forced oil companies to import both skilled and unskilled foreign workers. This situation was exacerbated in the 1970s when the expansion of the economy increased the demand for labour from 1.1 million to 1.5 million workers between 1970 and 1975. The demand subsequently doubled between 1975 and 2000, as the result of the rapid economic development that followed the oil boom revenues of the 1970s. The supply of indigenous Saudi workers simply could not keep up with the pace of growth in labour demand and the country has experienced a substantial rise in the number of foreign or non-Saudi workers. In fact, foreign or non-Saudi workers now dominate the labour force in Saudi Arabia, accounting for 51% of the labour force in 2000. It is worth noting that the proportion of foreign or non-Saudi workers has reduced noticeably from 61% in 1980 over the past two decades as a result of the Saudi government's Saudisation policy, which is to be discussed in detail later.

Despite the significant shortage of domestic labour supply and the dominance of the labour force by foreign or non-Saudi workers, there are apparent disparities in the pay and working conditions between the Saudi and non-Saudi workers. In 2002, the overall average monthly wage ratio between the two groups is found in this study as 3.7 in favour of Saudi workers. Moreover, Saudi workers, particularly in the public sector, have various privileges than their non-Saudi co-workers. Through labour laws and regulations, Saudi workers enjoy far superior access to various benefits over their non-Saudi workers, such as health services, pensions, training, and education. These aspects form the main dimensions of the labour market segmentation in the country.

While much work has been done on wage inequality and labour market segmentation in the developed economies, there has been much less focus on such

phenomena in the developing countries. The original contribution of this study is that it examines wage differentials and wage discrimination with reference to the sources of segmentation in the Saudi Arabian labour market between indigenous and migrant workers. This is done through a case study of the Saudi Chemical and Petrochemical industries. Previously, issues of wage differentials and wage discrimination, and labour market segmentation in Saudi Arabia have neither been a focus for research nor a goal of labour policy in the country. Therefore, it is hoped that this will contribute to the increasingly widespread discussion about labour market policy in the country.

1.2 ANALYTICAL FRAMEWORK

Firms hire labour in the market in consideration of a rate of compensation for using the labour service of the worker for a certain time period. Wages represent the main form of payment to compensate labour. The rate of compensation, or the wage rate, is determined by many factors. The mechanism by which the wage rate is determined reflects the constantly changing work relations between employers and employees in different labour markets. Even in a competitive labour market, firms pay different wage rates to their employees. This leads to wage differentials between workers in these labour markets in developed and developing countries, and across occupations.

There are many influences on wage differentials, such as gender, race, religion, size of firm, job-rank, age, industry, labour market experience, region, family background, training and education, immigration status, marital status, and number of family members (Tachibanaki, 1998). These influences are associated with the demand for and supply of labour factors that have a significant role in wage determination. The demand for labour is usually described as a derived demand, because labour is not demanded in itself but it is associated with the demand for goods and services products. Therefore, firms hire labour as a factor of production to combine with other factors, particularly physical capital, to produce these goods and services.

According to the neoclassical theory of the firm in a perfectly competitive market, the demand for factors of production is derived from the firm's optimal

production decision; that is, to employ each factor until its marginal revenue product is equal to the rental price of the factor. Therefore, in a perfectly competitive labour market, any factor that affects the marginal product of labour and the wage rate determines the demand for labour. Moreover, once imperfect competition is considered, other factors also emerge as additional determinants. As a result, a broad range of factors that include wage rates, employee benefits, the way products are produced, and the state of technology affect the demand for labour. In addition, government regulations on the labour market, international trade between countries, consumer preferences for products, and the skills of labour that are augmented through education, on-the-job training, and work experience are also important determinants.

Considering the supply of labour, the quantity of labour supplied depends on the number of individuals participating in the labour market and the number of hours they are willing to provide (Sapsford, 1981). Labour supply, like labour demand, is influenced by many factors, such as public policy, labour regulations, working day, employment, child labour, and information about the market price and demand conditions (Pencavel, 1986; Card, 1987). It is also influenced by some non-wage characteristics such as working conditions, job advancement, household size, payroll tax, social benefits, unionism, and job hazards (Altonji and Paxson, 1985), and the presence of immigrants in the labour markets of different countries.

However, various factors exist to distort the competitive nature of the labour market. It is found that in an imperfectly competitive environment, labour markets may be segmented into primary and secondary sectors (Doeringer and Piore, 1979). The former captures clean jobs, high and rising pay, and fringe benefits. In contrast, the secondary segment is characterised by low and stagnant pay, hazardous and insecure jobs, and an absence of fringe benefits.

Wage differentials and labour market segmentation are traditionally examined in the context of developed countries through theoretical and empirical studies, which provide the theoretical and methodological basis for the current study. Moreover, it must also be noted that the labour market in Saudi Arabia has distinct characteristics, because this labour market is not deeply rooted in the market system and, as a formal market for labour services, it has a relatively short

history. It emerged during the 1930s as a formal labour market that accompanied the economic development of the country when oil started to be exploited. Currently, it is still going through significant changes in both its functions and structure. The next few sections provide a brief review of the process of the emergence of the Saudi labour market and its salient features.

1.3 THE EMERGENCE OF THE LABOUR MARKET IN SAUDI ARABIA

Before the discovery of oil in Saudi Arabia in the 1930s, subsistence agriculture with its main components of raising livestock, cultivation, and fishing was the main economic activity apart from pearl diving. Cultivation and herding were carried out through the family or mutual collaboration among tribe members. However, some waged labour did exist in certain activities. For example, fishing and pearl diving were the main sources of income for native migrant workers from different parts of the country to the coastal areas. Some hired labour also emerged in agriculture to carry out irrigation through the manual elevation of water from wells. Nevertheless, there are no adequate wage records or statistics for that period. It is thought that the monthly wage rate during the 1920s and 1930s was about (Saudi Riyals) SR 80 per month or US \$21 in current prices (Ministry of Finance, 1999). Some small industries and handicrafts were found scattered in the big cities, such as cottage industries, building works, quarrying, and leather tanning. These firms were largely operated by hired labour. They were mostly paid for their work in kind, as monetary wages in their modern form only came into existence in 1910 (Ministry of Finance, 1999). This is due to the prevalence of the subsistence economy that was characterised by the limited market circulation of commodities and mutual collaboration among people.

Statehood started to be built when some public departments were established in the 1920s, which comprised the Royal Department, municipalities, courts, and finance and education departments, for example. Most other government departments were set up after the unification of the country in 1932. The number of employees in government agencies has increased gradually over the 1920s and 1930s, and non-Saudi nationals started to be recruited (IPA, 1999).

After the first oil discovery was made in Iran in 1908, the Gulf started to attract petroleum companies whose efforts resulted in more oil discoveries in Iraq, Bahrain, Saudi Arabia and the other Gulf countries (Luciani, 1984). In Saudi Arabia, oil was discovered in 1938 by Standard Oil of California (SOCAL), which was changed in 1948 into the Arab American Company (ARAMCO), and later nationalised by the Saudi government in 1975. As was the case in many Gulf countries, the growing oil industry in Saudi Arabia faced a shortage of both skilled and unskilled labour. This shortage forced ARAMCO to import foreign workers whose numbers increased significantly with the onset of commercial production of oil in 1946, from about 2,200 workers to more than 8,600 workers in 1951. This is in addition to Saudi migrants who moved from different parts of the country to join the oil and gold mining companies (Seccombe and Lawless, 1986).

There are no adequate records about the participation of women in the formal labour market in Saudi Arabia before the 1960s, when they started to be recruited for certain jobs in the public departments, particularly education and health care. Women were not recruited to jobs in manufacturing, construction, or similar activities in the country.

Increased oil production during the 1970s generated large public revenues, which increased from 4.3 billion US dollars in 1972 fivefold to 22.6 billion US dollars in 1973. Part of the oil revenues was allocated to finance large numbers of public and private sector projects. The public departments initiated many social and economic schemes, such as public utility services, industrial cities, hospitals, educational institutions, and municipal services. Meanwhile, many other industrial, agricultural, and services projects were launched by the growing private sector with government support, subsidies, and other financial incentives. For example, easy financing for private projects was available from development financial institutions that were set up with huge amounts of capital to provide real estate, industrial, agricultural, and even small business financing free of interest and with long periods of repayment extending to more than ten years. This policy increased the demand for labour from 1.103 million workers to 1.522 million workers over the period 1970-1975, and then the demand doubled with subsequent development plans, particularly during 1980-2000 (Development Plans, 1970-2000).

1.4 SPECIAL FEATURES OF SAUDI LABOUR MARKET

This section provides a brief introduction to the salient features of the Saudi labour market, which will be discussed and explained in detail in subsequent chapters.

1.4.1 A high unemployment rate among Saudi workers

Easy recruitment in the public sector with its numerous privileges encouraged Saudi workers to exhibit a strong preference for working in this sector rather than the private sector. Since the 1990s, the government has restricted recruitment of Saudi workers in the public sector, for certain jobs. At the same time, the unemployment problem started to emerge clearly for the first time since the oil discovery, reaching a rate of 13% in 1992 and then declining to 8.1% in 2000. To combat the unemployment problem, the government launched a Saudisation policy that aimed to replace non-Saudi workers with Saudi nationals.

1.4.2 Limited labour market participation by Saudi workers

Although the participation of Saudi workers in the labour force has slowly increased from a low rate since 1980, the current participation rate, which is the proportion of the employed and unemployed workers to the working population, remains low in comparison to international standards. In 1980, the rate was about 31% and only increased to about 35% in 2000. The low participation rate is fundamentally due to the very limited participation by women in the Saudi labour market. The majority, about 90%, of Saudi females were classified as non-participants in the labour market in 2000. Moreover, even among the Saudi males, the proportion of non-participants fluctuated around 40% of the working-age Saudi males.

1.4.3 Low skill base of the indigenous labour force

Since the beginning of oil production, Saudi Arabia has faced a shortage of skilled and unskilled labour. To tackle this problem, particularly over the 1970s and 1980s, the labour policy was directed to the importing of workers to satisfy

labour demand by new projects and businesses in both the private and public sectors. In addition, many training and educational programmes were launched to supply the needed skilled labour, primarily among the Saudi nationals. These programmes covered academic, technical education, and vocational training.

1.4.4 A significant proportion of foreign workers in the labour force

This is because of the labour supply shortage among native workers since the 1970s. Foreign workers, who were participating in different economic sectors but particularly in the construction and services activities, accounted for 51% of the total labour force participants. The majority, about 71% of the foreign workers, were employed in the private sectors in the year 2000 (Central Department of Statistics “CDS”, 2000).

1.4.5 A highly regulated labour market

There are numerous regulations governing different aspects of the Saudi labour market, such as migration control, labour regulations related to Saudi and non-Saudi workers in both the private and government departments, and pension regulations. These regulations reflect a significant degree of government intervention in the Saudi labour market.

1.4.6 A segmented labour market between Saudi and non-Saudi workers

The segmentation phenomenon in the Saudi labour market stems mainly from the government regulations and social values that make Saudi workers seek work mainly in managerial and administrative jobs. The prevailing labour regulations in Saudi Arabia provide these workers, particularly those in government departments, with various privileges over non-Saudi workers who represent most of the workers in the private sector, which has few privileges. Apart from other labour market factors and personal characteristics of Saudi and non-Saudi workers, government regulations have contributed significantly to the wage differentials and wage discrimination between the two groups of workers.

1.5 AIMS AND OBJECTIVES OF THE PRESENT STUDY

The overall aim of this study is to examine the extent of wage differentials and wage discrimination between Saudi and non-Saudi workers and to analyse their sources by examining the structure and operation of the labour market in Saudi Arabia. More specifically, the objectives of this study are:

- To evaluate how the regulatory system in Saudi Arabia might have contributed to the segmentation of the labour market and to the wage differentials;
- To explain the main sources of the wage differentials, including workers' personal and productivity characteristics, such as education and training, family structure, nationality or ethnicity, occupation, and non-wage privileges of the workplace.
- To investigate the extent of wage discrimination arising between the two groups of workers.

The main approach adopted by this study to achieve these aims and objectives includes:

- 1 - An examination of the literature on wage determination, and the available data on the Saudi labour market;
- 2 - A field survey of the workers in the chemical and petrochemical industries; and
- 3 - Regression analyses and decomposition of the collected cross-sectional data from the survey.

These objectives reveal the importance of the study, as the issue of wage differentials and wage discrimination has not yet been openly brought up in the Saudi labour market. It has neither become a subject of research nor a goal of economic policies, but the issue is there and is supported by some labour laws. Therefore, the importance of examining this issue is to contribute to bridging the gap in the studies on wage differentials and wage discrimination in Saudi Arabia with a hope that the economic reforms that have started in the country will consider such issues to remedy its labour market, and to increase awareness about distortions that create labour market segmentation in the country, on both the macro level and on the industry level.

1.6 RESEARCH METHODOLOGY

The analysis and explanation of different variables in this study are based on cross-sectional data on wages collected among workers in the chemical and petrochemical industries through a specific questionnaire that was designed for this purpose. This survey was carried out due to lack of such data from existing sources, as a result of restrictions by legislation in Saudi Arabia, which prevents access to any cross-sectional data from respondents to surveys conducted by the Statistical Department, which is the single authorised body for household surveys. The survey on which this thesis is based was carried out among workers of the chemical and petrochemical industries in the main three cities of the country: Riyadh, Jeddah, and Dammam. The analysis and investigation of this data are based on three techniques. First, simple percentile measures of workers' earnings are made in the 10th, median, and 90th upper percentiles. Second, regression analysis is used to explain the impacts of the controlled variables on the earnings structure of the employees in the selected industries. Third, wage differentials are decomposed using the Oaxaca-Blinder technique to measure both the explained and the unexplained portions of the raw earnings differentials between Saudi and non-Saudi workers in the chemical and petrochemical industries.

1.7 STRUCTURE OF STUDY

The study is organised into six chapters. The first is an introductory chapter that provides a review of the research, characteristics of the labour market in Saudi Arabia, and the aims and objectives of the study. Chapter Two presents a literature review on wage differentials. It discusses the theoretical aspects of the labour supply and labour demand determinants that influence wage differentials. Chapter Three discusses more details about the characteristics of the Saudi labour market and examines the segmentation phenomenon associated with labour market regulations in the country. Chapter Four is devoted to a discussion of the pay and working conditions in Saudi Arabia, particularly in the chemical and petrochemical industries. It discusses the research methodology and the data related to the study. A descriptive analysis of the earnings differentials between Saudi and non-Saudi workers in these industries is also presented. Chapter Five presents the empirical

analysis of the structure of employees' compensation in the chemical and petrochemical industries in Saudi Arabia using the cross-sectional data collected in the three main cities of the county. It discusses and employs the Oaxaca-Blinder technique to decompose wage differentials between Saudi and non-Saudi workers. Chapter Six provides a summary and the conclusions of the study.

CHAPTER TWO

REVIEW OF LITERATURE ON EARNINGS DIFFERENTIALS

2.1 INTRODUCTION:

In a market economy, the employment level and the wage rate are jointly determined by the interactions of the demand for and supply of labour in the labour market. The supply of labour reflects the decision by individual workers or their representative bodies (e.g., trade unions) to participate in the labour market under desired conditions, which typically include pay and working hours. This decision varies substantially across different labour markets due to differences in the organisation of the labour market (e.g., whether or not there is union representation), the macro and microeconomic environment, population structure, skill levels of workers, social values and culture, and individual preferences. The demand for labour primarily reflects the macro and microeconomic environment within which the firms operate. Under conditions of perfect competition, the demand for labour is derived from the optimal factor input condition that labour should be hired up to the point where the nominal wage equals the marginal revenue product of labour (MRP_L).

In the competitive labour market, all workers would have the opportunity to be paid the same unit wage rate (e.g., hour, month, or some other period) under the following conditions: 1) All workers have identical productivity and are perfectly substitutable for one another. 2) There is perfect mobility of the labour force in the labour market. 3) All workers and employers have perfect knowledge about the labour market. 4) Wages are determined by demand and supply. Under conditions of perfect competition, any inequality in the unit wage rate must arise from differences in workers' productivity levels. However, it has been argued that wage inequality or wage difference can also be attributed to the occupational distribution and the nature of occupations in which workers are engaged, referred to as the occupational wage differential (Adam Smith, 1776). On the other hand, wage differentials and wage discrimination might arise due to personal characteristics that are unrelated to any of the above competitive labour market conditions. Such

personal characteristics include gender, race, and ethnicity, and form the primary factors for generating wage discrimination in the labour market (Arrow, 1995).

The previous two chapters have revealed significant wage differentials between Saudi and non-Saudi workers in the labour market of the selected industries. Such differentials exist among workers from the two groups who have similar qualifications, or occupational status, or personal or family characteristics. Moreover, these chapters provide *prima facie* evidence of wage discrimination between the two groups of workers in the chemical and petrochemical industries.

This chapter reviews the literature on wage differentials and wage discrimination as well as previous empirical studies on these issues. In addition, it discusses supply and demand factors that influence wage differentials in the labour market in general, and discusses literature on labour market segmentation.

It should be noted that the wage measure in this study is based on gross monthly earnings computed from the basic wages, bonuses and other pecuniary benefits of workers in the chemical and petrochemical industries converted to a monthly basis. Because monthly earnings are a function of both the wage rate and the number of hours worked, the study concentrates here on full-time, monthly working hours (based on the standard 48 hours per week), which is the common form of labour participation in the country as well as in the chemical and petrochemical industries.

Many economists have discussed wage differentials between different groups of workers classified by special characteristics such as sex or ethnicity in different countries. They examined such a phenomenon by controlling various factors that may influence wage determination of these workers. Such factors include workers' occupational status, demographic variables, human capital components, and other workplace characteristics. These factors usually arise from both the supply side and the demand side. Although the empirical analysis of this study focuses on the supply side factors that determine employee compensation in the selected industries, it is useful to start with a review of the general literature on both the demand and supply side factors.

2.2- SUPPLY DETERMINANTS OF WAGE DIFFERENTIALS

Analysis of the labour supply can be based on the representative worker's utility model that involves indifference curves and budget curves for the choices of the consumers regarding the optimal utility level. The indifference curves are framed to show the various combinations of the individuals' choices between two alternatives: work and leisure. The labour supply analysis is concerned, at the microeconomic level, with the individuals and the household decision on their time allocation. Usually, individuals' labour supply involves a choice between working for pay and leisure that represents what is left over from the allocated work time. Leisure and paid work can be used to produce specific utility or satisfaction, so both of them can substitute for each other and individuals can choose the optimal combination between the two alternatives (Smith, 1994; Sapsford, 1981). Should an individual sacrifice some of his/her income, there would be an increase in his/her leisure time that could be substituted for this sacrificed income to keep him as satisfied as before.

The competitive labour supply model postulates that individuals are free to choose and determine the time or work hours they prefer to provide in the labour market, sacrificing their leisure time. This indicates that cutting off leisure time for working pay involves disutility that could be compensated by wages (Smith, 1994). Figure (1) illustrates an individual or worker's combination of the two alternatives across indifference curves that connect the various combinations of income on the vertical axis and leisure time on the horizontal axis. The traditional utility theory assumes that as the two alternatives produce equal utility or have the same satisfaction level, then the worker or the individual will be indifferent to choosing between them. The figure expresses various combinations of the individual's preferences between work-for-pay and leisure time that gives him the same satisfaction or utility subject to income based on monthly work hour constraints. As individuals decide on the number of hours they supply in the market, they simultaneously determine their leisure time (H_i). From this figure, curves I_1, I_2 and I_3 are the indifference curves. Each curve shows all combinations of income and leisure time that gains the individual a level of utility. From this figure, the budget lines B_1, B_2 and B_3 have slopes, which represent different

earnings level Y_1, Y_2 and Y_3 , while H_n is the allocated work time, and H_1, H_2 and H_3 are the leisure time left over after the worked hours.

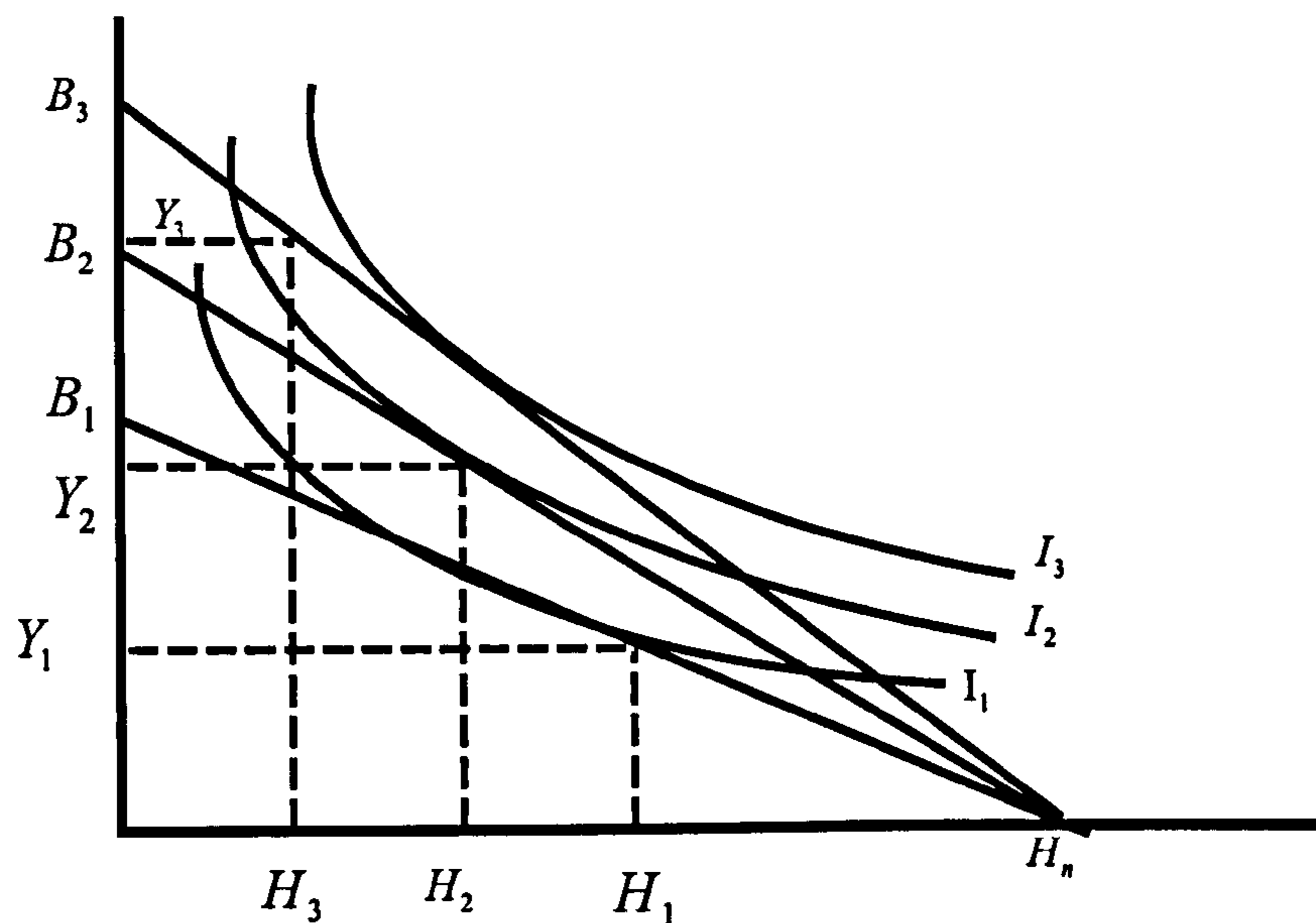


Figure (1)
Combination of Leisure and Work Time

The representative worker's trade-off between work and leisure depends on the wage rate. A change in the wage rate has two opposite effects on the trade-off: the so-called income and substitution effects. For example, a rise in the wage rate means that a worker can work for a smaller number of hours to achieve the same level of earnings as before. If the worker's preference for work and leisure remains unchanged after the rise in the wage rate, and provided that leisure is a normal product, the worker's demand for leisure tends to increase and thus the supply of labour tends to fall. This is called the income effect. However, a rise in the wage rate also has a substitution effect on the supply of labour, as it tends towards more work. This is because with the rise in the wage rate, the opportunity cost of leisure also rises and the demand for leisure tends to fall, or the supply of labour tends to increase. At normal levels of the wage rate, it is usually assumed that the substitution effect dominates the income effect and there is a positive relationship between labour supply and the wage rate. However, if the wage rate is increased to a sufficiently high level, the income effect could dominate the substitution effect

and the relationship between the labour supply and the wage rate could become negative.

The individual labour supply decision has been extended to study family labour supply. The family labour supply theory considers the family as one productive unit that pools together its consumption (c) and the leisure times of its members (L_1, L_2, \dots, L_n). The family also pools its earnings and expenses; therefore, total family utility is maximised subject to its expenses and income. Becker (1968) and Killingsworth (1983) argued that the family utility model produces double substitution effects on its members' labour supply. The first is the substitution effect on one family member's labour supply of an increase in his or her own wage. The second effect on a family member's labour supply is the rise in compensation of some other family member; this is called the cross-substitution effect. This type of substitution effects is either positive or negative depending on whether the leisure time of the family members (i), and (j) is a complement or a substitute. Therefore, a change in the husband's income has the same effect on the wife's labour supply as a change in the wife's income on the husband's labour supply. Killingsworth (1983) argues that the gross or total effect of a rise in i 's income on j 's labour supply need not equal the total effect of a rise in j 's income on i 's labour supply, because the income effects on the two family members need not be equal. In addition, if the cross-substitution effects are zero for all family members, then the only effect of a rise in one member's income on another member's labour supply is a pure income effect. Campbell and Green (2002) assumed that rising wage inequality could be associated with incentives to devote long work hours in the labour market. To examine this assumption, they estimated the effect of the worked hours over 1991-1995 on the earnings of 1996 for men and women in the UK. They found that the average number of the aggregate weekly worked hours between 1991 and 1995 has a positive decreased impact on 1996 gross weekly pay, with the return becoming negative beyond 47 hours for women and 59 hours for men. Moreover, they found that an extra unpaid hour between 1991 and 1995 raised earnings by 4% in 1996, and the long-term cost of working a short time, for women, has its implications on continuing gender gap earnings in favour of male versus female. They argued that these findings confirm

that the increased wage inequality in the UK is associated with the propensity to work long hours, and with the cessation of the historical downward trend in average worked hours.

Granado (2003) discussed labour supply and hour constraints in the USA among individuals who stayed in the same job during two successive years (stayers) and individuals who changed their employer in this period (movers). He based his analysis of this issue on the assumption that workers could freely choose the number of hours they work, in contrast to an alternative assumption that the employer decides the number of hours and the workers can move at zero cost to the firm that offers the exact number of hours they want to work. He found that movers who are not laid off have positive and significant labour supply elasticity. He argued that this is because the higher their wages in a given year relative to the previous year, the higher their hours worked in that year relative to the previous year. In contrast, both the movers who were laid off and the stayers were found to have insignificant labour supply elasticity.

However, changes in the labour supply are generated by inflow of some factors related to the supply side. These factors comprise human capital components, demographic factors, and tax and welfare transfer benefits. The next sections provide some details for the impact of these factors.

2.2.1 Human Capital and Wage Determination

The quality of efforts that individuals offer to the labour market is related to the human capital investments that comprise their education, training, experience and even health care. It represents an important part of the labour supply and wage determination. Often, the term “human capital” is used to indicate skills or labour quality (Mincer, 1993). The human capital model involves analyses of investments related to some categories, which mainly include education, training, and health factors that contribute to produce a supply of skills and to augment an individual’s earning capacity. Such investments take the form of expenditures on education, job training, health and knowledge. But these forms of investments may be constrained by the individual’s physical and mental abilities, family wealth, and educational and market opportunities that match his or her education and training (Mincer, 1974). However, the human capital investment

aims to increase individuals' productivity and improve their employment opportunities in the labour market for better earnings.

The human capital literature confirms the impact of education and training on wage determination; this may give rise to wage differentials. Mincer (1993) contended that positive differences in wage levels that are associated with differences in schooling or in occupational distribution in the labour market are the returns to investments in education and job training. These returns change with changes in costs and demands for education.

However, this points to the impact of human capital on earnings distribution; as Becker (1975) argues, the age-earnings profile tends to be steeper among more skilled and educated people, due to the impact of on-the-job training and education. The human capital theory confirms the life-cycle nature of the individual's earnings, as these earnings change over the lifetime that is associated with the decline in human capital investments and depreciation of the human capital stock. The theory postulates that the human capital investments typically increase during the early working life at the younger ages, and then continue at a diminishing rate. This is reflected in the wage profile, which grows over the lifetime. It is assumed that the earnings rapidly grow during the first decade of working life and then decline and level off in the third and fourth decades (Mincer, 1974 and 1993). However, the earnings life-cycle pattern reflects the inherent biological and psychological features of the human capital stock that depreciates by age. Mincer (1993) argued that the age-depreciation factor has its impact on earnings, but only to a certain degree, because it reflects productivity changes over the working life. The human capital theory has considered experience and its effects on the worker's earnings. Theoretically, experience is viewed as being associated with the individual's working life. Killingsworth (1975) defined experience as the habit of punctuality, the habit of following rules and instructions, and the habit of planning and deciding. It is argued that experience increases with augmentation of the human capital stock. Moreover, analysis of the influence of experience on earnings is usually associated with the worker's educational and training status.

Concerning the impact of training on workers' earnings, Becker (1975) infers that trained people would receive lower earnings during the training period because of training costs during that period, but receive higher earnings later because they start to collect the returns on their training. He argues that the combined effect of training payment and revenues have to form the age-earnings curve of trained people.

Moreover, the theory considers the impact of health care as a form of human capital on the worker's earnings and productivity in the labour market. Health improvement at working ages can help to extend the worker's earnings period in the labour market through keeping his/her productivity over the working lifetime. A better nutritional and health care programme, higher wages, coffee breaks, and good characteristics of the workplace may affect work ethics and productivity (Becker, 1975). Employees can invest in health outside the firm, but a firm may pay such investment if it could benefit from the resulting increase in productivity. It can pay by offering higher wages during the investment period than would normally be offered and it can convert outside health investment into on-the-job investment.

The human capital theory postulates procedures to measure returns to the incurred investments. The same investment appraisal techniques of the internal rate of return (IRR) and the net present value (NPV) that are used for physical capital investment can be applied to human capital investment. The discount factor of these components is based on the compound principle that aims to evaluate the forecast returns of the proposed invested capital. These techniques usually consider the time preference of the investments and their opportunity cost. The human capital theory applies the same techniques to predict the returns on human capital investments. An example is the regression earnings equation developed by Mincer in 1974 to estimate the rate of return to human investments; this equation (Equation 1) is expressed as:

$$\ln Y = B_0 + B_1 S + B_2 X + B_3 X^2 + u \quad (1)$$

where $\ln(Y)$ is the natural logarithmic earnings rate, S is years of schooling, X is experience, B_1 is the rate of return to schooling, B_2 is a coefficient reflecting a positive return to experience, B_3 is negative coefficient of the quadratic

experience (X^2), and u is the residual error term. In this equation, the experience variable is measured in years of working life to represent accumulated investments on-the-job training and on-the-job mobility. The quadratic experience term (X^2) in Equation (2) is based on the assumption that investment in human capital declines linearly with time, which indicates that the experience square coefficient (B_3) is expected to be negative. Mincer (1974) estimated the rate of return for schooling in the USA as 10.7%. His estimates suggested that the return on years of experience produced a positive value of 8.1%, but to a certain extent, as each additional year produces a negative reward estimated at (-0.012%). Willis (1986) presents changed rates for the average rate of return of education in the USA between 1939 and 1982 for secondary and higher educations. He contended that the educational rate of return declined to rates between 5.3% and 0.187% for both types of education over 1939-1982, while it appeared stable around 10% over the period 1939-1969. Heckman *et al.* (2003) estimated earnings equations for white and black males in the USA using census data for the period 1940-1990. They concluded that the rate of return on schooling is estimated at around 10-13% for white men and 9-15% for black men over the period 1940-1990. They estimated the coefficient on experience as 9-13% for white men with a negative coefficient on experience square of 0.13-0.23% for this group, and estimated the experience coefficient as 6.5-11% for black, while the coefficient of the experience square for this group produced zero values over 1940-1990.

On the basis of the earnings function (Equation 1), the model of the human capital discount factor can be obtained to measure the present value of the lifetime earnings for both uneducated and educated workers (Sapsford and Tzannatos, 1993), which are shown in Equations (2) and (3) as :

$$PV^u = (W^u / r) (1 - e^{-rT}) \quad (2)$$

$$PV^e = (W^e / r) (1 - e^{-rT}) e^{-rS} \quad (3)$$

where :

PV is the present value, W is the lifetime earnings, (e) is the basis of the natural logarithm, (W/r) is the present value of annuity paid forever, $(1 - e^{-rT})$ is the finite life correction factor (that is, it corrects the previous ratio for the fact that people eventually stop working for one reason or another), and (e^{-rS}) is another

adjustment for the fact that those who become educated will have no wage until their education stops and work starts, and the subscripts (e) stands for the educated workers, (u) stands for the uneducated workers, (r) for interest rate, (T) is the working time years, and (s) is the number of schooling years. Equating the right-hand side of the two equations and eliminating the finite life correction factor for both sides expressed as (Equation4):

$$W^e = W^u e^{rs} \quad (4)$$

and taking the logarithms on both sides in Equation (5) as:

$$\ln(W^e) = \ln(W^u) + rS \quad (5)$$

They conclude that the theory is compatible with the common sense result that educated workers should have greater wages than uneducated workers ($W^e > W^u$). This simple model provides a convenient relationship between annual earnings and length of schooling (in years).

2.2.2 Demographic Factors and Wage Determination

In labour economics, demographic factors comprise a worker's personal characteristics that include age, marital status, gender or sex, and family structure, especially number of children and their age distribution. These factors have their influences on the worker's earnings and their distribution. Age is a demographic factor that indicates physical conditions and the lifetime of the worker in the labour market. Workers usually enter the labour market at a young age (for example, at 15 years old), continue up to old age and then retire at the age of 55 or older. Age has an influence on earnings, which usually increase with age but at a decreasing rate because the worker's productivity tends to decrease with the increase in age. On the other hand, the human capital theory postulates that individuals' lifetime earnings curves reflect their productivity changes. Initially, productivity starts at the younger ages then levels off in the middle years and declines later due to decrease of physical and cognitive abilities (Mincer, 1993; Killingsworth, 1975). These biological characteristics of age increase work as a depreciation factor that influences the worker's earnings across his/her working lifetime. Mincer (1974, and 1993) provided some evidence to show that the inherent age depreciation factor affects earnings only to a limited degree, except at teenage and in the near- or post-

retirement years. It is argued that age has positive effects on these earnings in early working life and negative effects in later years. On the other hand, this theory of productivity associates human capital investments with age-earnings profile. One point to note is that it is useful to distinguish the effects on earnings from age and from experience. Whilst the age effects may reflect the worker's physical productivity over the lifetime, the experience effects reflect the impact on earnings of the worker's on-the-job training or learning activities.

Gender or sex is another variable of the demographic factors; it is usually used in labour economics to refer to male and female workers or men and women. Social, cultural and traditional values have their influences on the earnings distribution between men and women, particularly in the developed countries and urban areas in the developing countries. In addition, other factors such as religious and family conventions also determine women's participation in the labour market in many developing countries such as in Saudi Arabia and some other Middle East countries. Under the competitive labour market conditions, wages are determined on the basis of labour productivity, and inequality of unit wage rate is thought to be an unfair practice. So disparity of work payment between men and women creates wage or earnings differentials between them. Many economists examined the wage inequality between men and women over different historical periods and in different countries, and found that generally men earn more than women even where both have similar productivity characteristics. In addition, gender can be a source of wage discrimination in the labour market, which exists when a person, particularly a woman, is treated on different basis due to their gender (Becker, 1971; Oaxaca, 1971; Goldin 1990).

Marital status is another demographic component, which relates to the labour supply determinant of the wage rate. It influences workers' earnings in the labour market and contributes to the wage differential between married and unmarried workers, male or female. It is known that during the past several decades since the 1940s, women's participation in the labour market has increased, particularly among married women in the developed countries (Pencavel, 1986 and Goldin, 1990). In contrast, most women in some of the developing countries are still struggling to get themselves a place in the labour market instead of keeping behind

the doors at home, such as in Saudi Arabia and some other Middle East countries. On both theoretical and empirical levels, there is a wide agreement among labour economists that married men earned more than their unmarried colleagues (Korenman and Neumark, 1991). But economists give different explanations for the source of wage marital differential or the marriage premium for the married men. It is assumed that productivity of the married males explains difference in wages, as married males tend to provide more working hours (Lillard and Waite, 2000; Krashinsky, 2000; Rodgers and Stratton, 2003; among others). Moreover, it is found that workers who enter the marriage institution by a year later earn less than earlier-married people, which might further strengthen the wage marital differential (Korenman and Neumark, 1991; Bergstorm and Schoeni, 1992). It is also assumed that employers discriminate against married women in favour of married men. The reason is that employers discriminately regard married women as a factor of employment instability due to family responsibilities, which creates a marriage pay premium for men. Furthermore, work disturbance reduces the augmented work experience for the married women and then influences their human capital assets (Siebert and Sloane, 1981).

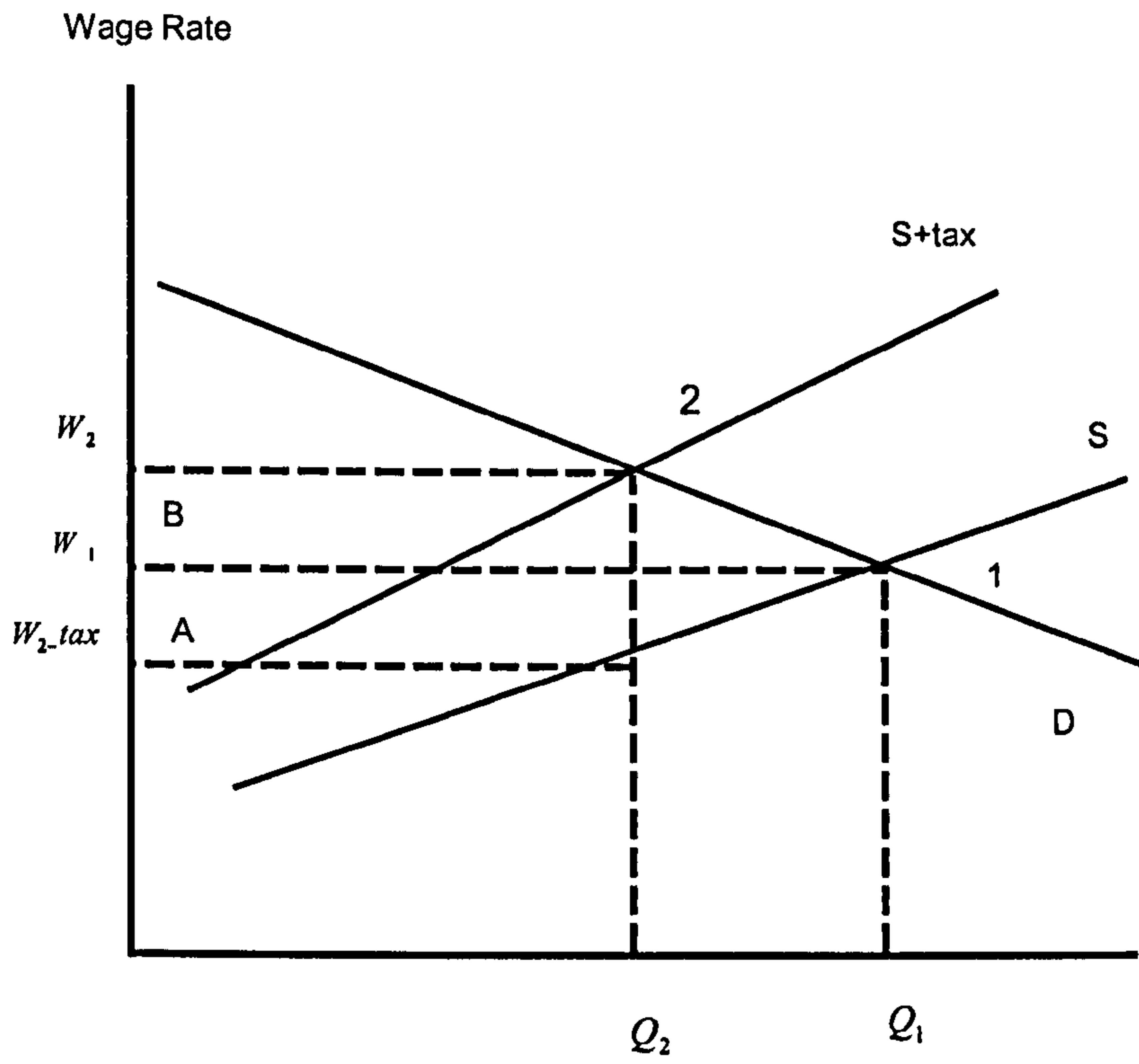
The family structure has its influences on the wage differentials between men and women in the labour market as well. The literature on the marriage premium indicates that married women earn less than unmarried women (Korenman and Neumark, 1991; Waldfogel, 1998; Richardson, 2000). This may be due to non-labour earnings of other family members, especially husbands (Goldin, 1990) or due to the presence of children, particularly those with infants, as this interrupts the mother's attachment to the labour market (Lundberg and Rose, 1998).

2.2.3 The Welfare System and Earnings

Taxes are usually set by the government as a policy to redistribute incomes among individuals through various welfare systems such as family credit, child benefit, and old-age pensions. Direct taxes are the main forms that are used partially to fund such programmes. Labour tax on payroll or earning or income is another factor that influences the labour supply and the workers' earnings. High rates of income tax on high wage earners may encourage employers to pay them

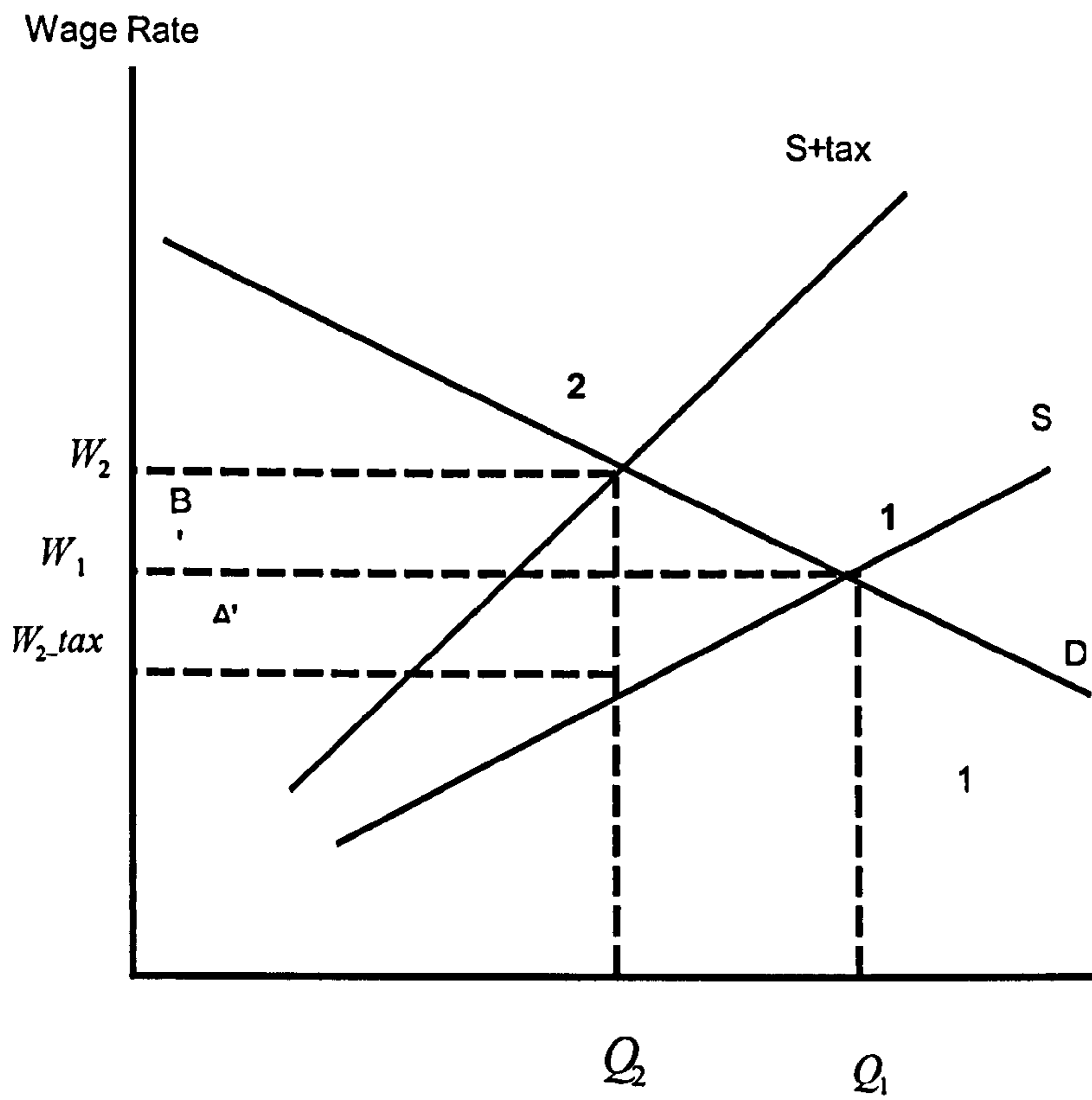
higher wages, while tax cuts for low paid workers may allow employers to cut wages. Therefore, the impact of income taxes that is borne by both the employer and the employee is usually determined by the elasticity of labour supply and demand (Sloman, 1997). The imposition of taxes distorts wage equilibrium by the tax rate, as is illustrated by Figure (2). Assuming that the labour market is in the equilibrium state before the labour tax is imposed, as labour supply and demand intersect at the wage reservation point (W_1). With the imposition of the labour tax, the labour supply curve shifts vertically upwards by the tax amount, ($S + \text{tax rate}$). The new intersect point will be at the wage rate (W_2). This figure shows that the income of workers is cut from W_1 to ($W_2 - \text{tax}$). This amount represents their tax share, which is represented by area A; in this figure, labour supply is relatively elastic while employers have to pay their share of tax as shown by area B. In the case of inelastic labour supply, workers pay most of the tax area (A') and the employer firm would have to pay its share of tax by the small portion that is shown by area (B') in Figure (3). However, the imposition of an income tax produces both income and substitution effects. The income effects suggest that because workers' income is reduced by the tax rate, they should increase their labour supply to keep the same income level as before, while under the substitution effects, the income tax reduces the opportunity cost of leisure, as an extra hour taken in leisure involves smaller opportunity cost in consumption, allowing workers to reduce their labour supply (Sloman, 1997). Besides, it is assumed that a rise in the income tax rate has two opposite effects: it reduces labour supply if the substitution effect is greater than the income effect or it increases labour supply if the substitution effect is outweighed by the income effect (Smith, 1994).

Tax revenues are the main source of financing the welfare system that provides specific benefits to different people. In developed countries, however, benefits are either cash or in kind. The cash benefits in turn are of two types. One is means-tested benefits whose amounts depend on the recipients' income that falls



Incidence of Income Tax (Elastic Labour Supply)

Figure (2)



Incidence Income Tax (Inelastic Labour Supply)

Figure(3)

below a certain level. This type of benefits requires the qualified people to declare their personal circumstances to the authorities. The other type of cash benefits is the universal benefits that cover different people such as pension benefits, unemployment benefits, and social relief, health care and invalidity benefits. This type of cash benefits can be provided to different people irrespective of their income. Workers usually pay social security contributions on the basis of their earnings. When they are retired, or become unemployed or fall sick, they are entitled to these benefits. On the other hand, the benefits in kind are not direct monetary payment; they take the form of the provision of free or subsidised goods or services. The two most common forms of the benefits in kind are health care and education (Sloman, 1997). In addition, there are some social insurance programmes that are directed to compensate workers who are unable to work because they face a temporary work injury, or a permanent disability, or being laid off. Under these programmes, benefits are only paid to those who are not working.

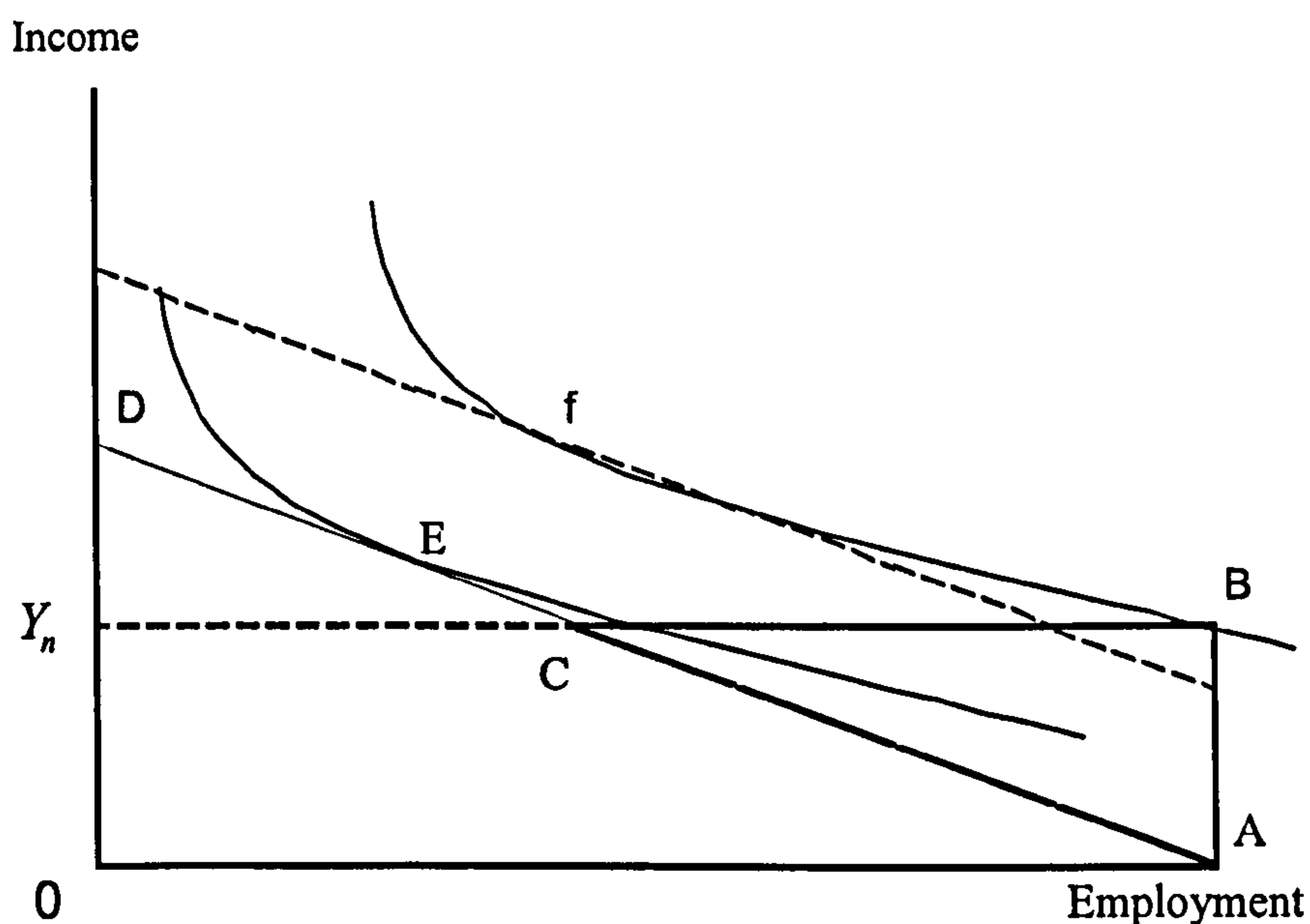


Figure (4)
Social Welfare and Labour supply

However, the productivity theory assumes that payment of social welfare benefits is based on the difference between individual's actual earnings and his/her needs. Ehrenberg and Smith (2000) explain that this difference creates a net wage

needs. Ehrenberg and Smith (2000) explain that this difference creates a net wage rate of zero. Their main arguments are illustrated by the guaranteed annual income programme in US. Under this programme the income of an eligible person is determined based on family size, area living costs, and local welfare regulations. The person's actual earnings are subtracted from the needed income. If the person does not work he or she receives a subsidy of (Y_n), see Figure (4). If the person works; but faced with reduction in his/her welfare benefits, then the budget constraint like ABCD is created. They suggested that, an extra hours work might yield no net increase in the person's income; because the extra earnings result in an equal reduction in the welfare benefits and the net wage of a person is zero, which is expressed in the figure by the segment (BC). But the welfare programme could increase the person's income by moving the lower end of the budget constraint out from AC to ABC as indicated by the dashed constraint. They argued that, this shift creates an income effects tending to reduce labour supply from hours at point E (hours of work) to point F (hours of leisure).

Jackman, Layard, and Nickell (1996) studied the effects of the unemployment policies on wages. They found that though unemployment benefits reduce the fear of unemployment and thus directly increase wage pressure from the unions, these benefits reduce the effectiveness of the unemployed workers. This encourages employers to raise wages. In addition, these benefits tend to reduce the competition that newly unemployed workers will face in their search for jobs. This again encourages the unions to push for higher wages. The authors argued that under elimination of benefits due to long unemployment, the wage flexibility policy will increase employment but will produce more unequal wages. Thus this policy will not eliminate unemployment in the long run. They discussed the impact of taxes on employment, arguing that reduction of payroll tax and increase of consumption tax rate will leave the tax wedge unchanged but will lower the equilibrium of unemployment so long as non-labour income is zero. They considered the impact of tax on labour costs in the long run, and found that tax has no significant effects on real labour costs in the long run in OECD countries.

2.3 LABOUR MARKET SEGMENTATION AND WAGE DETERMINATION

The standard theory of labour market segmentation initiated by Doeringer and Piore (1979) interprets different aspects of the labour market in the context of dualism. According to the theory, dualism occurs because of allocation of certain rights and privileges to a group of workers governed by certain rules that form an internal labour market, rather than others in the external labour market. Doeringer and Piore(1979) argued that the dualism phenomenon of the labour market is clearly interpreted by segmentation of the labour market into primary and secondary sectors. The two segments of the labour market are interconnected as movement between them occurs at certain job classifications that form ports of entry and exit to and from the internal or primary labour market. Meanwhile, jobs within the internal labour market are occupied by the promotion or moving of workers. Then this market is protected from external competition.

However, wage determination in the internal labour market is usually based on three factors that include:

- wage level, which describes the internal wage structure;
- vertical wage difference that refer to the differences in the wage rate across jobs; and
- horizontal wage differences which refer to the differences in the wage rate among individuals in the same jobs.

These factors are incorporated into three wage-setting instruments that comprise job evaluation, community wage surveys, and engineered production standards. More specifically, job evaluation is associated with vertical differentiation as it aims to set jobs into hierarchical ranks with different wage rates. It is based on some characteristics that are related to the job, such as skills, working conditions, managerial and technical responsibility, and some personal characteristics related to the worker holding the job, such as education, training and experience. Under the job evaluation procedure, a maximum number of points or weights is set up for each of these characteristics, and the wage rate is based on these points. The second instrument is the community wage surveys that associate the firm's wage level with its competitors in the labour market. This instrument is a

systematic procedure by which the firm compares its wage structure with that of its competitors for employment. However, wage surveys might extend to cover various aspects of working conditions. Doeringer and Piore (1979) argued that the firm not only surveys the wage rates, but also vacations, holidays, retirement benefits and other fringe benefits paid by the competitors. Bulow and Summers (1986) emphasise importance of wage surveys for the firms in the primary sector, because firms need to assess where they are standing in the wage distribution in the labour market. The third instrument is engineered production standards associated with the horizontal differentiation as suggested by the standard theory of internal labour market. The horizontal differentiation shows wages adjustment made by firms based on workers' merit rates and the incentive system. Under the merit rating system the firm sets some criteria to decide the workers' rates within the job classification and reviews the employees periodically in light of these criteria. While under the incentive rules, the wage adjustment or the horizontal differentiation factor shows payment by results or reward of the output.

However, the segmentation theory assumes that the two labour market sectors behave differently with a limited labour mobility between them. This is due to the hierarchy system of the primary sector, and to its administrative rules that limit inter-sectoral mobility between the two segments. The theory attributes appearance of these barriers to the characteristics of the secondary sector. These characteristics mainly comprise instability of employment, high unemployment rates, low wages and poor chances for advancement, poor training opportunities, and lack of administrative rules of work (Doeringer and Piore, 1979). These barriers arise even though the workers in the secondary sector have the necessary work skills and proper work habits for the primary sector. This keep these workers standing in the queue as a reserve of the labour force in the primary sector, so they might be assigned to jobs for short periods in the secondary sector (Rosenberg, 1989; Doeringer and Piore, 1979). Workers in the primary sector can move across job ladders through structured and administrative rules of advancement of the upper and lower tiers of the primary sector. Those in the primary upper tier have good pay and work status that provides them with greater advancements and job mobility opportunities, as compared to their colleagues in the primary lower tier

(Osterman, 1975; Rosenberg, 1989). However, there are some factors that influence existence of the dual labour markets. These factors include specific skills, on-the-job training, and custom. Doeringer and Piore (1979) convened specific skills to the ways these skills can be utilized within different internal labour markets. They argued that skill specificity influences existence of these markets in three ways. First, when skills become more specific it becomes increasingly difficult for the worker to utilize them elsewhere than his/her current firm. Thus, this reduces his/her incentive to invest in specific training, but increases the incentive for the firm to increase such training in order to reduce employees' turnover (Rosenberg, 1989). Second, through on-the-job training, the performed work cannot be duplicated in the classroom, because this training is derived from the content of the job itself, and then confined only to skills required for the job. In addition, on-the-job training has certain advantages over classroom instruction, because instruction on the job is made individually and can be tailored to the learning capabilities of each trainee; in addition, the relevance of the instruction is immediately apparent. Therefore, specificity promotes this type of training by reducing number of people learning a particular skill at a given time. Doeringer and Piore (1979) argued that the specificity of training makes skills, which it produces highly specific to the enterprise they were required. The third way is the firm custom that confines to the way employers are developed to govern work performance and how individuals relate to each other in the work process. Rosenberg (1989) inferred that customs are usually codified in the internal labour markets.

2.4 LABOUR DEMAND AND WAGE DETERMINATION

Wage determination is also influenced by the demand for labour, which in turn is affected by changes in some factors that comprise technological innovation, consumer tastes, and impacts of international trade on employment. However, demand for labour is defined as the amount of labour that the employers employ during a certain period and at a particular wage rate. The demand for labour is a derived demand on goods and services, because labour is demanded not for its own sake but for its contribution to the production of goods and services.

This section discusses the impact of the above factors on wage determination in the labour market.

2.4.1 Technological Change and Labour Demand

Technology refers to people's use of their inventions and discoveries to satisfy their needs and desires (The World Book Encyclopaedia, 1996). Technological change, which may encompass the introduction of new products and production techniques as well as changes in technology, enables firms to cut costs. It may affect demand for labour through demand for product; therefore, shifts in product demand tend to shift labour demand in the same direction, and changes in the elasticity of product demand will tend to cause similar changes in the elasticity of labour demand. Thus, introduction of new products, e.g., word processors that serve as a substitute for old ones (such as typewriters), will tend to shift the labour demand curve in the older sector to the new one, causing loss of employment in the former sector. Another dimension of the technological change is that associated with the substitution of capital for labour, which is related to reduction in cost of capital. Let's consider the elasticity of substitution between the two variables, i.e., the percentage change in the capital (K)/ labour (L) ratio due to a 1 percent change in the relative price of labour. With the assumption that output (Y) is constant, the elasticity of substitution is measured by Equation (6) as:

$$\text{Elasticity of Substitution} = \frac{\% \Delta K/L}{\% \Delta W/r} \quad (6)$$

where W/r is the ratio of labour wage (W) to the labour cost (r). If the relative price of labour increases, the capital/labour ratio increases, resulting in positive elasticity, and then the elasticity is said to be a gross substitute. If the elasticity is negative, the gross elasticity is said to be a gross complement.

However, the extent to which capital and a particular type of labour are gross substitutes depends on the nature of the industry and the production processes. Moreover, it is generally true that unskilled labour and capital are more likely to be a gross substitute rather than the relation between skilled labour and capital, which tends to be a gross complement. Therefore, it is suggested that technological change increases the demand for skilled labour more than for unskilled labour. On the other hand, the standard theory of labour demand assumes

that the technological change may increase demand for skilled workers by more than unskilled workers because of the skill-biased technological changes. It is assumed that if the technological changes are good substitutes for the unskilled labour and complements for the skills of highly educated workers, these changes would lower the demand for the unskilled labour, and increase the demand for the skilled labour, and then they have their impacts on the wage structure of both categories of the workers (Ehrenberg and Smith, 2000; Borjas, 2002). Figure (5) links wages to supply of and demand for skills. It represents two types of workers, skilled and unskilled workers, and (w_0) is the equilibrium wage ratio of the number of skilled and unskilled workers. The demand is depicted as downward sloping because the greater the wage gap between skilled and unskilled workers, the lower the fraction of skilled workers that employers would like to hire. The relative supply of skills (p_i) is assumed to be inelastic in the short run, to indicate that a certain fraction of the workers is skilled regardless of the wage gap between skilled and unskilled workers (Borjas, 2002). Under the conditions of the competitive labour market, equilibrium of supply (S_0) and demand (D_0) attains at point (A) and the relative supply of skill (P_i) given by (w_0) . Under these conditions, there are two ways in which the wage gap between skilled and unskilled workers could have increased. The first is initiated by the supply curve to shift to the left indicating a reduction in the relative number of skilled workers and then increase their relative wage. The second is the demand curve to shift to the right (D_1), indicating a relative increase in the demand for skilled workers and again rising their relative wage. On the other hand, shifting supply from (S_0) to (S_1) , keep other things constant, the labour market equilibrium shifts to point (B) reducing the relative wage of skilled labour to (w') . On this figure, with shifting of the demand curve for skilled labour from (D_0) to (D_1) will increase the relative wage of skilled labour to (w'') with the equilibrium point (C).

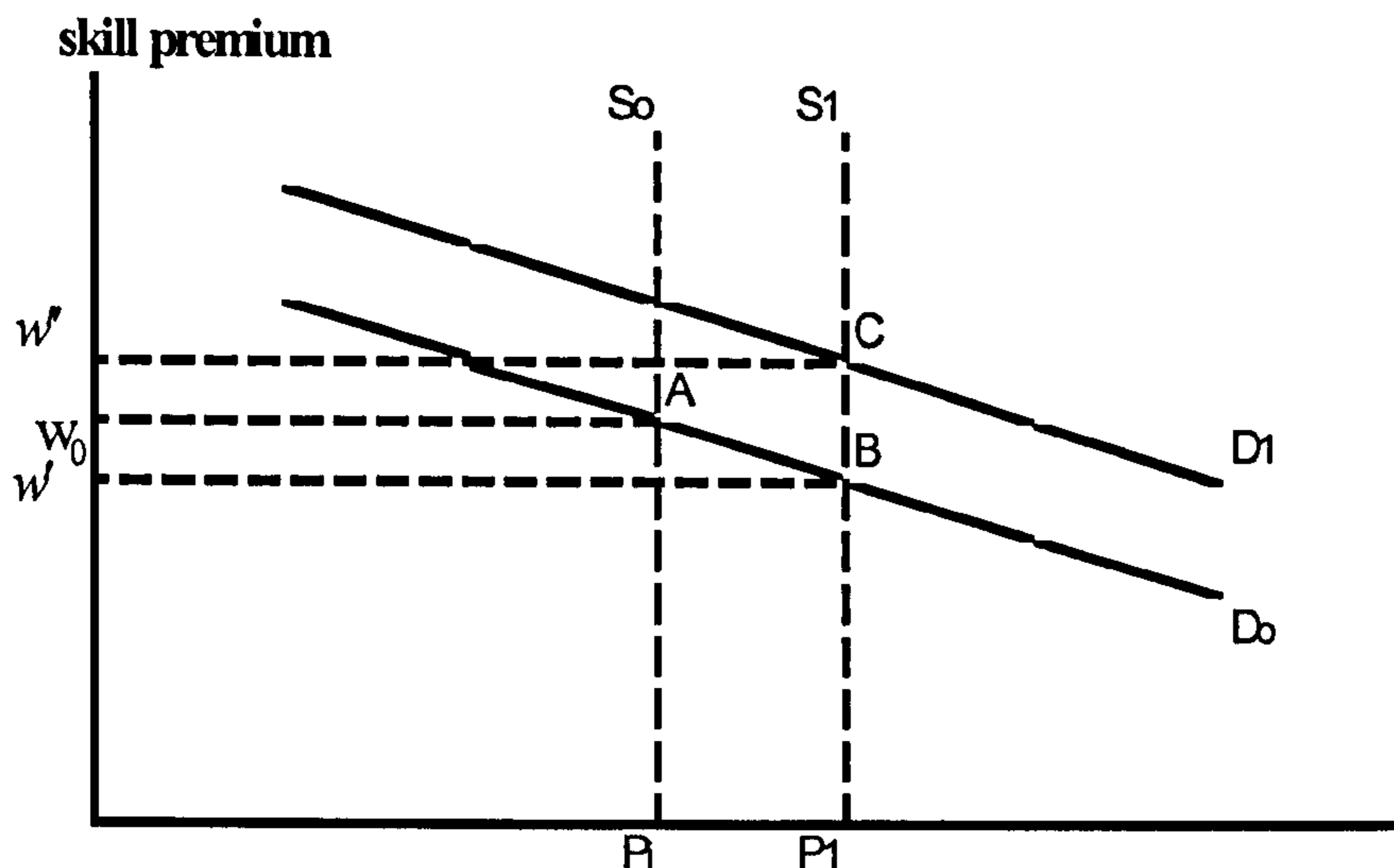


Figure (5)

Relative demand for and Supply of skills

Moreover, some economists have referred to a historical aspect of the effects of technological change on labour demand. Acemoglu (2002), and Ehrenberg and Smith (2000) argued that technologies of the early nineteenth century were skill-replacing (unskilled-biased), because the increased supply of the unskilled workers in cities of England made introduction of the new technology that was based on skills more profitable, while the technical change in the last sixty years of the twentieth century is skill-biased because the rapid increase in the supply of skilled workers has induced development of skill complementary technologies.

The debate on the impact of technological change on labour market issues extends to involve wage inequality among workers. In general, economists agreed on contribution of the technological change on wage inequality by skills, between higher skilled workers and those with lower human capital, as technological change essentially is an outcome of application of research and development that is based on human capital investment. Card and DiNardo (2002) discussed the influence of technological change on wage inequality between male-female and black-white workers in the US. They concluded that technological change over the 1970s and the 1990s had some effects on relative wages, as during the 1970s the wage inequality for white workers fell from 28% to 18% for men and from 18% to 4% for women. While during the 1980s, when the overall wage inequality was rising and the gender gap was closing, the black-white wage gap was relatively stable. In the 1990, racial wage gap were roughly constant. In addition, the skill-

biased technological change by itself has not provided evidence to understand the shifts in the wage structure in the US labour market in the last quarter of the 20th century.

Reenen (1993) examined the impact of technological change on wage inequality by using data of the Industrial Relations Survey of 1984 in the UK. He found that technological change has strong effects on wages of skilled manual groups of workers. He found that the skill-biased technology (SBT) widened wage inequality, as the wage differentials associated with new technology is estimated between 5 and 7%. He also found that high union intensity in workplaces reduces the impact of technology wage inequality, especially for skilled manual workers.

Allen (2001) provides another work on the relationship between technology and wage distribution. He explained this issue in the context of schooling, experience, and gender in the US. He found that increases in Research and Development (R&D), and acceleration in the growth of the capital-labour ratio coincide with increased wage gaps by schooling within industries. Moreover, he found that increases in R&D are associated with wage gap between college and high-school graduates in non-scientific occupations; as a one percentage increase in R&D intensity increases the wage gap between the two groups by 1.6% in contrast to 2.1% for all occupations. He also found that the impact of the technological change on wage inequality is stronger with R&D, and workers in the R&D-intensive sectors have greater wages than their colleagues in sectors with little R&D. He found that R&D fell by 0.8% in fabricated metals and rose by 1.7% in the public utilities, and the wage gap between the two groups of workers in these sectors increased by 3.6% between workers in the public utilities and 1.7% between workers in the fabricated metals. Yin (2002) discussed the impact of the technical change on wage and employment disparity among the skilled and unskilled workers in the context of general equilibrium of the labour market. He argued that the skill-biased technological change (SBTC) provides an explanation for the causes of such disparity. Many economists (Katz and Murphy, 1991; Johnson, 1997; Yin, 2002), argued that the increased demand for highly-skilled workers, in the 1980s and the early 1990s, played a leading role in increasing the earnings gap between skilled and unskilled workers in most developed countries,

particularly in the UK and the USA. Yin (2002) argued that a shift in demand from unskilled to skilled workers is associated with changes in the composition of the products that an economy produces and the way these products are produced. Therefore, a change in the composition of products will induce a change in relative demand for the skilled or the unskilled labour. However, when Saudi Arabia planned to change its economy from a subsistence pattern into a modern one, demand for skilled labour was required to operate oil industry and highly-technological petrochemical plants, and in the meantime the demand increased for unskilled labour to meet the demands of the construction and production sectors. Different products (or sectors) have different skill characteristics and require different combinations of skilled and unskilled labour to produce the respective product or products.

Considering skilled and unskilled wage determination, Yin (2002) argued that the disparity in skilled-unskilled wages and employment is largely influenced by the business cycle. Therefore, economic booms and recessions may be associated with a reduction or an increase in the elasticity of supply of skilled and unskilled labour, and a difference in the elasticity or inelasticity of the supply of skilled and unskilled labour may explain the relatively stagnant nature of the unskilled workers' wage growth and their unemployment, as unskilled workers have less bargaining power in their wage determination than their skilled counterparts. Moreover, it is expected that during recessions, labour mobility across skills can be downward rather than upward, because the skilled workers can do many unskilled occupations, while the unskilled workers cannot enter the skilled job market, at least without a considerable period of training to augment such skills. But during economic booms, for example, the skilled workers are reluctant to move downward for unskilled jobs, while the unskilled workers may have some bargaining power to determine their wages, and the divergence of elasticity of labour supply between them and the skilled workers tends to decrease.

2.4.2 International Trade and Demand for Labour

International trade theory is mainly initiated by the works of the classical economists (Mill and Ricardo among others), while the modern contributions to the theory are based on the principle that trade is driven by the relative costs of

producing various commodities or comparative advantages that make a country specialise in products that provide it with the greatest comparative advantage over the others.

Countries have various endowments of factors of production. This variety tends to persist because factors of production are relatively immobile between countries. Therefore, the ability to supply commodities involves differences in both absolute and comparative advantages. The absolute advantage refers to the ability of a country to produce a product at a lower cost with fewer resources than another country. If country A can produce X product with fewer resources than country B, which can produce Y product with fewer resources than country A, then each of the two countries has an absolute advantage in the respective product, and production of both X and Y commodities will be maximised by each country. On the other hand, comparative advantage refers to the ability of a country to produce a product at a lower cost relative to the cost of producing the same good in another country. According to the theory of comparative advantage, trade between two countries can be rewarding even if one of them could produce all goods with less resources than the other, provided that the relative efficiency of producing these goods differs between the two countries; i.e., to produce with a lower cost in one country than in the other. Therefore, countries gain from international trade by specialising in goods that have a comparative advantage and importing goods that have a comparative disadvantage. This is known as the law of comparative advantage.

The modern theory of international trade assumes that countries have a comparative advantage in abundant goods. This factor concerns the classification of countries relative to their most available factor of production, mainly labour and land. The country is said to be labour abundant relative to another country, if the first country (A) is endowed with more labour per unit of land in relation to the second country (B). Similarly, the country is land or capital abundant, if it is endowed with more land per labour in relation to another country. However, the abundant factor is usually associated with the factor intensity that refers to units of labour or land or capital that are required to produce units of commodity. For example, if commodity Y requires more labour per unit of land than commodity X,

then commodity Y is labour intensive relative to commodity X in the production process. This relation can be put in another way: commodity X requires more units of land per unit of labour than commodity Y. In that case, commodity X is said to be land (capital) intensive relative to commodity Y.

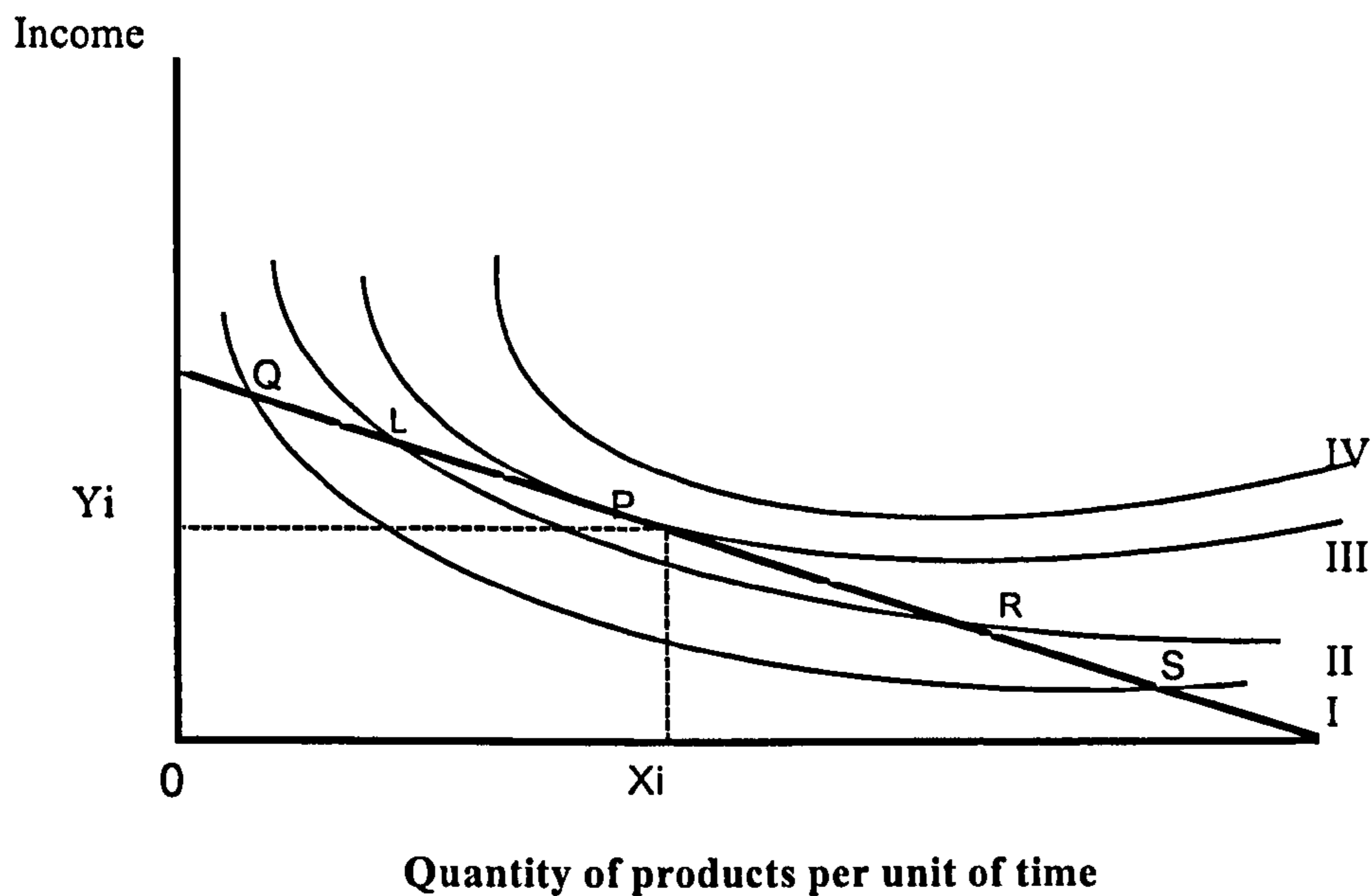
These aspects contribute to a country's specialisation in terms of Heckscher-Ohlin's comparative advantage principle. However, a country's pattern of specialisation also depends on the terms of trade; that is, the relation between export and import prices or the exchange ratio of exports and imports. Therefore, the terms of trade are highly influenced by prices of exports and imports. These prices in turn depend on the demand and supply of the traded goods and their elasticities in the respective countries. Economists argue that introduction of international trade under a perfectly competitive product market has its effects on labour demand. Chacholiades (1978) confirms that with the introduction of international trade, workers become worse off while employers (landlords) become better off, irrespective of the peculiarities of their indifference maps or curves. This point can be illustrated by the case of a perfectly competitive product market with two commodities and two factors of intensity (for example, product Y is land-intensive and X is labour-intensive). With the advent of international trade, production of Y expands while that of X contracts and both commodities become more labour intensive and the marginal physical product of labour (MPP_L) will fall, while the marginal physical product of land (MPP_T) will rise in the two industries. Therefore, when the ratio MPP_T/MPP_L increases, the relative income of workers falls, and the relative income of landlords rises. Borjas and Ramey (1995), among others, have discussed the impact of the international trade on employment. They examined the relationship between trade in durable goods that are produced by concentrated industries and wage inequality. They recognized that these industries employed many skilled and unskilled workers who earn high wages. The authors explained that when foreign firms enter markets in which domestic firms have market power, their entry increases the wages of highly-educated workers in two ways. First, because revenues of domestic firms have fallen, the wage ratio of workers remaining in these industries decreases. Second, to the extent that foreign competition reduces employment in the concentrated industries, many of the

workers move to lower-paying competitive sectors, while the wages of less-educated workers fall relative to the educated workers. The authors emphasised that the more competitive the industry, the lower the impact of net imports on rents per workers and, consequently, the smaller the decline in wages. Thus, the negative impact of net imports on wages is stronger when the industry is more concentrated. They assumed that the wage ratio of the less-educated workers to the more-educated workers is influenced by wages in the concentrated and competitive industries. They argued that an increase in net imports of the goods produced by the concentrated industries shifts labour from these industries to the competitive industries, and decreases wages of the less-educated workers in both industries. Wages decrease in the competitive industries because the supply of less-educated workers has increased. This results in an overall decrease in the average wage of the less-educated workers relative to the more-educated workers. Concerning the impact of foreign competition on the overall market of the penetrated industry, Borjas and Ramey (1995) argued that the negative impact of this competition on wage inequality would be smaller when the industry being penetrated is more competitive. Using data on wages and employment from USA Current Population Surveys from 1977-1991, they examined an assumption that foreign competition in highly concentrated industries is an important factor underlying the increase in the return to skills observed in the 1980s in the USA. They found that the shift of workers out of the concentrated sector into the rest of the economy could account for up to 23% of the increase in the wage inequality between 1976 and 1990. Borjas and Ramey also found that trade could explain about half of the decline in employment in these industries during this period. They concluded that changes in trade in the concentrated industries could account for 10% of the aggregate increase in wage inequality over the period. Greenaway *et al.* (1999) discussed the effect of foreign competition on wages in the UK. They introduced import and export variables to the earnings equation. They suggested that foreign competition, as expressed by trade, the level of union density, labour productivity, and human capital, influences the ability of firms to pay, and unions to obtain, large wage increases. They found that an increase in the level of import penetration causes a fall in wages in both the short run and long run, and increases in the level of export

activity also have a negative impact both in the short and long terms. They argued that since trade negatively affects wages, if those at the bottom end of the income scale are disproportionately affected by trade liberalisation, then this would cause income distribution to become more unequal. They contended that the origin of imports has its impact on the wage distribution among workers; for example, trade between the UK and East Asia tends to increase the wage gap between skilled and unskilled workers, while the expansion of intra-industry trade within the European Union tends to affect the relatively highly-skilled workers.

2-4.3 Changing Consumer Behaviour

Consumer demand expresses the amount of a commodity or a service that consumers are willing to buy at a given price during a stated period. Demand of individual consumers gives rise to the market demand for goods and services. The theory of consumer behaviour assumes that the consumer has complete information on the range of goods and services available in the market, and that he/she knows about the capacity of these products to satisfy his/her needs. In addition, the theory postulates that the consumer knows about the prices of these products. This information set could help him to maximise his/her utility subject to an income constraint. On Figure (6) the downward budget line shows the different combinations between goods the consumer can purchase with a limited income, with the assumption that income is spent on X_i and Y_i products. The figure shows that the consumer cannot get any combination of goods on the right to the budget line. He can choose only combinations on the budget line between points Q and S that are touched by the indifference curve, which shows combinations of goods that yield the same level of total satisfaction. So, the consumer is indifferent to the choice between these combinations. Based on this notion, each point on the budget line yields some specific level of satisfaction or utility. As seen on this figure, there are an infinite number of attainable combinations represented by points Q, L, P, R and S on the budget line. Many of these combinations can be trailed, but the optimal one is represented by point (p) where an indifference curve is just tangent to the budget line. At that point, the consumer has attained the maximum level of satisfaction.



Quantity of products per unit of time
Figure (6)

The

total satisfaction a consumer gains from all units of a product consumed within a given time period produces his/her total utility (TU) derived from consuming that product, and consuming one extra unit within a given time period gives rise to his/her marginal utility (MU). In the short run, if consumer tastes change such that the marginal utility of a particular product rises, this will lead to an increase in consumption of this product, and then to its market price. However, any change in the consumer's demand for products or goods and services has its impact on the firm's demand for labour, which is derived from the demand for these products. However, both increase in products demand and rise in their market prices make the marginal revenue (MR) of firms exceed their marginal cost (MC). In the short run, a firm can make changes in its employment under the conditions of a perfectly competitive product market. The short run is defined as a time that is sufficiently brief that the firm cannot increase or decrease its capital stock; i.e., the firm's capital stock is fixed at a specific level K_0 (Borjas, 2002). Therefore, the firm as a profit maximiser would decide whether or not to employ an additional unit of labour to meet the demand to produce its goods and services. It should weigh the increase in revenue that would result from employment of an extra unit of labour against the resulting increase in its costs. Since the firm operates in a perfectly competitive product market, the prices it charges for its product and the prices it

pays for its inputs are largely determined by the market; i.e., the firm works as a price taker. Therefore, to evaluate the contribution of an additional unit of labour to the firm's revenue, the firm has to calculate its marginal revenue (MR). This can be settled by multiplying the firm's marginal product of labour MP_L by the given market price (P). This is referred to as marginal revenue product of labour (MRP_L). On Figure (7), the marginal revenue product of labour (MRP_L) represents the firm's short-run labour demand curve. If the market wage rate were at point (W), the firm would employ a quantity of labour at (L) hours. At this level, the wage (W) equals MRP_L , but if the wage rate falls to (W'), the firm would expand its demand for labour to a new profit-maximising level of (L_2) hours, at which point the (MRP_L) equals the new lower wage rate (W'). This figure shows that if the firm were to hire more than (L_2) hours, it would still have lower marginal revenue product, while the firm cannot exceed its employment beyond (L_1), since, for the additional labour hours, the marginal revenue would exceed the wage rate (W).

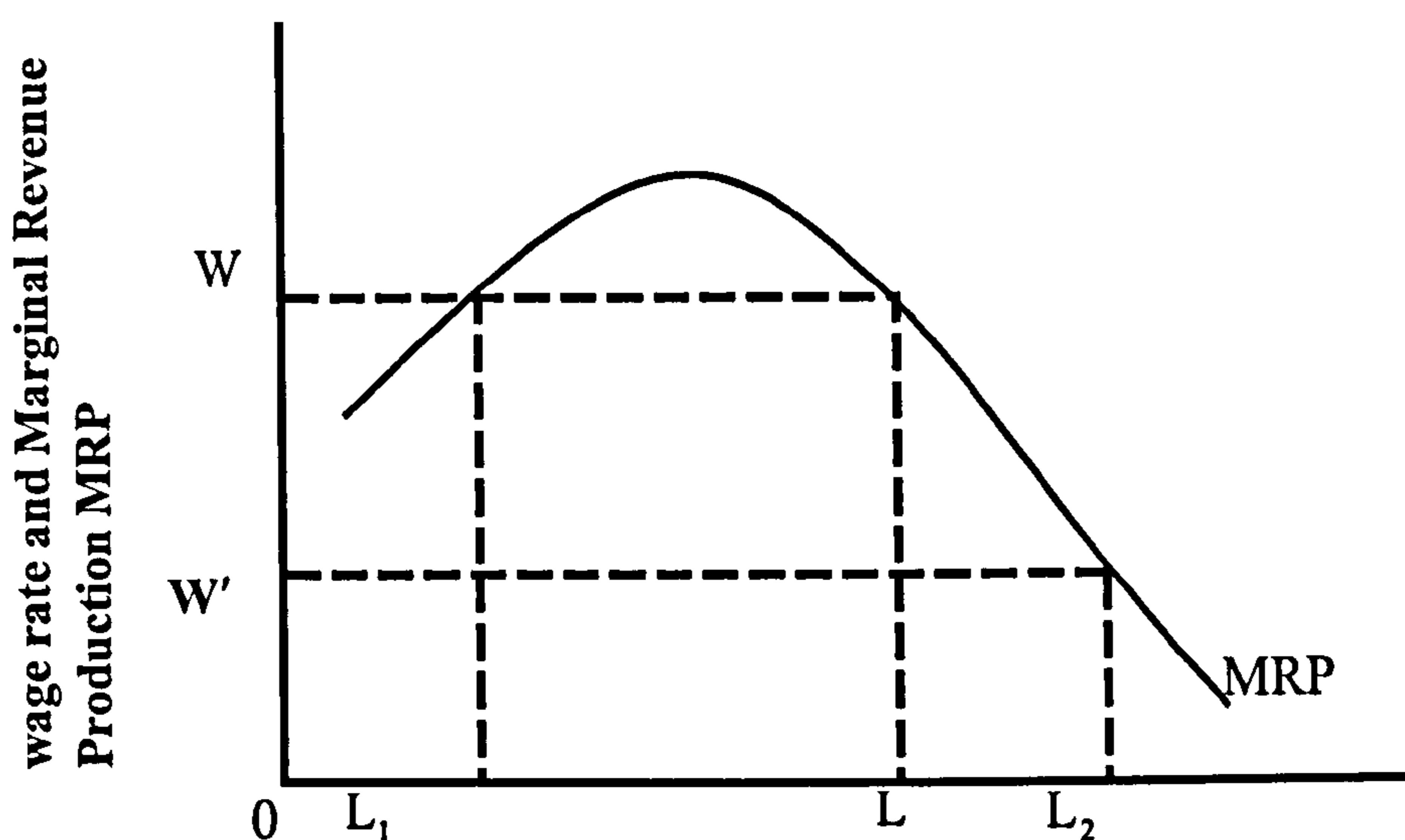


Figure (7)
Firm's Labour Demand (in Short Run)

But at the industry level, the demand for labour expresses the overall firms' demand for labour. Of course, it is incorrect to add up the firms' curves to arrive at the industry demand. This is because a firm's labour demand curve in the short run is based on its marginal revenue (MR). Each firm in a perfectly competitive

industry is small in relation to the industry as a whole, so it cannot influence the prices of the products that it sells in the market. But if all firms in the industry consider the labour wage to increase their employment, there would be more output in the industry, which would drive the market price of the output to fall. So at the level of industry, a decrease in the wage rate will make each firm tend to increase its labour input, and then its output. From Figure (8a) the firm's labour demand is depicted by the demand curve $d_1d'_1$; if the wage rate is W the firm employs e_1 units of labour at point (a). Aggregating on the industry level, on Figure (8b), the labour demand at the current wage rate (W) is L_1 units of labour at point (A). When the wage rate declines to W' , because labour supply increases at the previous wage rate, the firm would expand its demand for labour along $d_1d'_1$ curve at point (b'), and employing e' units of labour. When all firms expand their employment of labour, the total output expands. As the commodity prices fall, the individual firm's labour demand curve declines to dd' and the wage rate decreases to W' at point (b) employing e_2 units of labour. Aggregating for all firms, the industry employs L_2 units of labour with the current market wage rate at point (B) on the industry demand curve DD_1 .

The responsiveness of labour demand in the industry to changes in the wage rate is measured by the elasticity of labour demand, which is defined as the percentage change in employment resulting from a 1 percent change in the wage, as expressed in Equation (7):

$$\eta = \frac{\% \Delta E_i}{\% \Delta W_i} \quad (7)$$

where η is the elasticity demand for labour, $\% \Delta$: the percentage change, and subscript (i) denotes category of labour (i).

Since the labour demand curves usually slope downward, an increase in the earnings will cause employment to decrease; then the elasticity of demand will be negative. However, the magnitude of the responsiveness of the demand for labour in relation to a change in the wage rate is measured by the absolute value of the elasticity. Therefore, if a 1 percent increase in wages leads to an employment decline of greater than 1 percent, this is referred to as an elastic demand curve. In

contrast, if the absolute value is less than 1, the demand curve is said to be inelastic. If demand is elastic, aggregate earnings of workers will decline when the wage rate increases, because employment falls at a faster rate than wages rise. In contrast, if the demand is inelastic, aggregate earnings will increase when the wage rate increases. From the equilibrium state of the labour market, an increase in wages causes employment to decrease and then produces a negative elasticity of demand. Therefore, the larger the absolute value of the elasticity of demand, the larger the percentage declines in employment with any level of increase in wages. The standard theory of wage elasticity postulates that the elasticity of demand for a category of labour, holding other things constant, will be high when the price elasticity of demand for the product being produced is high, other factors of production can be easily substituted for the category of labour, the supply of other factors of production is highly elastic, and the cost of employing the category of labour is a large share of the total cost of production.

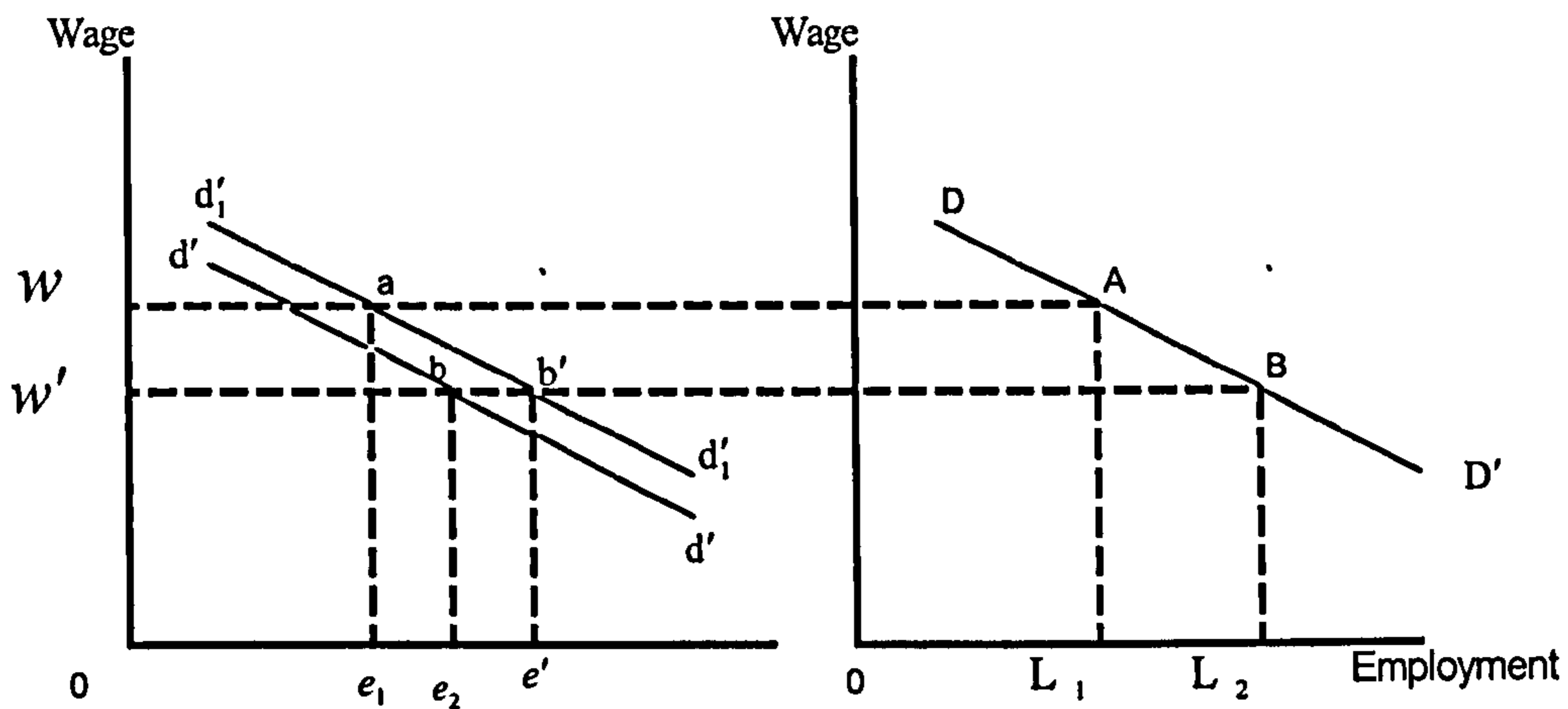


Figure (8a)

Figure (8b)

Industry Labour Demand

2.5 WAGE DIFFERENTIALS AND WAGE DISCRIMINATION

This section discusses some applications of models that are usually used to interpret and explain wage differentials and wage discrimination in different countries, especially in the developed countries and some urban areas of the

developing countries. Most of these applications cover wage inequality between two groups of workers, for example, males and females, and black and white workers.

Wage differentials between workers in the labour market may arise due to different social and economic reasons. Variation in culture, tradition, and ethnicity may support the phenomenon of the wage differential existence in the labour market. On the other hand, wage discrimination is usually associated with the wage differential or earnings gap between different groups of workers. Many economists (Oaxaca, 1973; Blinder, 1973; and Glodin, 1990; among them) examine and analyse wage differentials between these workers in the labour market. They decomposed the total wage differentials into two parts: the unexplained portion, which is referred to as the wage discrimination, and the explained portion, which is attributed to personal and productivity characteristics of the workers. The wage discrimination is attributed to gender or racial or ethnicity reasons or to other subjective factors. According to Becker (1971), economic discrimination arises in the labour market when a group of workers who have identical work characteristics to another group is treated differently because of personal characteristics rather than economic endowments. This makes discrimination a subjective and highly contentious subject matter that depends on social, ideological, and physical distance between the two groups. Gender discrimination is a form of market discrimination. It exists if individuals are treated differently on the basis because of their gender. Similarly, racial discrimination and ethnicity discrimination in the labour market are based on social and cultural factors behind this phenomenon. He uses a discrimination coefficient (DC) to measure the magnitude of the variable or variables that influence wage discrimination between workers in the labour market, and defines this coefficient as the proportional difference between the wage rates of these workers. Becker measures the level of discrimination under the state of wage rate equilibrium of two groups of workers whose wage rates, if paid discriminatively, differ. He argues that this state of equilibrium exists in the absence of discrimination and nepotism, and when each of the two groups of workers perfectly substitutes for the other. Market discrimination against a group

of workers exists if the average net wage rate or (income) of this group is reduced by a greater percentage than the other group of workers.

On the other hand, the standard theory of wage discrimination postulates that direct and indirect contact in the work place, the level and duration, and intensity of this contact, have their effects on discrimination level. Becker (1971) argued that discrimination is less severe against Blacks in the case of temporary jobs in comparison to those in permanent jobs, because the duration of contact in the former type of employment is less than in the latter case. Similarly, discrimination by blacks against one another is much less than it is by whites against blacks, and this may result from the more intense contact among blacks than between blacks and whites. Moreover, Becker found that discrimination is greater against older and better-educated non-whites. This may reflect a positive relation between discrimination and occupational status of these workers, since older and better-educated non-whites have higher and more responsible occupational positions and thus they have higher relative income to their other colleagues. Becker also found that region or area of residency has its impact on tastes for discrimination.

Arrow (1995) discussed discrimination in the labour market; he confirms that discrimination might be practiced by both the employers and employees in the workplace. Arrow contended that when the employer firm discriminates between two groups of workers, e.g., blacks (B) and whites (W), it seeks to maximize its utility function through equalizing the workers' marginal productivity (MP_i) to what is paid to them as a compensation for their labour. In this case, the wage of the black worker, for example, is the market wage (W_B) plus the price the employer is willing to pay in terms of profits (π), which is denoted as (dB) that is taken to be the marginal rate of substitution of profits for black workers ($MR\pi_B$). This provides the marginal productivity of these workers, expressed (in Equation 8) as follows:

$$MP_B = W_B + dB \quad \text{where} \quad dB = MR\pi_B \quad (8)$$

Similarly, in the case of the white worker, the marginal productivity is expressed (in Equation 9) as:

$$MP_w = W_w + dW \quad (9)$$

From Equation (8) dB will be negative if the employer has no positive liking for having (B) workers, who are paid less than their marginal productivity; even the two workers (B and W) are interchangeable in production. Therefore, this creates employer discrimination against black workers, while (W) workers, from Equation (10), gain or at least are not losing.

On the other hand, Arrow assumes that all employers have the same utility function, $U(\pi(B, W))$, which depends on the ratio (W/B) workers, but some employers may be more discriminatory than others. Therefore, firms that display the highest values of (dB) have the highest ratios of (W/L), i.e., white to total workers. He contended that a partial degree of segregation shows that the (B) workers tend to be found in the less discriminatory firms and the (W) workers in the more discriminatory ones, and in the competitive labour market the degree of discrimination tends to decrease, as only the least discriminatory firms survive.

On the other hand, discrimination might be practiced by co-workers in the workplace. This happens when a group of workers, say, foremen, who are indicated as (F), likes working with (W) workers and dislikes working with (B) workers. Such work relations are governed by the ratio W/B. However, this kind of discrimination restricts the employment opportunities of the discriminatory workers (F) to be based on both wages and the W/B ratio in the labour market, which determine the equilibrium point of these workers as in Equation (10):

$$\omega_F = \omega_F(W/L) \quad (10)$$

Where ω_F is the foremen's wage and L is the total labour force of the firm (W+B). But if firms have no discriminatory tastes and seek only to maximize profits, they will still not hire (B) workers at equal wages with (W) workers, since an increase in (W) decreases the wages and thus the cost of foremen (F) workers, while an increase in (B) workers increases the cost of (F) workers. Arrow argues that if all employers have the same levels of (W) and (B) workers, the extent of the wage difference between (B) and (W) workers depends on the extent of the discrimination. This can be measured (in Equation 11) by the following formula:

$$\frac{\omega_W - \omega_B}{MP_L} = - \frac{\omega'_F}{\omega_F} \frac{S_F}{S_L} \quad (11)$$

where:

ω_W and ω_B are the wage rates of (W) and (B) workers, respectively, ω'_F is the derivative of ω_F and S_F is the total payments for foremen, and S_L is the total payment for floor workers (W and B). As seen on Equation (12), the left-hand side is the market wage differential that exists due to discriminatory tastes of foremen relative to the wage level in the absence of discrimination, and due to the observed wage differential that depends on the ratio $\frac{S_F}{S_L}$.

Bergmann (1971) discussed the economic consequences of discrimination to white and black employers and employees. She explained that black workers generally have relatively less education and are concentrated in certain jobs. She argued that the effects of limiting certain jobs for these workers depend on the size of their labour force relative to the restrictions on hiring them. Therefore, discrimination in employment of black workers, as Bergmann (1971) concluded, crowds them into certain occupations because of the refusal of most employers to consider hiring them for jobs in other occupations. This has caused the marginal productivity of these workers to be lower in comparison to that of white workers with the same level of education. Using data from the Census Bureau's Current Population Report of 1969, she estimated changes in wages of white and black workers in response to lessening in discrimination. She found that the group that is most affected by a lessening in discrimination is the white male workers who did not finish their elementary education, and their loss in income is between 6 and 9%, while losses among white female workers extend to all those who did not finish high school, which count between 9-14%. Other findings of her study show that a rearrangement of the labour force, under elimination of discrimination, by moving labour out of occupations with marginal productivity, has a low effect on aggregate income. She also found that occupations that black workers had specialised in might lose one-fourth or more of their workers, and this would cause a change in relative wages due to the absence of discrimination.

Malkiel and Malkiel (1972) studied pay differentials between males and females in professional occupations. Using data of a single corporation for the period 1966-1971, they based their research on the human capital approach, and concluded that the characteristics of the two groups were responsible for between

54-63% of the total pay differential between men and women over 1966 and 1971, in favour of males. Moreover, differences in human capital characteristics of the two groups can explain between 37-49% of the total pay differentials between them, in favour of males. They further estimated the impact of schooling levels, individual's publications, area of specialisation, and marital status on pay differentials. It is found that the pay difference attributed to these characteristics of the two groups is still high as it stood at between 54-73% of the total pay differentials over 1966-1971, supporting higher payment to males. They found that the adjusted difference due to these variables and post-schooling investments is slightly decreased to levels between 36% and 46% for males. When they include the occupational status to these characteristics, the level of the unexplained residual is reduced to about 3% of the total pay difference between the two groups of workers.

Oaxaca (1973), in his seminal work, also analysed and explained sources of the hourly wage differential between male and female (white and black) workers. He contended that social attitudes and uneven occupational distribution between male and female workers accounted for the wage differentials between them. He developed a decomposition technique that allocates the sources of the wage differentials into an explained part that is due to difference in the endowments of the two groups and another part that is due to discrimination in the labour market. He argued that discrimination against females exists in the labour market when the relative wage of males to females exceeds the relative wage that would prevail if males and females were paid fairly. Based on this concept, he formulated a discrimination coefficient (Equation 12) as:

$$D = \frac{W_m / W_f - (W_m / W_f)^0}{(W_m / W_f)^0} \quad (12)$$

D represents the discrimination coefficient, W_m/W_f is the observed male-female wage ratio, $(W_m/W_f)^0$ is the male-female wage ratio that would prevail in the absence of discrimination in the labour market, and (W_i) is the hourly wage rate of i -th worker. He suggested that the discrimination coefficient could be estimated on the basis of either of the following two assumptions:

- 1) the current wage structure faced by females would also apply to males if there were no discrimination, or
- 2) the current wage structure faced by males would also apply to females if there were no discrimination.

Taking the natural logarithm of both sides, Equation (12) can be transformed into the following expression:

$$\ln(D+1) = \ln(W_m / W_f) - \ln(W_m / W_f)^0 \quad (13)$$

The wages equations for males and females can be estimated (Equation 14) as:

$$\ln(W_i) = X_i B_i + U \quad (14)$$

where W_i = the hourly wage rate of the i -th worker, X_i denotes individual characteristics, B_i is the coefficient on the i -th characteristic, and U is the disturbance term.

He estimated the gross wage differential (Equation 15) as:

$$\ln(G+1) = \ln(\bar{W}_m) - \ln(W_f) \quad (15)$$

where G is the gross wage differentials, which is calculated as ($G = \frac{\bar{W}_m - \bar{W}_f}{\bar{W}_f}$).

According to Oaxaca, when the gross wage differential is expressed in a term of natural logarithms($\ln(G)$), the discrimination coefficient (D) implies that the differential can be decomposed into the effects of discrimination and the effects of differences in personal characteristics. Therefore, the discrimination coefficient (D) is a part of the gross discrimination (G), as it calculates as a proportion of the gross wage differential (G).

Then from the ordinary least squares estimation, he constructed the wage equation for each race-sex group separately (Equations 16 and 17) as

$$\ln(\bar{W}_m) = \bar{X}_m \hat{B}_m \quad (16)$$

$$\ln(\bar{W}_f) = \bar{X}_f \hat{B}_f \quad (17)$$

where:

\bar{X}_m and \bar{X}_f are the vectors of the mean values of the characteristics for males and females, respectively; and \hat{B}_m and \hat{B}_f are the corresponding vectors of the estimated coefficients. Substituting (16) and (17), he calculated the gross differential into Equation (18) as:

$$\ln(G + 1) = \bar{X}_m \hat{B}_m - \bar{X}_f \hat{B}_f \quad (18)$$

Using data from the 1967 US Survey of Economic Opportunity, Oaxaca (1973) estimated the wage differentials between males and females among white and black workers separately for each race group and for full-scale wage equation. The explanatory variables included variables that are related to socio-economic characteristics and personal characteristics of these workers. These variables mainly comprised percentage share of unionised and non-unionised workers, industry, occupation, health problems, part-time work status, migration, size of the urban area, marital status, region, education, and experience. He concluded that the estimates of discrimination coefficient (D) were at 40% for white workers, and 45% for black workers (both males and females). The gross wage differential (G) was estimated at 54% for the white group and 49% for the black group (both males and females). These results tell that discrimination accounts for 74% of gross wage differentials for white workers and 92% for black workers. On the other hand, the difference between the gross wage differential (G) and the discrimination coefficient (D) represents an estimate of the wage differentials that would prevail in the absence of discrimination. He calculated this wage differential at 14% for white workers and 4% for black workers. However, estimates of the full-scale sample give the wage discrimination coefficient as 29% for white workers and 25% for black workers. From these results, Oaxaca (1973) calculated the discrimination effect at 53% of the gross wage differential for white workers and 52% for black workers.

Blinder (1973) discussed a similar decomposition technique as Oaxaca (1973) to examine wage differentials by sex and race. He argued that wage differentials generally comprise two parts: the explained one that might be attributed to certain characteristics such as education and work experience, and the other unexplained portion that is attributed to wage discrimination in the labour market. He decomposed wage differentials between two groups of workers by estimating the earnings equation (Equation 19) for each group as:

$$\ln(W_i) = a_0 + \sum_{i=1}^n x_i B_i + u_i \quad (19)$$

where:

$\ln(W_i)$ is the natural logarithmic earnings of individual workers, x_i ($i = 1, \dots, n$) represent the observed individual worker's characteristics that are used to explain wages; the parameters (B_i) indicate effects of changes in the workers' characteristics on their earnings; while (u_i) are the disturbance terms that takes into account the influence of various errors, such as errors of omitted variables, errors of the functional form of the model, errors in measurement of dependent variables, and effects of human behaviour. He formulated the explained portion of the wage differential (Equation 20) as:

$$\Sigma B_j^H \bar{X}_j^H - \Sigma B_j^L \bar{X}_j^L \quad (20)$$

where the H superscript indicates the high-wage group and L indicates the low-wage group. The unexplained portion, or the portion attributed to discrimination, is expressed (in Equation 21) by:

$$B_0^H - B_0^L \quad (21)$$

Blinder calculated the explained portion and broke it (Equation 22) down into:

$$\Sigma B_j^H \bar{X}_j^H - \Sigma B_j^L \bar{X}_j^L = \Sigma B_j^H (\bar{X}_j^H - \bar{X}_j^L) + \Sigma \bar{X}_j^L (B_j^H - B_j^L) \quad (22)$$

The first term on the right hand side expresses the wage differential that arises from the advantage of the high-wage group in the endowment of characteristics over the low-wage group. The second part indicates the differential that arises from the fact that even if the high-wage group has the same characteristics as the low-wage group, the high-wage group enjoys superior marginal effects due to these characteristics than the low-wage group.

Blinder estimated and decomposed wage differentials between white males, white females and black males in the USA using data from the Michigan Survey Research Centre's Panel Study of Income Dynamics from 1968-1970 and data from the 1967 Survey of Economic Opportunity. Blinder examined various factors that contribute to the wage differentials between white and black workers. These factors include education, age-wage profile, work experience, union membership, geographical distribution, and occupations. He found that between 60-70% of the wage differentials were due to educational and other objective characteristics, such as work experience. The remaining 30-40% was attributed to discrimination,

including discrimination in occupation. The wage differential between white males and females is estimated at 46%.

Swaffield (2000) analysed the gender wage differential in the UK. She argued that after three decades of applications of the Equal Pay Act (1970), difference in average wages between men and women is still evident. The main factors are education, experience, marital status, work-oriented women, home-oriented women, aspiration and household constraints, full-time and part-time employment status, and union membership. Using a decomposition technique based on the Oaxaca-Ransom (1994) model, she formulated the technique (Equation 23) as:

$$\ln(G+1)=(B^m - B^*)X^m +(B^* -B^f) X^f +(X^m - X^f)B^* \quad (23)$$

As seen on this equation, the first term on the right-hand side is an estimate of the male wage advantage, and the second term is an estimate of the female wage disadvantage. The third term is an estimate of the productivity differential between male and female workers, and (B^*) stands for the wage structure observed in a non-discriminatory labour market.

She estimated the controlled variables by using data from the British Household Panel Survey (BHPS) of 1991-97 across six waves of surveys. Estimates covered full-time and part-time employees aged between 18 and 65 years old with manual and non-manual jobs. She estimated four categories that included experience (both potential and actual experience), motivation factors for work-oriented women and home-oriented women, aspiration variables, and household constraints. Each category comprises some other related variables, and is formulated to be associated with actual and potential experience. She estimated the gross gender wage differentials at 31% for all employees and about 20% for full-time employees with the unexplained portion between 41.4 and 70.4% for all employees across the four categories, and between 44.3 and 70.4% for full-time employees across these categories. The calculated adjustments of gender earnings inequality showed that the aggregate earnings differential is about 36% for all employees. The skill level of the female employee's mother has a positive effect on the female wage, estimated at 8%. The unexplained or discriminatory portion of

the gender wage differential is calculated to be between 12-43% when potential labour market experience is included in the wage equation.

Goldin (1990) discussed the history of American women's participation in the labour force over the period 1790-1988 in order to understand the grass roots of the gender wage gap in America. She formulated a statistical technique to measure the wage discrimination and difference in wages between males and females, based on the decomposition techniques attributed to Oaxaca (1973) and Blinder (1973). She contended that wage discrimination might be due to the difference in slopes or the difference in intercepts. Goldin (1990) suggested two natural logarithmic earnings equations separately for each of the two groups (Equations 24 and 25) as:

$$\text{Log } W_f = a_f + \sum B_f X_f \quad (24)$$

$$\text{Log } W_m = a_m + \sum B_m X_m \quad (25)$$

where $\text{Log } W_f$ and $\text{Log } W_m$ represent natural logarithmic earnings of female and male, respectively. The variables X_m and X_f indicate personal characteristics of male and female, respectively, while (B_f) stands for slopes of female and (B_m) for slopes of male, and the terms a_m and a_f represent the intercept of the equation.

Then she calculated the difference between slopes and intercepts of the two groups of workers, by combining the two Equations (24) and (25). She argued that such a difference could be multiplied by the mean values of the characteristics of any of the two groups as expressed in Equation (26).

$$\text{Log}(W_m - W_f) = (a_m - a_f) + \sum X_{f/m} (B_m - B_f) + \sum B_{f/m} (X_m - X_f) \quad (26)$$

Using data from the Survey of California and Michigan workers in the manufacturing sector, she measured the determinants of female earnings during the period between 1888 and 1907. The study found a substantial difference in average annual earnings between males and females in this sector over different years. In 1890, females earned 54% of the male earnings, 55% in 1900, and 56% in 1905. Goldin (1990) found that married men received 17% more earnings than married women, while associating marital status and work experience reveals that the difference in earnings between unmarried workers in their early work experience is about 47% for male workers, but decreases to 8% for those with 10 years of experience. Moreover, she found that wage discrimination accounted for 35% of the earnings differential between the two groups of workers in this sector over

1888-1907, while training and experience were responsible for 25% of this difference in favour of males. Goldin (1990) examined wage discrimination among clerical workers in 1940 in the USA. She found that work experience for five years increased male earnings by 11% more than females with the same years, and males earn 19% more than females for 10 years' experience. Besides, education is found to augment workers' earnings in clerical jobs and consequently widens the wage differential between males and females. She found that a college diploma yielded 11% for males but 7% for females. A married man is found to earn on average 12% more than a single man. On the other hand, a clerical female who changed both the employer and occupation might get a 60% increase in earnings in comparison to only 20% for her colleagues in the manufacturing sector. However, she estimated the explained portion of the wage gap to be 39% in clerical jobs, compared to 65% in manufacturing. Moreover, the clerical females would have earned 24% more in the absence of discrimination, which would close the earnings ratio between female and male to 80% rather than 64% under discrimination.

Preston and Crockett (1999) discussed gender earnings in the context of deregulation of the Australian labour market during the 1990s, when the rules of pay determination at the state and federal levels transformed from a centralised arbitrary system into an enterprise bargaining system. They followed the Oaxaca-Blinder technique to estimate and decompose wage differentials between males and females with the assumption that male earnings structure would have prevailed in the absence of discrimination. They decomposed male and female wage equations using the standard model. Using data from the 1996 Census Household Sample, they restricted the sample to full-time earners aged between 16 and 64 years old. They controlled for workers' endowments that comprise education, potential experience, overtime payment, birthplace (Australian-born, born in English-speaking country, and born in non-English speaking country), marital status, industry, region, and work in the public sector. They estimated the wage differentials between the two groups of workers as 14.1% in favour of males for the country as a whole, and between 13.3% and 17.6% across regions. They argued that there is some evidence that labour market deregulation has contributed to

growth in the gender wage gap in Australia. They found that the more deregulated the labour market, the greater the gender gap.

Vartiainen (2002) explained gender wage differentials in the Finnish labour market. She followed the Oaxaca technique and set up earnings equations separately for males and females, and based her analysis of this issue on data from the 1998 Household Income Distribution Survey (HIDS). With application of the standard theory of wage decomposition, she first estimated firm size, age, and education. The study reported the gross wage differential at 21.48% and the explained portion at about 3%, and the estimated unexplained portion at about 97% of the raw wage differential between men and women in the Finnish labour market. Introduction of industry and occupation characteristics slightly reduced the gross wage differential to 21.5%, with the explained portion at about 53% and the unexplained portion at about 47% of the gross wage differentials. Then she decomposed wage differentials between workers across five sub-sectors that included manufacturing workers (monthly earnings), manufacturing workers (pay per hour), local government workers, central government workers, and private service sector workers. She found that the gross wage differentials among workers in these workplaces was between 15% and 31%, while the explained portion was between 43% and 91% across these sub-sectors, and the unexplained portion was between 9% and 57% across these workplaces.

Drolet (2002) discussed the persistent gender pay differentials in Canada by applying the decomposition technique and controlling different variables that were classified into four categories. The first controls the human capital components such as full-year full-time work experience (FYFTE), educational level and major field of study, job tenure, marital status, and age of the youngest family member. The second category controls components such as part-time status, union status, region, geographical size, and firm size. The third specification includes job responsibilities, and the fourth controls occupation and industry. The estimates of the study were based on data drawn from the 1997 Survey of Labour and Income Dynamics (SLID) in Canada, with a sample of paid workers aged between 18 and 64 years old. Drolet calculated the gross wage differential across the four categories as 22%, while the explained portion across these categories was calculated to be

between 21.4% and 49.1%, and the unexplained portion was between 50.9% and 78.6% across the four specifications. She found that the ratio of female to male earnings was between 84.1% and 89.4% across these specifications.

In summary, empirical studies of wage inequality and discrimination have largely been based on the decomposition techniques, which assume that:

- 1) the decomposition model is mainly based on the individual's earnings that relate to his/her life-cycle human capital investments, but data on such investments are not entirely available. Therefore, cross-sectional data on earnings and other socio-economic characteristics of individuals is considered the most appropriate source for empirical applications of the decomposition technique;
- 2) the decomposition technique uses cross-sectional data that is mainly related to the labour supply determinants, rather than using data expressing the labour demand determinants;
- 3) the decomposition model has improved the traditional linear earnings regression technique by postulating a separate earnings equation for each group of workers, with lower and higher earnings, and then incorporating the two equations, whereas the traditional regression treats the coefficient of the characteristics or attributes of the lower and higher earnings groups as the same. This can be expressed in Equation (27) as:

$$Y_i = \alpha_1 + \alpha_2 D_i + BX_i + U_i \quad (27)$$

where: Y_i is monthly earnings of workers, X_i = years of experience (for example), and $D_i = 1$ if higher earnings group, 0 otherwise. Therefore, the traditional regression model makes the two groups of workers have the same earnings-experience slope (B), and eliminates the lower earnings group from the equation. In contrast, the decomposition model makes the coefficient vary for the two groups of workers, and it expresses the differences in the characteristics of the two groups (Equations 13-26);

- 4) the decomposition approach assumes participation of the workers in the labour force; i.e., it assumes that workers in the sample have to be employed to easily measure the wage gap and to measure the effects of discrimination on earnings distribution among the participants;
- 5) variation in the workers' endowments requires various personal characteristics, workplace characteristics, location, industry and many other similar characteristics that might influence the workers' earnings to reduce the level of the unexplained portion;
- 6) the approach considers subjective factors such as variables misspecification or variable omission to be part of the discrimination or the unexplained portion. Thus, as Blinder (1973) argued, the true extent of wage discrimination may remain unknown.

However, these assumptions provide reasonable methods to analyse and interpret the wage differentials and wage discrimination among workers in the labour market. Their rationality is supported by the wide applications of the decomposition model in different countries. Therefore, this research adopts the same assumptions in applying the decomposition technique to the analysis of wage differentials and wage discrimination in the Saudi labour market.

2.6 GENERAL CONDITIONS OF LABOUR DEMAND AND SUPPLY IN SAUDI ARABIA

This section discusses general conditions related to labour demand and supply in the Saudi labour market, and the aggregate earnings distribution between Saudi and non-Saudi workers. Due to lack of adequate data, it first discusses the factors influencing earnings distribution between the two groups of workers as derived from available released data and information on these factors in Saudi Arabia in general, and then discusses the general features of demand and supply in the chemical and petrochemical industries. However, it is known that educational attainment, occupational status, experience, demographics and family, social welfare subsidies, and similar factors have their impacts on the wage determination in the labour market. These factors are mainly related to the labour

supply side, while the labour demand factors comprise international trade patterns, technological change, and consumer preferences.

2.6.1 Supply Factors

In Saudi Arabia, aggregate monthly earnings data present the overall distribution among workers by educational qualifications, gender, and occupational status. Table (2-1) presents the aggregate earnings distribution based on the ethnicity of Saudi to non-Saudi workers in the labour market. As can be seen on this table, earnings inequality between the two groups of workers widened over 1994-2002. The aggregate average monthly earnings ratio of Saudi to non-Saudi workers is calculated between 3.3 and 3.8 over this period, in favour of Saudi workers. The table reveals that though the earnings ratio between the two groups decreased slightly from 3.81 in 1999 and 2000 to 3.75 in 2002, but it is still higher.

Table 2-1
Earnings Ratio of Saudi to Non-Saudi
Over 1994-2002

Year	Saudi	Non-Saudi	Saudi/Non-Saudi
1994	7220	2179	3.31
1995	7620	2127	3.58
1996	7489	2062	3.63
1997	7369	1952	3.78
1998	7021	1870	3.75
1999	6757	1774	3.81
2000	6560	1722	3.81
2001	6166	1639	3.76
2002	5824	1554	3.75

Source: Saudi Monetary Agency "Annual Report" No.40

Regarding the impact of educational attainment on earnings of the two groups of workers, it was mentioned earlier that Saudi Arabia was a subsistence economy even after oil exploitation started. Up to the 1950s, the number of educated Saudis was very low and the lucky ones were those who finished their general secondary education, as post-secondary educational institutions did not

exist in the country. Those who received post-secondary education did so by studying abroad. With the booming oil industry in the 1970s, the country targeted education and classroom training to improve the skills of Saudi nationals. Chapter Three of this study refers to numerous free educational and training programmes that were launched by the government. Educational attainment is considered as a successful means of influencing labour supply and structure of the labour force, which influence the competitive wage in the labour market (Borland, 2000). Table (2-2) shows the impacts of the educational status of workers on the monthly earnings of Saudi and non-Saudi workers in 1996 and 2000. The table reveals that

Table 2-2

**Monthly wage Ratios of Saudi to Non-Saudi Workers
by Education Over 1996-2000**

(Saudi Riyals)

Educational Level	1996			2000		
	Saudi	Non-Saudi	Ratio	Saudi	Non-Saudi	Ratio
Illiterate	3245	1123	2.89	3155	1136	2.78
Read & Write	3512	1247	2.82	3450	1260	2.74
Primary	4462	1323	3.37	4600	1378	3.34
Intermediate	5174	1599	3.24	5437	1587	3.43
Secondary	8198	2305	3.56	7200	2580	2.79
Post-Secondary	6293	2652	2.37	6810	2880	2.36
Graduate	11691	5131	2.28	10893	5581	1.95
Post graduate	23634	10412	2.27	21112	10856	1.94

Source: Central Department of Statistics (CDS) "Survey of Establishments", 1996 and 2000

Saudi workers with higher educational qualifications earn more than their fellow citizens with low educational qualifications. In 1996, the earnings ratio of Saudi workers with post-graduate qualifications to their colleagues with university qualifications is about 2.0. In 2000, the earnings inequality between the two groups decreased slightly to 1.91 in favour of post-graduates. In turn, Saudis with university educations earned more than their colleagues with lower qualifications over the two years. The earnings ratio of Saudi university graduates to their colleagues with secondary education(tertiary) is calculated at 1.51 and 1.57 in

1996 and 2000, respectively, while the earnings ratio between Saudis with secondary education and their fellow citizens with intermediate educations is calculated at 2.6 in 1996 and about 2.0 in 2000. This confirms the assumption that workers with higher education earn more than those with lower educational qualifications. However, the table records a similar trend of wage differentials across -educational qualifications among non-Saudi workers. It shows that the monthly earnings ratio of non-Saudi graduates compared to their colleagues with university qualifications is about 2.2 in 1996 and 2.0 in 2000, while those with university qualifications earn 2.2 compared to their colleague with secondary qualifications in both 1996 and 2000. As shown on this table, non-Saudi workers with secondary educations earn more than their colleagues with intermediate qualifications by 0.38 in 1996 and 0.60 in 2000.

Considering the impact of educational status on the wage inequality between Saudi and non-Saudi workers, this table shows that Saudi graduates earn 2.28 and 1.95 times as much as their non-Saudi graduate counterparts in 1996 and 2000, respectively. The table indicates that Saudi workers with secondary qualifications have earnings ratios of 3.56 and 2.79 to their non-Saudi workers with the same qualifications in 1996 and 2000, respectively. Wage inequality between the two groups of workers extends to those with lower educational qualifications. As seen on this table, the earnings ratio of Saudi workers with intermediate educations compared to their non-Saudi counterparts with the same qualifications is higher than those with higher qualifications. It is calculated at 3.24 and 3.43 in 1996 and 2000, respectively. Moreover, uneducated Saudi workers also have higher earnings than their non-Saudi counterparts. The earnings ratio of Saudi to non-Saudi workers among the illiterate workers is calculated at 2.89 and 2.78 in favour of Saudi workers in 1996 and 2000, respectively. It is clear that the macro-data on the earnings by educational status for Saudi and non-Saudi workers reveals the influence of the educational attainment, as a human capital component, on the earnings of these workers in the Saudi labour market.

The literature presents wage differentials associated with the occupational status of workers, which is referred to as occupational wage differentials. The

literature assumes that the occupational status of workers has its influence on their earnings distribution. In the Saudi labour market, there are many occupations that were created by the foreign workers who entered the country after the oil discovery and particularly in the 1970s. Meanwhile, the expansion of education and training programmes that were instigated by the government, both inside and outside the country, have contributed to an increased participation of the Saudi workers in some of these occupations, particularly in the white-collar jobs. The released macro-data on the occupational distribution of Saudi and non-Saudi workers reveal the impact of the occupational status of these workers on their monthly earnings. This data indicates the existence of wage inequality among these workers across occupations over 1985-2000. Table (2-3) shows that Saudi workers have significant higher earnings than their colleagues over this period. Their aggregate average monthly earnings ratios compared to non-Saudi workers are calculated between 1.24 and 3.00 over the period. For workers in the professional jobs the earnings ratio is between 1.01 and 1.97 to the advantage of Saudi workers, in the managerial jobs, the occupational wage differential between Saudi and non-Saudi workers was slightly lower over 1985-1989, as the earnings ratio for workers in these jobs is calculated between 1.09 and 1.88 for non-Saudi over 1985-1989, with exception of 1987. In clerical jobs the ratio is calculated between 1.04 and 1.71 in favour of Saudi workers over 1985-2000, with exception to 1985. However, analysis of the earnings across occupations in the table reveals that the earnings gap between the two groups of workers widened over 1985-2000.

Some more supply factors include demographics, experience, on-the-job training, and non-pecuniary wage compensations that are governed by specific regulations, such as pension, job risks, promotion, health services, and other similar privileges. As is discussed earlier, these factors contribute to the prevailing working conditions in the country. Moreover, labour regulations, especially the rules that relate to wage determination, are in force to increase earnings inequality between Saudis and non-Saudis in the labour market. As it is mentioned before, the labour law allows Saudi workers to gain more wages than their non-Saudi counterparts even though they have similar personal characteristics, such as education and experience. Pension and health care services institutions are largely offered to

Table 2-3
Monthly wage Ratios of Saudi to Non-Saudi Workers 1985-2000
Across Occupations
Over 1985-2000

Educational Level	1985	1986	1987	1988	1989	1996	2000
Professional, Technical	1.01	1.41	1.62	1.29	1.36	2.10	1.97
Managerial	0.60	0.92	1.10	0.71	0.53	1.09	1.13
Clerical Works	0.96	1.04	1.63	1.05	1.09	1.71	1.63
Sales works	0.77	1.01	1.16	1.17	0.79	2.54	2.13
Services	1.10	1.74	1.66	1.55	2.14	3.00	3.15
Production	1.29	1.67	1.78	2.02	1.71	2.94	3.57
Construction	1.25	1.15	1.19	1.21	0.86	0.00	
Transportation	1.19	1.48	1.69	1.19	1.08	0.00	
Agricultural	1.41	2.45	2.72	2.09	2.50	3.68	3.19
Aggregate	1.24	1.70	1.97	1.71	1.66	3.00	2.99

Source: CDS "Employment and Earnings Survey", 1985-2000

support Saudi workers and augment the total compensation packages in the Saudi labour market. Therefore, these factors are identified by the literature as the primary causes and sources of wage differentials and wage discrimination in this labour market as well as in other labour markets.

2.6.2 Demand Factors

From a demand perspective, the Saudi labour market has also undergone significant changes over the past few decades. Such changes were first of all brought about by the process of industrialisation and evolving economic structure in Saudi Arabia. In Saudi Arabia as well as in the other Gulf countries, the oil industry has played a great role in transforming its economy into a modern one, and the oil revenues have had a significant impact on the structure of the labour market in the country. Labour demand from the early oil industry during the 1930s was met by: i) recruitment of skilled workers from developed countries, particularly among British and American professional and technical experts; ii) skilled and semi-skilled artisans and clerical workers from Asian countries; and iii)

unskilled workers among indigenous population, particularly the pearl diving workers. With the expansion of the oil industry during the 1950s, demand for labour grew faster than local supply. So the oil companies were obliged to import large numbers of foreign workers to meet the demand for skilled and semi-skilled labour in different occupations. With rising oil revenues in the 1970s, Saudi authorities launched ambitious development programmes that produced a great gap between the demand and supply of labour associated with the skill shortages among indigenous workers. This caused wages to rise in the local markets in comparison to the neighbouring countries and in turn increased the inflow of foreign workers into the country (Seccombe and Lawless, 1986). Moreover, the Second Economic Development Plan of 1975 in the country was directed to creating vast gas energy projects, which were considered some of the largest engineering and construction programmes in the world, creating huge industrial cities on the Red Sea and the Gulf Coast. Such projects spurred labour demand for thousands of skilled and unskilled workers who were brought from outside the country by the contracting multinationals (Woodward, 1988).

On the other hand, the country has adopted an import substitution policy that aims to create some local manufacturing industries, which are largely based on imported inputs. But many products of these industries have generally low domestic demand (Datta *et al.*, 2000) due to competition from foreign products. Moreover, the demand for domestic products was also constrained partially by the low consumption level of most of the foreign workers who tended to send their remittances abroad rather than spending them within the country. The constrained capacity to consume among the foreign workers might have also reduced the demand for imported goods and service as the remittances of these workers represented between 22 and 77.5% of total imports over 1985-2003 (Table 2-4). The reason why foreign workers were unwilling to spend their income inside Saudi Arabia was a direct consequence of the country's immigration policy which prevents most of the foreign workers from bringing their families with them, or becoming citizens of the country. Therefore, foreign workers see no future in Saudi Arabia and thus no need to improve their long-term livelihood in the country. Due to the sheer number of foreign workers, the consequence for Saudi Arabia can only

Table 2-4
Remittance of Foreign Workers to Imports
in Saudi Arabia (in Millions SR)
over 1985 2003

Year	Remittance	Imports	Re/import
1985	18834	85564	22.01
1986	17788	70780	25.13
1987	18478	75313	24.53
1988	24384	81582	29.89
1989	31994	79219	40.39
1990	42083	90282	46.61
1991	51483	108934	47.26
1992	50172	124606	40.26
1993	58860	105616	55.73
1994	67792	87449	77.52
1995	62227	105187	59.16
2000	57713	113240	50.97
2001	56699	116931	48.49
2002	59451	121089	49.10
2003	55861	138435	40.35

Source: SAMA, Ibid

mean a subdued level of aggregate demand for goods and services and thus limited further rises in the demand for labour services.

Moreover, the skills distribution in the labour market reveals a weak skill structure in the country. Table (2-5) shows the skill structure of the employed workers in the Saudi labour market over 1980-2000. The fraction of workers who completed their university education rose from 10% of the total in 1980 to 16.5% in 1987, but it decreased to 14.06% of the total in 2000. This is probably due to the Saudisation policy. The macro-data on the educational status of the workers do not show figures on post-graduates in the labour market over 1980-1987, but that of the 1990s reveal that the number of the post- graduates or highly educated workers increased slightly from 1.4% of the total in 1992 to 2.2% in 2000. The fraction of unskilled workers with education less than secondary level, i.e., primary and intermediate, counted a large weight that increased from 15% in 1980 to about 34% of the total in 2000.

Table 2-5

Educational Distribution of Labour Force 1980-2000

Education	1980	1983	1986	1987	1992	1999	2000	1980-2000
Illiterate	46.56	44.22	42.22	39.82	36.41	29.87	29.27	-52.19
less than Secondary	15.34	16.53	19.50	21.02	27.71	31.65	33.90	549.49
Secondary	11.04	12.77	10.72	11.29	13.30	14.90	15.86	177.18
Post-secondary(Diploma)	N.A	N.A	N.A	N.A	5.46	7.45	4.67	N.A
University	9.85	10.79	14.49	16.53	15.00	14.42	14.06	175.57
Graduate	N.A	N.A	N.A	N.A	1.38	1.72	2.23	N.A
Not Reported	17.21	15.69	13.08	11.34	0.06	N.A	N.A	N.A
Total	3102735	3815366	4059717	3941324	5191117	5846908	5986984	92.96

Source: CDS Ibid

Moreover, although the number of the illiterate (unskilled) workers decreased from 46% in 1980 to 29% of the total in 2000, it is still a large portion of the skill structure in the labour market. Both categories of unskilled workers account for about 63% of the total in 2000. This reflects a poor skills structure with a significant level of low skill in the Saudi labour Market. As a result, the country has to rely on the importation of skilled workers from abroad in order to fill in the skill gaps. In this context, the Human Development Report states that the ratio of expenditures on R&D in the country are not more than 0.3% of GDP over 1996-2002, in comparison to 3.45% for UK, 2.8% for USA, and 2.5% for Germany. However, the rate is higher for Jordan and relatively for UAE as it counts 6.3% and 1% for the two countries, respectively, which largely have similar labour markets and social and political environments to Saudi Arabia (HDR, 2004).

On the other hand, the table indicates a growth of skills demand over 1980 and 2000. The demand for skilled or educated workers with university qualifications increased at 177% over the two years with an annual average rate of 8.8% over the period 1980-2000, while the demand for the unskilled workers with low education levels rose between the two years with a significant ratio of 549%, with an annual average of 27% over 1980-2000. The level of skilled or university educated workers among the new entrants in 1994 was 14% of the total in the UK, 13% of the total in France, and 23% of the total in the USA (Report of Skills Task Force, 1998).

International trade is another factor that influences the demand for labour. It reveals the integration of the domestic labour market into the international economy through mutual trade of imports and exports of goods and services between different countries. Since early in the 1970s, Saudi Arabia has experienced a significant expansion of its external trade, particularly exports. The structure of Saudi exports is composed of oil and non-oil products (mainly import substitution products), which are exported to the neighbouring countries in the region. Oil exports represent the main source of the country's revenues; these exports contribute largely to GDP, though their contribution slightly decreased from 38% in 1970 to 37% in 2000. On the other hand, the country imports various

products from different parts of the world. The ratio of imports to GDP increased slightly over 1970-2000. It was calculated at 6% and 30% of GDP over 1970-1980 in comparison to ratios of 16% and 24% of GDP over 1990-2000. The structure of these imports mainly consisted of raw materials, semi-final products or the intermediate products, and finished products for final consumption (SAMA, 2003). In the meantime, the ratio of imports to non-oil GDP has slightly changed over the two periods. It is calculated between 25-50% during 1970-1980, in comparison to relatively low ratios of 26% and 40% during 1990-2000. However, this indicates how the non-oil sector depends on imports to create demand for its products that in turn push demand for labour to meet the needs of the labour market.

However, oil prices could have their impacts on the workers' earnings in the Saudi labour markets. Bivins (2001) argued that as oil prices fell in the 1980s and in the 1990s, the revenues collected by the governments of GCC countries decreased, as did the real domestic wages. On the other hand, development of the oil revenues affected demand for labour, particularly in the public agencies. Table (2-6) shows the burden of employment with public departments on the expenditures of the general budget that were mainly covered by the oil revenues. As seen on this table, most of the government revenues were allocated to pay wages and privileges of workers in these departments. It reveals that over 1986-2003, the public budget allocations for employment represent between 38-118% of the oil revenues, and between 29-67% of the total government revenues.

As is discussed earlier, the Saudi labour policy also has major ramifications for the demand for labour. It is known that the demand for labour in the government departments is fuelled by generous compensation and non-wage benefits that attract natives to primarily seek employment in these departments, which offer plentiful job opportunities in different occupations annually. It is mentioned elsewhere that the government has changed its recruitment policies since 1990 when it started to restrict its labour demand for certain jobs that were related to the health sector and educational services, and instructed the private sector to recruit Saudi workers to meet its demand for labour. However, most of the native job seekers in the labour market have low educational levels and many

of them are new entrants to the labour market. Moreover, most of these workers have no skills that match the labour demand of the private sector; therefore, many

Table 2-6
Annual Salaries Allocations to the General Expenditure, Revenues, and Oil Revenues in Saudi Arabia
Over 1986-2003

Year	Expenditure	Salary	Salary/Expend%	Oil Revenues	Salary/Oil Rev	Total Revenues	Salary/Total Revenue
1986	174709	50475	31.6	42464	118.9	76498	66.0
1987	159646	55652	39.4	67405	82.6	103811	53.6
1988	141200	56288	40.1	48400	116.3	84600	66.5
1989	140460	58276	16.2	75900	76.8	114600	50.9
1991	359601	62485	17.4	246297	25.4	316639	19.7
1992	181000	72940	40.3	128790	56.6	169647	43.0
1993	196950	76964	39.1	105976	72.6	141445	54.4
1994	160000	67713	42.3	95505	70.9	128991	52.5
1995	150000	61409	40.9	105728	58.1	146500	41.9
1996	150000	61256	40.8	135982	45.0	179085	34.2
1997	181000	94670	52.3	159985	59.2	205500	46.1
1998	196000	1E+05	51.5	79998	126.3	141608	71.3
1999	165000	95801	58.1	104447	91.7	147454	65.0
2000	185000	106958	57.8	214424	49.9	258065	41.4
2001	215000	110022	51.2	183915	59.8	228159	48.2
2002	202000	111354	55.1	166100	67.0	213000	52.3
2003	209000	116433	55.7	231000	50.4	293000	39.7

Source: SAMA, Ibid

employers view them as both less productive and more expensive than foreign workers (Datta *et al.*, 2000; Girgis, 2000). Table (2-7) shows the weight of the Saudi educated among job seekers in the labour market over 1992-2001. It indicates that the proportion of the university graduates was between 1 and 11% of the total job seekers over this period; those with secondary qualifications counted between 10 and 43%, while workers with intermediate education represented between 15 and 28% of the total Saudi job seekers, and those with lower educational levels counted the majority of the Saudi job seekers, between 17-72% of the total over this period. However, the job seekers in the labour market are induced by wages and benefits in the public sector as they do not accept wages paid to their non-Saudi counterparts who are targeted to be replaced by Saudis

Table 2-7
Weight of Educated Among Saudi Job Seekers
Over 1992-2001

Year	Illiterate	Read - write	Primary	Intermediate	Secondary	University	Total
1992	14.8	20.0	30.8	18.5	13.8	2.0	28355
1993	14.3	19.2	31.7	19.7	13.1	1.9	27464
1995	14.0	19.8	29.9	20.8	13.8	1.7	24232
1996	12.1	15.1	30.7	21.4	17.2	3.5	43596
1997	11.4	14.3	30.6	21.6	18.2	3.9	55373
1998	9.1	11.0	29.5	21.4	24.5	4.5	66386
1999	7.8	10.5	25.5	22.2	27.6	6.4	65078
2000	6.1	8.1	3.1	28.5	43.1	11.1	65194
2001	2.7	3.7	20.5	24.0	42.4	6.7	81006

Source: Ministry of Labour and Social Affairs, Annual Reports (Various Years)

(Mellahi, 1999), so they expected that the private sector would pay them extra wages that represent the difference between the current monthly wage of the non-Saudis. Datta *et al.* (2000) estimated the influences of labour policies affecting the private sector in GCC countries, which have similar characteristics, and their labour markets operate with similar policies. The authors assumed that the labour supply of foreign workers is perfectly elastic at a given wage and they are exclusively employed by the private sector, which produces non-tradable goods (especially services) and import-traded goods. The authors also assumed that the domestic labour has two wage rates: one is the government wage (exogenous wage), which the employers may resort to, and the wage determined in the labour market by the employers (endogenous wage). However, variables of the model are extended to cover exports, GDP, and government spending. Using macro-data for the period 1975-1998, they found that wages of domestic labour, both exogenous and endogenous, are higher than that of foreign workers, by 67% and 77% for the two types of the wages, respectively, and the demand for foreign labour exceeded demand for domestic labour by 61% in the GCC countries. This, in turn, increased the fiscal deficit of the government expenditure, which has to be balanced by an

increase in exports. They argued that an increase in the wages of the domestic increases demand for foreign labour, and increases demand on imports and non-traded goods.

We now turn to examine the general features of the demand and supply conditions in the labour market for the chemical and petrochemical industries. These industries have a significant role in the industrial structure of Saudi Arabia. They are generally considered to be nascent industries that mainly depend on local production of gas and some imported chemical inputs. The chemical and petrochemical industries started in the country in 1956 and the rate of its growth picked up with the establishment of Saudi Basic Industries Corporation (SABIC) in the 1970s. By 2003, per capita consumption of plastics in Saudi Arabia reached 40 Kilograms, which was higher than the level in many Asian countries and more than double the level for the Middle East as a whole(US-Saudi Arabian Business Council,2003). Saudi Arabia has become a producer and exporter of a variety of petrochemicals, with these industries contributing to the country's total exports by 5% as in 2002. In terms of contribution to manufactured exports, the share by the chemical and petrochemical industries is even higher at 69% of the total non-oil manufactured exports over the 1996-2000 period (CSD, 2000). The chemical and petrochemical industries have also become an increasingly more important supplier to the domestic market, as it is expected that the annual domestic demand for the products supplied by these industries would increase at 7-10% in the coming years (Al-Mady, 2000). The rapid growth in these industries is bound to change the composition of demand for labour in Saudi Arabia. Since most of these industries, with the exception of SABIC, are mainly labour-intensive, as their capital/labour ratio is calculated at 2.8 in comparison to 5.3 for SABIC in 1995 (Ministry of Industry, 1995), it is expected that the growth in these industries may lead to a rise in the relative demand for unskilled labour.

Concerning factors influencing wage differentials and wage discrimination in the chemical and petrochemical industries, Chapter Three (coming) has revealed some sources of such factors that are mainly related to the supply side. The first category of factors primarily reflects the human capital components that include

educational qualifications, on-the-job training, and work experience. The second category of factors reflects the demographic characteristics that comprise workers' ages, marital status, and number of children. The final category of factors is related to some non-pecuniary working conditions that reveal wage differentials in the chemical and petrochemical industries. The wage differential among workers in these industries is supported by the simple statistical measures that reflect the influences of all of the above categories of factors on earnings of these workers. It is expected that decomposition of the controlled variables will shed further light on their influence on the wage differentials and wage discrimination. Chapter Five will provide a detailed investigation of the extent and sources of the wage differentials and wage discrimination in these industries.

However, the previous chapters confirm that Saudi workers gain many more benefits in the labour market than their non-Saudi counterparts, who are largely disadvantaged. Saudi workers in the chemical and petrochemical industries generally have higher earnings than their non-Saudi counterparts, they have better working conditions than non-Saudi workers, and they have permanent jobs, while the non-Saudi workers do not. These factors are expected to have their contribution to the wage differentials and wage discrimination in these industries. However, it is expected that a portion of the wage differential between these workers is explained by some personal and productivity characteristics that include the mentioned major human capital components. Other variables include demographic factors, specifically workers' ages, marital status; and appearance of children, and workplace conditions that comprise occupational status, promotion, work injury risks, health services, mobility in the labour market, and paid leave.

CHAPTER THREE

SALIENT FEATURES OF THE SAUDI LABOUR MARKET

3.1 INTRODUCTION

This chapter provides a detailed discussion of the main features of the Saudi labour market. It makes use of the available summary data on the main characteristics of the Saudi labour market. In particular, this chapter examines features of the segmentation phenomenon in the Saudi labour market based on labour regulations that characterise this labour market and provides an initial assessment of the main causes of this phenomenon in Saudi Arabia. The main features of the Saudi labour market are discussed in the following sub-sections; they comprise the Saudisation of the labour force, the supply of labour, skill shortages among Saudi workers, foreign workers in the Saudi labour market, and the regulations that govern the labour market.

3.2 SAUDISATION OF THE LABOUR MARKET

As mentioned earlier, Saudisation refers to the Saudi government policy that was introduced to replace non-Saudi workers by Saudi workers, particularly in the private sector and skilled occupations. The Saudisation (see Appendix I) policy was largely prompted by the unemployment problem that first became significant in the country during the 1990s. The term *unemployment* refers to the number of workers who participate in the labour force but are not employed for pay during a particular period. The ratio of the unemployed to the total labour force (the participants) is the unemployment rate. However, the unemployment rate explains a fraction of the labour force that is not working, the remaining part of the labour force being accounted for by the employed workers in the labour market. In Saudi Arabia, unemployment among the native workers started to appear clearly during the mid-1990s for the first time since the oil discovery (Wood and Mellahi, 2002). During the 1970s and the 1980s, the labour market policy in the country was directed towards increasing the supply of skilled Saudi workers in different occupations. This policy was backed up by a generous recruitment of these

workers in government departments that provided better remuneration, generous work privileges, and facilities superior to the private sector (Al-Towaijri, 1992). However, with the emergence of the economic problems of the mid-1980s, when the country's oil revenues started to decrease due to falling oil prices, the single export product in Saudi Arabia, recruitment in government departments was adversely affected. This problem became more severe in the 1990s. The government then restricted recruitment to only education and health-care jobs and froze employment in other departments. Consequently, unemployment among Saudi workers suddenly jumped to 13.4% in 1992, but subsequently decreased in 1999 and 2000 with a similar rate of 8.1%, as Table (3-1) illustrates. From this table, it can be seen that unemployment among Saudi females increased from 11.8% in 1992 to 15.8% in 1999 and then to 17.6% in 2000. Although the rate among Saudi male workers decreased from 13.6% in 1992 to 6.5% in 2000, it is still a significant problem when viewed from a historical perspective.

The rise in unemployment was accompanied by labour shortages in different occupations. Theoretically, as Frey and Livraghi (1996) explained, labour shortages can exist even when there is a quantitatively sufficient supply of economically active workers. These shortages often are accompanied by the mismatch between the demand for and supply of different skills, as discussed by Ehrenberg and Smith (2000). In Saudi Arabia, the government has launched many subsidised educational and training programmes in the academic, vocational, technical, and higher education sector since the 1970s with the onset of the oil boom. This enabled the country to increase its trained and educated human resources, but despite these programmes there is still excess demand for skills, particularly technical and vocational skills (Seventh Development Plan, 2000).

Governments are normally concerned about unemployment; therefore, they intervene in the labour market through various policies such as payroll taxes, wage subsidies, and minimum wage policies. While the Saudi government froze recruitment in the public sector, it sought to force firms in the private sector to recruit Saudi nationals. This policy was known as '*Saudisation*', and was aimed at substituting Saudi for non-Saudi workers who actively participated in the Saudi labour market.

Table 3-1
Employment Status of Saudi Workers in the Labour Market*
Over 1992-2000

	1992**				1999				2000			
	Employed %	Unemployed %	In Labour force	Working age	Employed %	Unemployed %	In Labour force	Working age	Employed %	Unemployed %	in Labour force	Working age
Male	49.1	13.6	2087223	3676618	55.6	6.8	2411006	4044119	58.9	6.5	2516695	3994756
Female	4.7	11.8	194610	3627267	8.5	15.8	412709	4066823	8.3	17.6	426524	4225048
Total	27.0	13.4	2282211	7303885	32.0	8.1	2823715	8110942	32.9	8.1	2943219	8219804

Source: Central Department of Statistics (CDS) "Labour Force statistics", Riyadh, Saudi Arabia, years 1999-2000

* Percentage indicates the ratio of employed and unemployed Saudi Workers in the Labour Force

** Saudi Chambers of Commerce "National Employment Scheme", Riyadh 1999

Further, 'Saudisation' included nationalisation, which was used for the first time in the 1970s to nationalise 60% of foreign banks' share of capital for Saudi investors and keep the rest to the original owners, who could only trade their shares in the local markets.

The Saudisation policy was first applied in the labour market during the 1980s, when the foreign companies completed construction of the huge industrial cities and chemical and petrochemical manufacturing plants in the country. It aimed to replace key posts occupied by foreign workers in these industries by Saudi nationals. Woodward (1988) argued that Saudi planners tried to alleviate the problems of reliance on foreign labour, and points to the massive training programmes inside and outside the country run by the government to enable Saudi workers to manage and operate the new government corporations and to replace expatriates with Saudi nationals. He revealed that multinationals in the country including Shell, Exxon, Mitsubishi, Unions Carbide, and Bechtel all understood that the American, European, or Japanese management in these industries would be phased out under the Saudisation labour policy.

The second wave of Saudisation in the labour market started in the 1990s. It aimed at replacing non-Saudi workers in the white and blue-collar occupations by Saudi nationals and reducing the numbers of foreigners in the country. In 1994, a ministerial decree, Resolution 50, declared specific steps towards Saudisation. It induced firms to attract Saudi nationals to join their services and to secure permanent jobs for them, and compelled firms that employed twenty workers or more to increase their number of Saudi employees by 5% a year. Non-compliant firms would incur punishments including a freeze on the firm's applications to import new foreign workers, a freeze on the firm's applications to renew residency cards (Iqama) for their current foreign workers, excluding non-complying firms from competing for government tenders, restricting their access to government financial support, and limiting the firm's access to government subsidies and facilities inside and outside the country.

The potential cost to non-compliant firms could be substantial, as the government provided firms, particularly those in the manufacturing sector, with cheap financing costs that were paid once at a rate of 2.5% of the total financed

amount. Further, the government also subsidised water and electricity and levied a low rate of taxation (Zakhat) at 2.5% for Saudi firms, while foreign companies had to pay between 25-45% on corporate profits (Datta *et al.*, 2000). Furthermore, the government provided the private sector with abundant business opportunities and other incentives such as tenders for public utilities projects, government procurements, and agricultural subsidies.

The decree designated some job positions to be occupied by Saudi nationals only. These included departmental staff, reception staff, government affairs (Muaqib) staff, cashiers, and security guard staff. Because of this decree, many occupations were listed by the High Council of Manpower (HCM) to phase out foreign workers. Some of these occupations were strictly assigned to Saudis, such as salespeople in the vegetable retail and wholesale sectors, auctioneers, and workers in real estates offices, whereas in other sectors it was planned to phase out foreign workers gradually (HCM, 2003).

The policy of substituting foreign workers by natives has become a common policy across the Gulf Co-operation Council (GCC) countries. Apart from Saudi Arabia, a similar process has also occurred in other Gulf states, such as *Kuwaitisation* in Kuwait (Al-Nasser, 1995), *Omanisation* in Oman (Hobbs, 1995), *Bahrainization* in Bahrain (AL Darazi, 1995), and *Qatarisation* in Qatar (Looney, 2004).

However, despite the concerted Saudisation efforts in Saudi Arabia, labour shortages still existed and many foreign workers were brought into the country to supply labour. Figure (9) shows a striking increase in the number of work permits issued to recruit new foreign workers in managerial and administrative jobs during recent years between 2002-2003. From this figure, number of the issued work permits to brought new foreign workers in the Saudi labour market is still high as it hovered around 400,000 permissions annually over the period 1999-2003, and most of them are allocated for workers in production occupations.

New Permitted Workers to Enter the Saudi Labour Market over 1999-2003

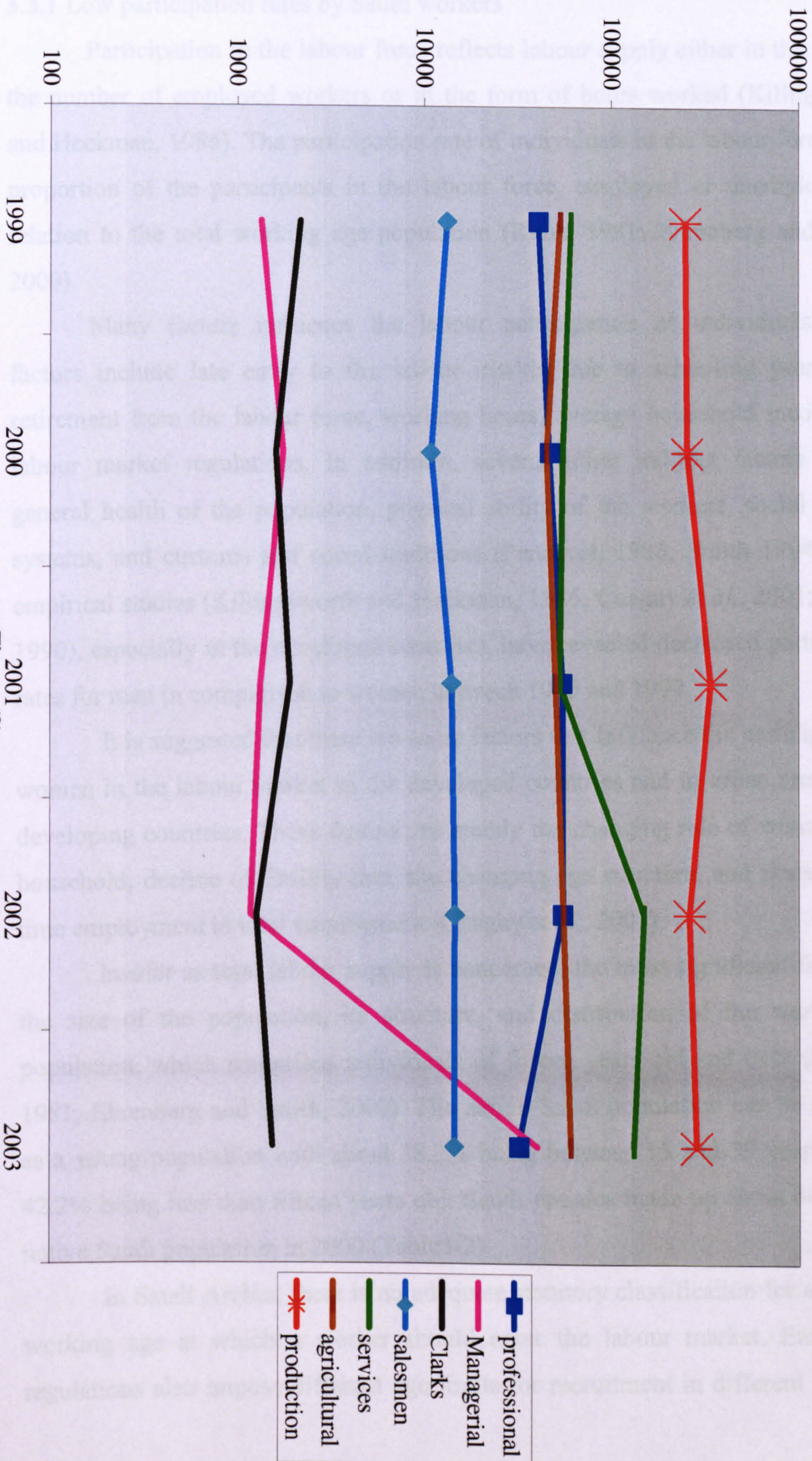


Figure (9)

3.3 THE LABOUR SUPPLY OF SAUDI WORKERS

3.3.1 Low participation rates by Saudi workers

Participation in the labour force reflects labour supply either in the form of the number of employed workers or in the form of hours worked (Killingsworth and Heckman, 1986). The participation rate of individuals in the labour force is the proportion of the participants in the labour force, employed or unemployed, in relation to the total working age population (Rima, 1981; Ehrenberg and Smith, 2000).

Many factors influence the labour participation of individuals. These factors include late entry to the labour market due to schooling years, early retirement from the labour force, working hours, average household income, and labour market regulations. In addition, several other indirect factors include general health of the population, physical ability of the workers, social security systems, and customs and social traditions (Pencavel, 1986; Smith 1994). Many empirical studies (Killingsworth and Heckman, 1986; Chagny *et al.*, 2001; Goldin, 1990), especially in the developed countries, have revealed decreased participation rates for men in comparison to women between 1950 and 1999.

It is suggested that there are some factors that influence the participation of women in the labour market in the developed countries and in urban areas of the developing countries. These factors are mainly the changing role of women in the household, decline of fertility rate, the changing age structure, and share of part-time employment in total employment (Chagny *et al.*, 2001).

Insofar as total labour supply is concerned, the most significant factors are the size of the population, its structure, and distribution of the working age population, which comprises individuals of fifteen years old and over (Sapsford, 1981; Ehrenberg and Smith, 2000). The native Saudi population can be described as a young population with about 38.2% being between 15 and 39 years old and 42.2% being less than fifteen years old. Saudi females made up about 50% of the native Saudi population in 2000 (Table3-2).

In Saudi Arabia, there is no adequate statutory classification for an eligible working age at which a worker should enter the labour market. Employment regulations also impose different age limits for recruitment in different sectors of

the economy. While labour regulations applying to the private sector make it illegal to recruit individuals under fourteen years old, regulations relating to employment in the public sector set the minimum recruitment age for work at eighteen years old for a Saudi candidate and twenty years old for non-Saudi candidates.

Table 3-2
Population Distribution of Saudi and non-Saudi
By Sex and Age Group in 2000

(in Thousands)

Age Group	Saudi		Non-Saudi		Total	
	No.	%	No.	%	%	No.
>1 to 14	7052.4	45.3	1346.3	25.6	40.3	8398.7
15-39	5961.2	38.2	2857.8	54.4	42.3	8819.0
40-64	1996.5	12.8	1006.2	19.1	14.4	3002.7
65+	578.6	3.7	47.8	0.9	3.0	626.4
Aggregate%	15588.7	100%	5258.1	100%	100%	20846.8
Male	7800.1	50.04	3514.9	66.85	54.28	11315.0
Female	7788.8	49.96	1743.2	33.15	45.7	9532.0

Source: Saudi Arabian Monetary Agency (SAMA) "Annual Report 38th", Riyadh, 2002

Despite the discriminatory regulations, summary data on labour force for the period 1980-1992 by the Central Department of Statistics (CDS) showed that the starting working age was 12, whilst more recent statistics showed it to be 15. With these inconsistent classifications in mind, it should be noted that the age structure of the Saudi participants in the labour force showed some changes among different age groups over 1980-2000. Table (3-3) shows that the number of Saudi nationals in the aggregate working-age population more than doubled over 1980-2000. The working-age population increased from 3.7 million in 1980 to about 8.22 million in 2000. This reflects a high growth rate of increase in the working population among Saudis, which is, on average, 3.5% over 1980-2000. However, the participation rate among Saudi workers is low (the level of non-participants

Table 3-3

Participation Rates of Saudi Workers in the Labour Market over 1980-2000

Year	Male Labour force		Working Age	PR/Aggregate Working Age %	Female Labour force		Working Age	PR/Aggregate Working Age %	Aggregate Working Age	
	in %	out %			in	out			PR %	No
1980	58.8	41.2	1882193	29.7	3.1	96.9	1845199	1.5	31.2	3727392
1983	56.5	43.5	2100229	28.4	3.4	96.6	2069799	1.7	30.1	4170028
1986	54.9	45.1	2513879	27.6	4.2	95.8	2489536	2.1	29.7	5003415
1987	53.1	496.9	2664230	26.7	4.1	95.9	2640251	2.0	28.7	5304481
1992	56.8	43.2	3676618	28.6	5.4	94.6	3627267	2.7	31.3	7303885
1999	59.6	40.4	4044119	29.7	10.1	89.9	4066823	5.1	34.8	8110942
2000	63.0	37.0	4421280	30.6	10.1	89.9	3798524	5.2	35.8	8219804

Source: Central Department of Statistics (CDS) "Labour Force Status", Riyadh, Saudi Arabia, years 1980-2000

PR :Participation Rate

peaked at 70% of the working population in the mid-1980s) because the majority of non-participants are women, who are largely eliminated from the labour market, as well as elderly people and students. The proportion of the Saudi non-participants started to decrease steadily over the 1990s and stood at about 64% in 2000, and in turn increased in the aggregate participation rates, particularly among Saudi women over 1999-2000.

2.3.2 Gender issues

Turning to the gender issue, in contrast to the male-female comparison in the developed countries, the aggregate participation rates of males in the labour market of Saudi Arabia are much higher than female rates over 1980-2000. Saudi males dominate the labour market, as their share of the labour market participants (in labour force) is slightly increased particularly between 1987 and 2000.

From Table (3-3), it is clear that Saudi male participants in the labour market accounted for about 30% of the Saudi working age population during 1980-2000, while Saudi females' participation rate in the labour market peaked to about 5.2% of the working population in 2000, rising from a mere 1.5% in 1980. Despite this three-fold increase over the two decades, the labour market participation rate among Saudi females remains very low. The main reasons for this can be attributed to conservative religious teachings and social traditions prevailing in the country (Al-Ghannam, 1987, and Al-Khudari). In addition, education and training programmes segregate women in academic education, which restricts their job opportunities for certain occupations. The Saudi education system prevents women from enrolling in engineering, journalism, pharmacy, and architecture, but largely they are trained in fields of education and clerical jobs (Baki, 2004). Al-Hassuen and Al-Manaa (1989) argued that the prevailing traditional views eliminate the political, economic, cultural and social role of women in Saudi Arabia and consider them unproductive members of the society, and thus make women dependent on men. Al-Hazzaa (cited in Makar, 1996) attributed the exclusion of women from their economic role to the effects of oil revenues. He argued that this made it economically feasible to perpetuate the old customs of veiling and seclusion of women in Saudi society. Besides, the abundant oil wealth enhanced the role of the clergymen whose teachings largely affect the social and economic

role of women in the country. As the majority of women were kept out of the labour market, opportunities were then only available for men (Mammen and Paxson, 2000).

In addition to these reasons, Sado (1999) argued that firms in the Saudi labour market preferred to recruit men than women. Employers think that women work fewer hours or they refuse to work double shifts, which is a common practice of work in the country. This indicates the employers' discriminatory attitudes against females, which contributed to the low participation rate among not only non-Saudi females but also Saudi females.

3.3.3 Social and economic factors

For Saudi workers as a whole, several general social and economic factors cause their low participation. School attendance and social traditions largely influence the participation of Saudi workers in the labour force. Table (3-4) shows that students and housewives accounted for large proportions of the non-participants in the labour market. From this table, it is clear that school pupils amounted to 35% of the non-participants in 1980, 40% in 1987 and about 45% in 1992. The standard theory of labour supply attributes high rates of non-labour status among young people to the rising trends in school attendance where individuals spend a long time and enter the labour market after schooling (Pencavel, 1986; Rima, 1981; Dixon, 1996; Preston, 1999). As far as the Saudi housewives are concerned, they represent a significant share of the working-age female population in Saudi Arabia, although this share declined from 52% in 1980 to 43% in 1992.

Another reason for the low participation rate among the Saudis is government social support. During the first years of development plans of the 1970s and the 1980s, the government provided Saudi nationals with easy access to numerous services and generous welfare benefits. It is argued that these benefits have promoted a preference for much more leisure time among Saudis, and this in its turn has changed the work ethic among Saudi workers, and makes them more interested in positions of social status and authority rather than positions in

Table 3-4

Distribution of Saudi Non-participants in the Labour Market over 1980-1992

year	Non-Labour Participants						Total	%*	Working Population
	housewives	%	student	%	others	%			
1980	1335159	52.1	908492	35.4	319118	12.5	2562769	68.8	3727392
1983	1474159	50.6	1107930	38.0	331136	11.4	2913225	69.9	4170028
1986	1659253	47.2	1444538	41.1	414081	11.8	3517872	70.3	5003415
1987	1749994	46.3	1527974	40.4	504366	13.3	3782334	71.3	5304483
1992	2185426	43.5	2243645	44.7	592981	11.8	5022052	68.8	7303885

Source: Central Department of Statistics, Ibid.

* Non-participants/working Population

production and services occupations (Al-Shuabi, 1984;AL-Khouli, 1985). In addition, the economic development process creates new opportunities in trade and other business activities, so many educated Saudis prefer to work in the trade and service sectors, which have their cultural roots in the country. They are primarily engaged in these sectors to maximise such opportunities, to avoid discipline, rules commitment, and instructions procedures that are required in the industrial sectors (Al-Khouli, 1985). The extended family is another factor that influences participation of the Saudi workers in the labour market, as it makes some family members largely dependent on other members. It is known that, in Saudi Arabia and many developing countries, the working male in the family has to support his other non-working family members, especially his parents and unmarried sisters (Al-Towaijri, 1992).

3.3.4 Working hours

Working hours are another aspect of participation in the labour market; weekly working hours reflect the quantitative aspect of the labour supply decision as well as the level of a worker's participation in the labour market. Empirical studies on working hours in the labour markets in the developed countries confirm decreasing trends of the weekly working hours across these markets (Altonji and Paxson, 1985; Blyton, 1995; Husbands, *et al.*, 1995; Boheim and Taylor, 2001; Grossbard-Shechtman and Neideffer, 1997; Clarkberg and Moen, 1999; Bowles and Park, 2001; Bosch and Wagner, 2001). In their general review of global trends in working hours from 1984 to 1994, Husbands *et al.* (1995) showed that the weekly working hours in some countries were reduced to around 35 hours and 37.5 hours of work on average. In Saudi Arabia, long weekly working hours still prevail. Although labour regulations strictly determine the weekly working hours to be 48 hours over six working days, these regulations make it possible to extend the working hours to 60 hours per week for certain jobs in the private sector, particularly those in the service sector such as wholesale and retail shops, restaurants and hotels. While in the public sector the weekly working hours are 35 hours over five working days.

The labour regulations in Saudi Arabia allow a short rest period between daily working hours for meals and prayers. Therefore, it is common for work to stop many times during the day for prayer. Al-Mohawis (1986) confirmed the long weekly working hours in the Saudi labour market, illustrating it with the fact that in the 1980s the average weekly working hours in the construction sector were between 52 and 75 hours. Besides, while workers in the developed economies can decide on the number of hours they wish to work, either on a part-time or full-time basis (Smith, 1994), in Saudi Arabia full-time work is the norm and part-time work is rare.

However, data on hours of work in Saudi Arabia is rare and inaccurate. The summary data in Table (3-5) presents average weekly working hours for full-time workers across occupations over 1980-2000, for both Saudi and non-Saudi workers. Data for 1980-1987 provides information for each group of workers, while that for 1999-2000 provides the average weekly working hours for all workers, as reported in the last three columns of this table. It is clear that Saudi workers generally supplied fewer working hours than their non-Saudi counterparts. This reflects low participation levels in the labour market among Saudi workers who supplied on average between 41.3 and 44.2 working hours per week over 1980-1987, while the non-Saudi workers provided on average between 49.7 and 51.5 working hours per week over the same period. The table reports that the aggregate average of the weekly working hours among Saudi workers steadily declined from 44.2 hours per week in 1980 to 41.3 hours in 1987. It also indicates variations in the number of the weekly working hours across occupations among these workers. Saudis in sales jobs have the highest average working hours at between 48.2 and 50.5 hours over the period from 1980 to 1987, followed by workers in managerial jobs, who worked between 45.2 and 49.1 hours per week during the same period. From this table, it may be seen that Saudi workers in professional jobs have provided weekly working hours less than the standard level, as they, on average, worked 37 hours per week over 1980-1987. Similarly, workers in clerical jobs provided fewer weekly working hours that declined on average from 43.2 to 40.2 hours between 1980-1987. Saudi workers in machine operating

Table 3-5
Average Weekly Worked Hours of Saudi and non-Saudi Workers
by Occupation Over 1980-2000
(in Percentage)

Nationality	1980		1983		1986		1987		1980		1983		1986		1987		1999		2000	
	Average Hours	%*	Average Hours	%	Average Hours	%	Average Hours	%	Average Hours	%	Average Hours	%	Average Hours	%	Average Hours	%	Average Hours	%	Average Hours	%
Professional	37.6	-0.5	37.3	-0.3	37.1	-0.5	44.7	0.7	44.3	44.8	1.1	39.4	38.2	39.4	38.2	39.4	38.2	39.4	38.2	-3.0
Mangers	49.1	-4.3	45.2	-3.8	45.3	0.2	50.7	-0.6	50.4	48.5	-3.8	46.2	46.1	46.2	46.1	46.2	46.1	46.2	46.1	-0.2
Clerical	43.2	-1.6	41.6	-2.1	40.2	-3.3	50.3	-3.6	48.8	48.5	-0.6	42.7	42.9	42.7	42.9	42.7	42.9	42.7	42.9	0.5
Sales	49.6	-2.8	50.5	4.8	50.2	-0.6	55.6	-7.4	54.1	52.9	-2.2	61.6	61.0	61.6	61.0	61.6	61.0	61.6	61.0	-1.0
Service workers	49.0	-14.3	42.5	1.2	42.5	0.0	58.9	-13.1	52.9	54.1	2.3	53.9	52.4	54.1	52.4	53.9	52.4	54.1	52.4	-2.8
Production workers	45.6	-3.3	44.1	-0.2	43.7	-0.7	51.6	-2.1	50.8	50.7	-0.2			50.8	50.7	50.8	50.7	50.8	50.7	
Machine Operators	48.3	-6.6	44.2	-2.0	43.4	-1.8	54.0	-7.0	51.8	52.1	0.6	58.5	54.6	51.8	52.1	58.5	54.6	51.8	52.1	-6.7
Construction Workers	46.5	-3.9	43.3	-3.1	43.6	0.7	52.0	-3.1	49.6	49.1	-1.0			49.6	49.1	49.6	49.1	49.6	49.1	
Not reported	39.9	0.0	43		39.5	-8.1	57.2	-13.1	51.5	48.2	-6.4			51.5	48.2	51.5	48.2	51.5	48.2	
Aggregat	44.2	-3.6	42.1	-1.2	41.3	-1.90	51.5	-3.1	50.1	49.7	-0.8	50.8	49.8	50.1	49.7	50.8	49.8	50.1	49.8	-2.0

Source Central Department of Statistics(CDS),Ibid.

* Increasing or decreasing rate

jobs provided on average about 48.3 hours per week in 1980, but the number of weekly working hours was gradually reduced to 43.4 in 1987.

Considering gender and marital status associated with weekly working hours, Table (3-6) shows that Saudi females provided low weekly working hours that hovered around 36 hours per week over 1980-1987, in comparison to the Saudi males who worked between 42.5 and 53.1 hours in average per week during this period.

The table reveals that there is a minor difference in number of the weekly worked hours between married, never married, and divorced Saudi males over 1980-1987. In 1980, these three groups of workers provided between 43.2 and 44.8 hours, in 1983 they provided between 42.7 and 43 hours, and in 1986 their weekly worked hours are calculated between 42 and 42.7. In 1987, the divorced Saudi males provided higher weekly hours of 58.6, in comparison to 41.8 hours for the married and never married males. On the other hand, the table indicates that divorced Saudi females have provided higher weekly worked hours that hovered around 40 hours over 1980-1987, in comparison to about 37 hours on average for their married female colleagues over this period.

3.4 SKILLS SHORTAGE AMONG THE INDIGENOUS LABOUR FORCE

Skill shortages may arise due to a mismatch between employers' requirements and labour supply of the required skills, economic and technological changes, and changes in the occupational pattern (Handel, 1999; Arnal *et al.* 2001; Compbell, 2001).

In Saudi Arabia, skills shortages emerged in the 1930s, particularly among skilled workers in technical and administrative occupations, but severe shortages of skills arose in the 1970s to cover different occupations. Table (3-7) shows the occupational gap as set by the development plans over 1970-2000. As shown on this table, the gap increased annually across occupations, with the exception of the agricultural occupations that have skills shortage only over 1995-2000.

The main reasons for skills shortages in the country are due to the little development in education and training in the country before the discovery of oil,

Table 3-6
Average Weekly Worked Hours by Gender and Marital Status
Over 1980-1987

Specification	1980		1983		1986		1987	
	Male Workers	Female AWWH*	Male Workers	Female AWWH	Male Workers	Female AWWH	Male Workers	Female AWWH
Saudi Workers								
Married	893880	44.8	27921	37.4	976866	43.0	34701	37.4
Never Mary	196589	43.2	22425	35.5	193435	42.9	29496	37.7
Divorced	10299	44.0	2083	39.8	9177	42.7	2142	40.3
Widow	6722	44.2	4704	36.1	6660	38.3	4326	38.8
Total	1107490	44.5	57133	36.6	1186138	42.9	70665	37.6
Non-Saudi Workers								
Married	1465528	51.5	17804	41.6	1972874	49.8	23373	44.4
Never Mary	429675	52.0	6033	48.3	534358	50.2	7028	40.7
Divorced	11332	51.4	924	66.2	13068	48.6	823	53.0
Widow	5663	53.2	1153	N.A	6144	48.5	895	52.8
Total	1912198	51.5	25914	43.2	2526444	49.9	32119	46.2

Source: CDS, Ibid.
* Number of Average Weekly Working Hours

Table 3-7
Projected Labour Demand and Supply of Development Plans
over 1970-2000
(in thousands)

Occupation	1970-75			1975-80			1980-85			1990-1995			1995-2000		
	Demand	Supply	Gap	Demand	Supply	Gap	Demand	Supply	Gap	Demand	Supply	Gap	Demand	Supply	Gap
Professional	117.0	71.0	-46.0	191.1	79.1	-112	270.8	240.4	-30.4	1518.2	1389.5	-128.7	1086.2	1002.7	-83.5
Managerial	40.0	17.0	-23.0	21.1	13.7	-7.4				120.2	86.6	-33.6	189.3	158	-31.3
Clerical	612.3	35.0	-577.3	221.4	98.9	-122.5	266.8	231.7	-35.1	637.1	575.7	-61.4	889.8	858.4	-31.4
Technician	85.1	40.0	-45.1												
Sales			0.0	209.8	129.4	-80.4	1184.9	1076.9	-108	563.1	527.5	-35.6	692.9	645.8	-47.1
Service workers			0.0	279.7	152.3	-127.4	345.7	300	-45.7	1269.5	1314.1	44.6	1482.8	1559	76.2
Production workers	617.0	160.0	-457.0	1027.8	635.4	-392.4				2127.1	2079.4	-47.7	2419.8	2369.3	-50.5
Agricultural			0	379.7	413.3	33.6	558	622.2	64.2	469.9	458.7	-11.2	298.6	274.7	-23.9
Total	1471.4	323	-1148.4	2330.6	1522.1	-808.5	2626.2	2471.2	-155.0	6705.1	6431.5	-273.6	7059.4	6867.9	-191.5

Source: Development Plans, 1970-2000

prevalence of the religious education, and elimination of women from both labour market and education, as female formal education only started in the early 1960s.

These aspects created a state of mismatch between the available skills among native workers and the requirements of development that were based on modern technology (used in manufacturing, construction, and services) rather than the nomadic pattern that prevailed before the 1970s. Many economists (Becker, 1975; Tachibanaki, 1998; Rima, 1981; among them) confirm the existence of complementary factors between education and skills attainment. Tachibanaki (1998) considers education as a precondition to attain various occupations and perform jobs successfully. The standard theory of human capital considers that general education and scientific capability can be raised in formal education, while there are many specific skills that can be attained through specific professional education, such as medicine, economics, and law faculties. Therefore, many countries provide subsidies and facilities for education and training programmes to improve the productivity and skills of their population by allocating a portion of social investment to carry out these programmes. Most of these countries, particularly developing countries, believe that increasing enrolment in educational institutions, specifically the primary, secondary, and tertiary levels, is the key to national development strategy providing the labour market with educated and trained workers (Todaro, 1997). Such a strategy, which views education and training as the main mechanism for human resource development, was adopted in Saudi Arabia. As a result, many Saudis graduated from different educational and training programmes. Table (3-8) shows that the number of Saudi university graduates increased by about three folds over 1990-1997. The majority of these graduates came from social sciences faculties, particularly from education and humanities. Most of these graduates prefer to join managerial and administrative jobs rather than technical and vocational jobs that are occupied by non-Saudi workers, because these jobs have low wages. Mellahi (2000) argued that the wage differences between the white-collar jobs and skilled manual jobs distorted the labour market and affected Saudi individuals' incentives to invest in vocational training. Considering the relationship between education and training, and occupational status of the workers, Table (3-9) confirms that the proportion of

Table 3-8

Distribution Saudi University Graduates Across Subject Areas over 1990-1997*

	1990	1991	1992	1993	1994	1995	1996	1997
Education	29.21	35.85	43.38	52.65	48.48	49.54	49.40	54.97
Humanities	22.99	16.50	17.89	16.45	16.74	16.06	12.85	10.67
Theology	12.64	14.03	12.77	9.62	13.98	10.92	12.34	11.04
Sociology	2.10	1.33	1.23	0.88	1.27	1.10	1.40	4.85
Business and Economics	7.11	9.44	6.12	6.00	5.11	5.98	4.91	4.02
Pure Sciences	10.32	10.85	8.45	5.58	5.52	6.30	6.24	4.33
Medicine and Health Studies	6.18	4.42	3.55	3.08	3.25	3.22	4.56	3.29
Engineering	5.95	5.11	4.72	4.37	4.53	5.64	7.58	6.25
Agriculture	3.49	2.47	1.89	1.36	1.13	1.24	0.72	0.59
Total (number)	14364	18808	23074	30398	33181	29732	42370	52148

Source: Central Department of Statistical " Year Statistical Book" 1999

* All the numbers are in percentage terms with the exception of the total number

Table 3-9
Occupational Status of Saudi Workers by Educational Qualifications
Over 1980-2000

Years	1980										1983									
	>Primary	Primary	mediate	Second-ary	University	>25 years	Total	>primary	Primary	ediate	Second-ary	University	>25 years	Total						
Professionals	7.6	4.2	9.1	35.2	15.4	28.5	152899	7.6	3.6	6.6	39.0	18.0	25.3	183335						
Managers	21.4	17.1	13.6	18.5	20.5	8.8	35983	22.1	16.1	12.8	24.0	18.0	6.9	33909.0						
Clerks	12.1	28.9	14.6	10.7	4.0	29.7	191902	13.6	25.7	15.7	12.9	6.8	25.2	235746						
Sales	64.4	12.0	4.4	2.8	1.7	14.7	117675	59.9	14.6	6.4	4.5	2.0	12.6	127472						
Services Workers	64.9	13.8	3.1	1.4	0.2	16.6	206561	63.6	16.4	3.2	1.2	0.1	15.5	231167						
Production and construction workers	60.6	11.8	3.0	2.4	0.5	21.7	294841	60.8	13.9	2.5	2.5	0.7	19.5	294060						
Agricultural Workers	82.6	2.1	0.3	0.5	0.0	14.5	162455	82.6	2.6	0.6	0.3	0.0	13.9	151114						
Not Reported	46.3	10.7	11.7	11.4	0.0	19.9	2307	0	0	0	0	0	0	0						
Total	48.6	12.8	5.8	8.2	3.6	20.9	1164623	46.2	13.8	6.1	10.0	4.8	59.9	1256803						
	1999										2000									
Professionals	1.4	1.0	1.8	12.7	25.8	57.3	719585	1.6	1.7	6.6	17.9	16.8	55.4	726279						
Managers	4.3	5.6	13.6	29.3	6.9	40.2	74415	4.9	5.9	13.7	27.8	2.5	45.3	88496						
Clerks	5.6	18.1	27.8	36.1	5.8	6.7	422780	4.8	19.5	28.5	37.2	3.9	6.2	415141						
Sales	35.1	26.3	15.7	15.0	1.9	6.1	147392	36.1	22.6	18.1	15.9	1.1	6.1	170347						
Services Workers	23.5	34.5	25.0	11.6	0.8	4.6	825024	18.5	33.6	29.9	13.1	0.6	4.3	812608						
Production and construction workers	32.6	35.6	18.6	11.2	1.4	0.6	252024	32.9	33.6	20.6	11.4	0.8	0.6	280075						
Agricultural Workers	76.0	15.6	5.0	2.8	0.1	0.4	150969	69.1	15.4	8.2	5.2	0.5	1.6	208932						
Not Reported	67.7	12.0	0.0	0.0	20.4	0.0	2901	41.4	0.0	0.0	58.6			1495						
Total	18.5	20.2	16.3	16.1	8.8	20.0	2595090	18.0	19.8	19.5	18.0	5.5	19.2	2703373						

Source: Central Department of Statistics. Ibid

highly-educated Saudi workers in the total Saudi workforce was low over 1980-2000. Their number decreased from 8.8% of the total workers in 1999 to 5.5% in 2000, though it increased from 3.6% in 1980. The table confirms the fact that these graduates were concentrated in professional and managerial jobs, particularly during 1980 and 1983, while their numbers decreased in these jobs in 2000. On the other hand, the table indicates that Saudi workers with secondary education have significant proportions in the professional and managerial occupations over 1980-2000. Moreover, the uneducated workers and workers with low education of primary and intermediate qualifications appeared across occupations, and they, on average, represent between 5.8% and 48.6% of the total workers across occupations over this period.

3.5 FOREIGN WORKERS IN THE SAUDI LABOUR MARKET

Labour regulations restrict the right to work in Saudi Arabia to natives. However, under the pressure of the skills shortages, the government was obliged to open its doors to foreign workers to enter the labour market to work as temporary workers under strict conditions. As explained before, the presence of foreign workers or non-Saudi workers (*Ajanib*) goes back to the 1930s with the discovery of oil.

In the 1950s and the 1960s, only small numbers of foreign workers were employed in certain government agencies, but with the launching of the ambitious development projects in the public and private sectors, particularly over the 1970s and the 1980s, many foreign workers with different skills gained access to the Saudi labour market. Public departments and private firms sought to import these workers to meet the skill shortages of skilled, semi-skilled, and even unskilled workers. However, foreign workers were largely found in the construction sector, particularly during the 1970s and the 1980s. These workers came from more than 190 countries and nationalities across the continents (Ministry of Interior, 1995); they had high participation rates in the Saudi labour market. From Table (3-10), it may be seen that non-Saudi males had high participation rates, hovering around 80% of the total non-Saudi working population over 1980-1986, and then decreasing to around 70% over 1987-2000, in comparison to significantly low

participation rates for non-Saudi females in the labour market, which gradually increased from 1.4% of the non-Saudi working population in 1980 to 11.9% in 1999 before decreasing again to 10.7% in 2000. On the other hand, non-Saudi workers generally have a higher participation rates than their Saudi counterparts in terms of working hours (see Table 3-5).

Table 3-10
Participation Rates of non-Saudi by Sex Over 1980-2000

Year	Male			Female			Female/ Total W. Pop	Total Working Population
	in Labo ur Force	out Labour Force	Male Working Age	in Labour Force	out Labour Force	Female Workin g Age		
1980	83.97	9.19	2121512	1.14	5.70	155603	1.14	2277115
1983	84.04	9.85	2822669	1.07	5.04	183574	1.07	3006243
1986	81.03	10.06	2823864	2.01	6.90	276081	2.01	3099945
1987	77.37	12.52	2726565	2.39	7.73	306744	2.39	3033309
1992	70.20	4.70	2820452	10.23	14.86	944964	10.23	3765416
1999	67.89	4.31	2736882	11.87	15.93	1053565	11.87	3790447
2000	66.53	5.28	2829322	10.73	17.46	1110429	10.73	3939751

Source: CDS, Ibid

Another interesting observation from the Table (3-11) is that in 2000, non-Saudi workers with university educations were expelled from the labour market. In the previous year they accounted for 41.4% of the total non-Saudi workers in different occupations, but by 2000 their proportion decreased to only 3.7% of the non-Saudi workers in various occupations. This is a direct result of the Saudisation policy, as a major plank of that policy is to replace non-Saudi workers by Saudi workers, particularly in professional occupations. From this table, it can be seen that non-Saudi workers with secondary and university educations concentrated in the professional, managerial and clerical occupations over 1980-2000.

Table 3-11
Educational Qualifications Distribution of Non-Saudi Workers
Over 1980-2000 (in percentage)

Years	1980								1983							
	>Primary	Primary	Inter-mediate	Secondary	University	>25 years	Total	>Primary	Primary	Inter-mediate	Secondary	University	>25 years	Total		
Professionals	1.4	1.2	3.0	22.8	68.0	3.7	261017	3.6	0.9	3.0	24.8	67.9	1.9	307232		
Managerials	4.7	2.4	2.7	31.3	56.1	2.8	29600	7.2	2.0	2.2	28.6	60.6	3.1	30280		
Clerks	7.3	4.5	10.2	41.9	24.2	11.8	137961	4.1	4.1	11.0	40.9	28.9	0.8	200183		
Sales	47.4	8.3	6.8	12.0	7.2	18.2	135662	45.4	7.4	6.9	12.4	10.6	17.2	224156		
Services Workers	64.4	6.8	3.7	6.1	1.6	17.5	203811	59.1	11.5	5.5	10.0	2.1	11.8	254484		
Production and construction workers	56.3	10.2	5.9	8.1	1.9	17.5	1108696	52.9	9.3	7.8	9.5	2.6	18.0	1440180		
Agricultural Workers	74.7	4.8	2.8	2.4	1.8	13.4	54992	76.7	7.5	2.5	1.0	0.3	11.9	83953		
Not Reported	38.1	2.2	15.9	5.9	8.5	29.4	6373	35.1	13.4	23.4	20.5	0.9	6.7	18095		
Total	45.3	7.8	5.5	12.8	13.6	15.0	1938112	43.2	7.8	7.0	14.1	13.7	13.5	2558563		
	1999								2000							
Professionals	>Primary	Primary	Inter-mediate	Secondary	University	>25 years	Total	>Primary	Primary	Inter-mediate	Secondary	University	>25 years	Total		
Managerials	1.3	1.0	0.9	6.4	20.6	69.8	373913	1.0	0.5	2.8	7.2	14.8	73.8	378941		
Clerks	1.2	0.0	3.4	8.6	13.5	73.4	18463	1.1	2.9	6.8	9.9	3.9	75.4	34149		
Sales	6.0	6.4	10.1	27.1	20.6	29.7	104161	9.5	3.7	9.5	35.9	11.8	29.6	113171		
Services Workers	29.3	13.3	17.5	20.8	6.8	12.4	347509	32.2	11.0	20.2	21.7	3.2	11.7	402848		
Production and construction workers	58.9	15.0	12.9	10.2	1.4	1.7	713835	60.4	14.8	14.1	9.6	0.5	6.6	709943		
Agricultural Workers	44.8	17.7	16.7	15.2	3.9	1.7	1240500	45.0	17.2	21.4	13.1	1.9	0.3	1210411		
Not Reported	76.8	8.5	8.1	4.5	1.0	1.1	199091	75.9	11.6	8.1	3.1	0.6	10.7	159794		
Total	72.6	27.4	0.0	0.0	0.0	0.0	292	0.0	25.0	47.0	28.0	0.0	150.6	719		
Total	25.9	8.3	8.1	8.3	41.4	8.0	4797764	41.2	12.7	15.9	13.0	3.7	13.6	3069976		

Source: CDS.Ibid.

Non-Saudi workers are employed in both the private and government departments (the public sector). They occupy jobs in manufacturing firms that provide public utility services, construction, trade, and education and public administration. Table (3-12) shows the occupational structure of the two groups of workers; it reveals that non-Saudi workers dominate production and construction occupations, while their Saudi counterparts are concentrated in the white-collar jobs, particularly in the managerial and clerical occupations. This is similar to how foreign workers are concentrated in the same occupations in Singapore (Stahl, 1984; Cornwell and Rupert, 1995). As seen on this table, non-Saudi workers amount to more than 70% of the workers employed in these occupations over 1980-2000. However, these workers dominate sales occupations, with a share of 53.6% in 1980 and more than 70% of the employed workers in these occupations in 2000. The proportion of the non-Saudi workers in the professional jobs started to decrease since the last year of the second development plan in 1985, as their share in these occupations decreased from 63% in the professional jobs in 1980 to about 55% in 1986, and then declined further to 34.3% in 2000. This is similar to their proportion in the managerial and clerical jobs. Besides, the share of non-Saudi workers fluctuated in services and in agricultural occupations. It is abundantly clear that the Saudisation policy has largely replaced non-Saudi workers from professional, managerial and clerical occupations by Saudi workers over the years.

3.6 LABOUR MARKET REGULATIONS

Labour market regulations are the main instruments that the government uses to intervene in the labour market. They comprise economic, social and judicial measures. These measures cover issues such as protection of workers' rights, protection of the vulnerable, minimum wage, and assurance of good working conditions (Downes *et al.*, 2000). The standard theory of labour market segmentation confirms influence of such regulations on dualism in the labour

Table 3-12
Occupational Status of Saudi and non-Saudi Workers
Over 1980-2000

Occupation	1980			1983			1986			1987			1992			1999			2000		
	Saudi	Non-Saudi	Total	Saudi	Non-Saudi	Total	Saudi	Non-Saudi	Total	Saudi	Non-Saudi	Total	Saudi	Non-Saudi	Total	Saudi	Non-Saudi	Total			
Professional	36.9	63.1	413916	37.4	62.6	490567	44.9	55.1	590116	43.6	56.4	618677	51.0	49.0	763931	65.8	34.2	1093498	65.7	34.3	1105218
Managerial	54.9	45.1	65583	52.8	47.2	64189	66.4	33.6	83567	66.0	34.0	63705	73.9	26.1	92808	80.1	19.9	92878	72.2	27.8	122644
Clerks	58.2	41.8	329863	54.1	45.9	435929	63.9	36.1	412280	63.4	36.6	436373	68.4	31.6	363934	80.2	19.8	526941	78.6	21.4	528310
Salesmen	46.4	53.6	253337	36.3	63.7	351628	35.2	64.8	364026	32.8	67.2	400534	30.2	69.8	342585	29.8	70.2	494901	29.7	70.3	573196
Service	50.3	49.7	410372	47.6	52.4	485651	37.3	62.7	491607	45.7	54.3	505312	56.2	43.8	1455265	53.6	46.4	1538859	53.4	46.6	1522549
Agriculture	74.7	25.3	217447	64.3	35.7	235067	62.1	37.9	248654	63.1	36.9	258043	38.0	62.0	374444	43.1	56.9	350060	56.7	43.3	368728
Production & Construction	21.0	79.0	1403537	17.0	83.0	1734240	22.6	77.4	1814887	23.6	76.4	1578415	13.4	86.6	1520168	16.9	83.1	1492524	18.8	81.2	1490485

Source: CDS ,Ibid

market (Doeringer and Piore, 1979). Government intervention reveals its social role towards its citizens. Betcherman *et al.* (2001) argued that labour market interventions include market regulations that depend on individual contracts between the employer and the employees, statutory regulations that are based on rules and procedures set up by laws, and collective bargaining procedures. All such aspects present among the organised workers, particularly in the public sector, in developed countries and some developing countries.

In Saudi Arabia, there are various regulations that strictly regulate the labour market in both the private and government or civil service departments. These regulations include labour law, civil service rules, pension and insurance regulations, the related regulations of residency of foreign workers, and the *Iqama* rules. They have contributed significantly to the segmentation of the labour market and create a state of duality in the labour market in Saudi Arabia. The main features of segmentation in these regulations include:

3.6.1) Labour Law

It applies to workers in the private sector and commercial government corporations. The labour law as a statutory regulation has various aspects indicating segmentation; these include:

i) Employment Security - Employment or job security provisions in this law refer to hiring and firing rules that involve the contracts, but that are not provided screening recruitment procedures that could maintain employment security as in the public sector. It is known that employment in the private firms in Saudi Arabia is based on personal contracts, but there is no standard contract even in the same workplace. This creates different separate work relations between the employers and the workers, and makes the private sector lack adequate administrative rules that could maintain job security. It is in contrast to the government departments that have written recruitment procedures and regulations for each of the Saudi and non-Saudi workers. Moreover, the labour law entitles the employer to fire the worker for many reasons without any administrative investigation or explanation about his/her faults and mistakes, while the

regulations of the Civil Service protect workers against any punishment without investigation by the relevant authority,

ii) Work Compensation - In the private sector of Saudi Arabia, the wage rate is fixed through direct negotiation between the two contracting parties: the employer and the worker. Firms' regulatory wage scales or levels are rare in this sector and collective bargaining is absolutely non-existent in the country; there are not even any minimum wage measures. However, there are no adequate measures that determine the wage rate in this sector, such as salary scale or any other form of personal or productivity characteristics such as experience, education or any other, which is in contrast to the public sector in Saudi Arabia, where such characteristics are considered. This creates wage differences among workers in the private firms and even in the same workplace. Moreover, labour regulations require employers to pay their Saudi workers 2%* more than their non-Saudi workers. Such provisions discriminate between workers and support segmentation in the labour market.

iii) Dispute Resolution - Workers' complaints with labour laws and dispute settlement represent major aspects of the labour regulations in different countries. In Saudi Arabia, there are no specific labour courts. The work dispute settlements in the private sector are arranged through specialised committees that are appointed by a ministerial decree.

In contrast to the public sector where the Supervision and Investigation Commission, which is responsible for application of the Civil Regulations, works as an autonomous body that has its own regulations and staff, the committees that are responsible for the application of regulations governing employment in the private sector are affiliated with the respective labour offices in different parts of the country. Obviously, in cases of dispute that were submitted to the committees, the workers are usually the main complainants against the employer. This is another factor offering the private sector a characteristic of segmentation that affects employment security in this sector.

*Rules of employment of Non-Saudi in the public sector Article 13, and Labour Law Article 45.

2.6.2 Civil Service Regulations

The civil service regulations mainly apply to workers in government departments. These regulations consist of various laws covering many aspects of the employees' lifetime in employment with the government. The civil service regulations are more consistent than that of the private sector. They make the public sector appear more structured and organised than the private sector. The latter suffers a lack of adequate institutional relations between the worker and the employer, who can subjectively abuse his/her rights against the worker.

However, the civil service regulations cover different workplace characteristics that include occupational classifications, recruitment procedures and some screening measures, pecuniary and non-pecuniary compensations, promotion and annual allowances, scales of wages and salaries of different occupations, training procedures, and paid leaves. These characteristics distinguish workers in this sector and provide them with a large employment protection and allow them to access better working conditions than their colleagues in the private sector. These characteristics make the public sector more attractive for Saudi workers rather than the private sector.

3.6.3 Pensions and Insurance

The regulatory systems of different countries cover pension programmes for retired workers. These programmes represent a main component of the social security system of the respective country. The pension programmes may be organised through private funds or through public schemes. But in recent years the role of the state to provide pension is declining whilst the private pension funds are playing a more and more significant role, particularly in developed countries. In the United Kingdom, for example, the pension system comprises different forms of pension plans, including state pensions and the private-sector pension schemes. Under the state pension system, workers can select either the Basic State Pension plan, which entitles the retired employees to pensions financed by the National Insurance Contributions (NIC), or the additional State Pension or State Earnings-Related Pension Scheme (SERPS). Both of these plans are paid by the Department of Social Security. Besides, workers can select from a range of private pension

schemes that include occupational pension schemes or company or workers' pension schemes as well as many other alternative schemes (see Blake, 2003, for example). Other types of private pension choices include personal pension schemes, group personal pension schemes, and stakeholder pension schemes (Pension Service, 2003).

In Saudi Arabia, there are two main forms of social security programmes, including the civil pension fund for government employees, and pension and insurance for private sector employees. The main statutory features of these regulations that provide additional aspects of segmentation of the labour market in the country are discussed as follows.

i) Civil Pension Fund - Employees in government departments are entitled to a pension from the Civil Pension Fund (CPF) that covers only permanent full-time Saudi workers with government departments. Pension entitlement under CPF is based on age, or job tenure. Non-Saudi workers in the government departments are not covered by the CPF as they are entitled to a one-off compensation based on their job tenure with the government regardless of their age. This clearly fragments the public sector and allocates Saudi workers for better working conditions and provides them with more job security in comparison to non-Saudi workers in both the public (the internal sector), and in the private sector (the external sector), and thus contributes to the labour market segmentation.

ii) Pension and Social Insurance - Workers in the private sector are covered by the pension and work injuries insurance programme, which is run by the General Organisation for Social Insurance (GOSI). According to the GOSI's law, pension and work injuries insurance covers only Saudi workers, while non-Saudi workers are only covered by work injuries insurance and they are entitled to only a one-off compensation based on their job tenure. Thus the pension and social insurance regulations contribute to the labour market segmentation in the country, as they discriminate in provision of non-wage benefits that contribute to the social security of the workers. These regulations, clearly, deprive non-Saudi workers in the private sector of enjoying such job security privileges and thus affect employment protection in the labour market.

3.6.4 Migration Regulations

Migration dominates a great part of humankind's history on the planet. International migration is a worldwide phenomenon that happens in both developed and developing countries. Migration policy is the main component of the migration regulations. It aims at measuring, organising and controlling international migration or cross-border labour movements. In the context of international migration, the admission policy is a factor that controls status of the migrants into the country.

Many empirical studies about international migration policies distinguish between permanent residency and temporary residency of migrants into different countries. Borjas (1994) explains that workers can only migrate if the host country's government allows migration. He argues that the migration market is highly regulated, as most countries have strict policies describing the demographic characteristics of people who are allowed to enter the country. These characteristics might include skills, national origin, or family ties with current residents in the host country. He argues that migration policy is determined by the host country's political and economic gains from migration, as there are different benefits that could be gained from admitting skilled or unskilled migrants depending on the skills composition of the native labour force in the host country.

On the other hand, temporary labour migrants are those who migrate for a short time, ranging from a few months to several years, to take up employment in a foreign country (Castles, 2000). The international migration experience shows that countries that have fully embraced the free market principle, countries like the United States of America, Canada, Australia and New Zealand, have adopted permanent settlement as a main form of immigration. In contrast, some other countries where there are severe labour shortages, such as the Middle East oil-rich countries, have to rely on temporary migrants as temporary workers. There are also some other non-migrant receiving countries, such as Japan, that open their doors for permanent and temporary migration (Morales, 1992).

In Saudi Arabia, since the 1970s, international migration has been a prominent feature of the labour market. There is no comprehensive migration policy in the country, but features of such policy can be derived from the *Iqama*

regulations, (literally, the Residency Act), and the related instructions issued occasionally by the Ministry of the Interior. Foreign or non-Saudi* workers cannot enter the country unless they have a sponsor (called a *Kafeel*) of an eligible employer, or a permitted Saudi household in the case of domestic workers. When a foreign worker enters the country, he or she has to get a residency card, *Iqama*, and a work permit. The Passport Authority issues the former, and the work permit is usually issued by the Labour Department in the concerned district of Saudi Arabia.

Once the worker gets the *Iqama* card, he/she has to give his/her passport to the *Kafeel* (the sponsor) and only gets it back when he/she leaves the country, as the *Iqama* card comes instead of the passport. A non-Saudi cannot change his/her sponsor or job unless he/she gets a release from his/her sponsor, finds another employer to offer him sponsorship, and obtains approval from the Passport authority to change his/her sponsorship; it may take several months to settle the matter. However, the sponsor has the right to refuse to give a release, to deport the worker and to ask the authority to ban the worker from coming back to the country for two years. These regulations apply to non-Saudi workers in both the private and public sectors. In this way the residency regulation distorts the labour market and eliminates the non-Saudi workers from the labour demand and supply to match their opportunity in the labour market, as these regulations restrict their mobility in the labour market while their Saudi counterparts can move freely in this market. Insofar as residency status is concerned, in contrast to the situation in the USA and the UK where many temporary migrants have the right to proceed to obtain permanent residency, in Saudi Arabia permanent residency is exclusively restricted to Saudi citizens according to the Nationality Law. Although the Saudi Citizenship Law gives a foreigner the right to apply for Saudi citizenship if he has lived in the Kingdom of Saudi Arabia for at least five years (a new proposal extends it to ten years) and is of irreproachable reputation, in practice it is very difficult to get permanent residency. Even among the small minority of migrants who are granted Saudi citizenship, they still face further discrimination in other situations. For

* The Saudi Citizenship Law defines migrants as foreigners or non-Saudi who comprise migrant workers and their dependants, and foreign investors who usually make a minor part of the total migrants. In Saudi Arabia temporary migration is the only form that allows foreign workers of non-Gulf Co-operation Council (GCC) countries to enter for employment.

example, regulations of the Council of Ministers and the Shura Council both stated that the member of the respective council should be of Saudi origin by parents.

Foreign workers in professional, technical and managerial occupations with post-secondary education have the right to bring their families with them to Saudi Arabia. However, relatives of workers in other occupations have the right for only a short visit that might be extended to three months or another duration. This creates another aspect of employment instability among the disadvantaged workers and fragments both the private and public sector, as it allocates to some non-Saudi a pecuniary benefit not offered other colleagues only because they are not in specific jobs or they lack certain educational qualifications.

3.7 SEGMENTATION IN THE SAUDI LABOUR MARKET: CONCLUSION

Imperfect labour markets discriminate among workers in similar jobs or even in the same workplace with the same qualifications. The discrimination can arise from either labour market policies or individual firms' rules of work. These policies segment labour market into two groups of workers: one is economically advantaged, and the other group is disadvantaged or less advantaged.

The standard theory of labour market segmentation was originally developed by Doeringer and Piore (1979). This theory interprets different aspects of the labour market disparity in the context of the internal labour market, within which certain implicit or explicit rules accord existing workers certain exclusive rights and privileges over another group of workers in the external labour market. Doeringer and Piore (1979) argue that this creates a dual labour market, which is segmented into primary and secondary sectors with different characteristics. Jobs in the primary sector are generally characterised by high wages, good working conditions, employment stability, equity, chances of advancement, and process in administration of work rules. By contrast, jobs in the secondary sector are characterised by low wages, poor fringe benefits, poor working conditions, little chance of advancement, and the fate of being subject to arbitrary management practices. It is common that the disadvantaged workers are confined to the secondary labour market.

Migrants are affected by labour market segmentation in the host countries where the primary labour market accords various work privileges to the native workers over migrants who are found in the secondary labour market. Piore (1979) reveals that migrant workers in France, Germany, Switzerland, and Britain are usually employed in occupations rejected by indigenous workers. Müller (1999) analysed the welfare outcomes of migration policies in the context of a dual labour market on the basis of the state of temporary migration. He concluded that migration policies in Germany led to sectoral segregation between natives and migrants, where the “guest workers” system allocates migrants into the secondary sector and yields higher gains for natives at the expense of overall efficiency.

In Saudi Arabia, native workers prefer to find employment with the government departments or public sector that provides good compensation, prestigious social status, and job security. Very few Saudi workers are willing to join the private sector that has lower wages, and lower non-pecuniary benefits such as vacations, training, chances for promotion, working bonus, and working time schedules (Al-Khouli, 1985; Al-Moammar, 1983; Al-Towaijri, 1992; Al-Nimer, 1993; Datta et al., 2000; Wood and Mellahi, 2002). Table (3-13) reveals that most Saudi workers are employed by the public sector. In 2000, their share of employment in the public sector was nearly 88%, which is above the share in 1985 by about 25%. Meanwhile, the share of non-Saudi workers in the public sector decreased from 37% in 1985 to only 12% in 2000. This indicates a significant effect of the recent ministerial decree aimed at ending services of non-Saudi workers who had completed ten years in the service of this sector except for those in health care and higher education. In complete contrast to the employment pattern in the public sector, this table shows that non-Saudi workers dominate the private sector with an average rate of 79% over the period 1985-2000, even though their share in this sector decreased from 84% in 1985 to about 77% in 2000.

From previous sections, it is obvious that labour market regulations influence the segmentation of the Saudi labour market, as these regulations attract Saudi workers to concentrate mainly in the public sector on the one hand, and largely restrict the employment of non-Saudi workers to the private sector on the other hand. Doeringer and Piore (1979) argued that legislation related to the labour

Table 3-13**Distribution of Workers in the Government and Private Sector****(in percentage)****Over 1985-2000**

Year	Government			Private		
	Saudi	Non-Saudi	Total	Saudi	Non-Saudi	Total
1985	62.9	37.1	327188	16.0	84.0	1653900
1988	64.4	35.6	406083	17.6	82.4	1864600
1995	N.A	N.A	N.A	20.3	79.7	2208279
1996	78.9	21.1	609011	19.7	80.3	2680507
1997	N.A	N.A	N.A	22.1	77.9	2553797
1998	82.2	17.8	616291	22.3	77.7	2638082
1999	86.7	13.3	668423	22.7	77.3	2691440
2000	87.7	12.3	674554	23.0	77.0	2810901

Source: CDS" Economic Survey of Establishments".

NA= available

market has the effect of creating a secondary and a primary sector in this market. They illustrate the fact that unemployment compensation, social security, and minimum wage legislation all exempt some workers, even in the secondary sector, from coverage. They confirmed that such legislation affects the stability of the labour market; therefore, such legislation distorts the labour market. Lopes (2001) argued that legislation related to the Portuguese labour market provides workers in the public sector and large enterprises with a large employment protection, while workers in the small and medium-sized enterprises, the self-employed, and non-regular workers receive little protection from labour market regulations, which creates the dualistic phenomenon in the Portuguese labour market. In this context, regulations related to the Saudi labour market distort it and contribute to the segmentation phenomenon in this market. For example, migration and *Iqama* regulations prevent non-Saudi workers from moving freely in the labour market and tie them to their sponsors. These regulations regard movements of the non-Saudi workers in the labour market as illegal practices unless they obtain the prior consent of their sponsors to transfer officially to another employer. This prevents

non-Saudi worker from competing in the labour market, while the Saudi workers have the right to move and look for better jobs freely in the labour market. Bivins (2001) noticed that for many individual workers only one firm being assigned permission for employment of migrant workers in the Gulf Co-operation Council (GCC) countries, there is a monopsony in the migrant labour market. The monopsonist only offers a migrant worker a wage rate that is slightly more than the wage he/she may receive at home, as there is no other Saudi firm that is able to hire him/her.

Furthermore, regulations of the Civil Service prevent non-Saudi workers from changing their service from the private sector to the public sector, with the exception that some of these workers are allowed to work for doctors or a non-Saudi worker's husband or wifer wife who works in the public sector. However, Saudi workers can easily move between the two sectors without any barriers.

As Doeringer and Piore (1979) point out, this policy reflects a protection for workers in the internal labour market of the public sector from competition from other non-Saudi workers in the private sector, which represents an external labour market.

Labour regulations also state various and distinct conditions of work for Saudi and non-Saudi workers in both the private and public sectors. Distinction between the two groups of workers involves recruitment procedures, working hours, vacations, training, promotion, compensations, and pension.

Recruitment standards decide the quality and location of jobs for skilled and unskilled workers (Gitteman, 1993). The civil service regulations in Saudi Arabia set some criteria for job recruitment in the public departments. These criteria are based on some screening measures such as a minimum age of 17 for Saudis and 20 for non-Saudis, educational qualifications, health state, criminal records, and the previous work records if any. The recruitment procedures restrict non-Saudis to devote their work to only one government department.

In contrast to the public sector, regulations in the private sector do not state specific recruitment procedures. It is in the employer's interest to select among candidates, as there are no predetermined screening measures for job attainment in the private sector. Nevertheless, the labour law requires that a foreign worker in the

private sector should be recruited among skilled and qualified workers, although it did not set down any screening measures about recruitment of these workers. This opens the doors for skilled and unskilled foreign workers to join to the private sector since these workers are recruited in their home country by a local agent to whom the Saudi employer has to pay (Elenes *et al.*, 1992; Barsalou, 1985; Woodward, 1988). This assigns unskilled workers to the private sector, particularly in construction and production sectors that are dominated by private investments (see Table 3-12). Foreign workers in the public sector are recruited abroad through representatives of the Saudi General Civil Service Department. This allows public departments to recruit non-Saudi or foreign workers with specific skills and qualifications that are required for the work.

Working hours and vacations are another aspect of labour market segmentation in Saudi Arabia. Section 2 of this chapter about hours of work in the Saudi labour market reveals differences in weekly working hours between the private and public sectors. It shows that, in general, workers in the public sector are working fewer hours than their counterparts in the private sector. While the weekly working hours in the public sector extend to 35 hours over five days, the standard work week hours in the private sector ranges between 48 and 60 hours over 6 days across occupations.

Considering vacations as a non-pecuniary benefit, labour regulations entitle workers in the public sector to have longer vacations and holidays than their colleagues in the private sector. Saudi workers in the public sector enjoy various vacations that include official holidays, annual paid leaves, emergency paid leave, work-injuries paid vacations, sick paid leave, school examinations paid leave, and paid vacation to accompany a sick family member. A Saudi worker in this sector may get the right for sick paid leave to get medical treatment outside the country. In such cases, the Saudi worker has a right to get free air tickets and financial support for treatment. The periods of vacation privileges for Saudi workers range between 5 days and 18 months, but non-Saudi workers in the public sector have limited kinds of paid vacations that only include official holidays, paid annual vacations, and sick leave for a limited period. The periods of these vacations may extend to 75 days in total. Married female Saudi workers in the public sector have

a right for maternity vacation of up to 60 days, while their non-Saudi counterparts in this sector have a right for 45 days only.

Concerning training, labour regulations and government programmes devote a great deal of attention to the training of Saudi workers in the public sector. These regulations restrict training courses sponsored by the government to Saudis only, whether the training takes place inside or outside the country, whereas non-Saudi workers in this sector are denied any training opportunity. Labour law requires the employers who employ more than 100 workers to train 5% of his Saudi employees. It does not extend such privileges to non-Saudi workers.

These aspects and others not only segment the labour market in Saudi Arabia, but also discriminate between migrants and natives. As DeBeiji (1995) points out, discrimination occurs when migrant workers receive inferior treatment compared to native workers in spite of comparable education, qualifications, and experience. Piore (1979) further discusses the situation of discrimination on the basis of nationality; that is, good jobs are reserved for natives whilst migrant workers are excluded from privileged jobs even if they are more skilled and more productive.

Therefore, these practices make the labour market in Saudi Arabia significantly different from that of other countries that receive a large numbers of migrant workers, such as the USA and the UK, whose employment regulations strictly prevent discrimination in the labour market. Work permit regulations in UK require the employer to offer work conditions and pay no less favourable than those offered to a resident worker doing the same job (Glover *et al.*, 2001). Regulations regarding temporary migrants in the USA require an employer to treat all employees the same, whether they are natives or migrants (USA Department of Justice, 1991).

Another aspect of the labour market segmentation in Saudi Arabia is work advancement. The recruitment regulations in the public sector give Saudi workers the right for promotion after a maximum period of four years that a worker spends in his/her current position, whereas non-Saudi workers in either the public or private sectors generally have no such rights whatsoever. The only exception is for non-Saudi university teaching staff, who are governed by separate recruitment

regulations that provide them with better conditions of work compared to other non-Saudi workers. Even so, they still do not enjoy the same privileges as their Saudi counterparts.

Considering work compensation in the public sector, wage scales across occupations reveal that Saudi workers have more benefits than their non-Saudi counterparts. For example, the difference in the entry salary between the graduate Saudi doctor and non-Saudi doctor is estimated at 50% in favour of the former (Al-Taweel *et al.*, 1995). In addition, Saudi workers have the right for an annual salary allowance that is valued between SR 70-640 Saudi Riyals across occupations. As a comparison, their non-Saudi counterparts in this sector might be paid an annual salary allowance that is equal to about 5% of the basic salary, without job promotion. However, non-Saudi workers in the public sector have an annual accommodation allowance and travelling tickets, which are not allocated to Saudis.

Firms in the private sector have no specific wage scales. Payment is settled according to personal contract or an oral agreement between the employer and the worker. There are no collective agreements on work compensations. The labour law sets loose rules about wages and compensations of the workers in the private sector in comparison to that in the public sector. The Labour Law makes some differences in payment between Saudis and non-Saudis, as it requires the employer to assign 51% of the employer's total budgeted compensations to Saudi employees (Article 45). However, wage differential (more details below) between Saudi and non-Saudi is a prominent feature in the labour market.

As explained before, pension privileges also represent a part of conditions of work that contributes to the segmentation of the labour market in Saudi Arabia. Most of these privileges are allocated to Saudi workers rather than their non-Saudi counterparts who only have very few social security benefits.

In summary, the Saudi labour market can be argued to be a highly segmented one and the segmentation is manifested through significant differences in pay and working conditions across different groups of workers in the Saudi labour market. The segmentation phenomenon can be observed among workers of different nationality, gender, and sector (particularly public versus private). However, many factors, historical, cultural and policy-oriented, have contributed

to the segmentation phenomenon that in turn has contributed to the prevalence of the wage differentials and wage discrimination in the labour market and in one particular industry in Saudi Arabia, the chemical and petrochemical industries, which is the main focus of the remaining chapters of this study.

CHAPTER FOUR

PAY AND WORKING CONDITIONS IN THE SAUDI CHEMICAL AND PETROCHEMICAL INDUSTRIES

4.1 INTRODUCTION

This chapter focuses on the pay and working conditions in the chemical and petrochemical industries in Saudi Arabia. It reports the findings of a survey of Saudi and non-Saudi workers. These findings are set in the context of the relevant theory and literature and secondary data where available.

Working conditions, which have administrative, social, and economic rights, are framed by statutory laws, or collective bargaining, or individual contracts. Further, they embrace many pecuniary and non-wage features of the workplace, such as working time, skills development, particularly through training, discrimination by gender or race, health and safety, social relations in the workplace, holiday entitlement, and contract. In addition, working conditions extend to the physical environment, which has ambient features (noise, vibrations, temperature, light, air quality, chemicals) and ergonomics features (equipment and furniture positions, repetitive movements, loads) (Paoli, 1992; Houtman *et al.*, 2002; Fagan and Burchell, 2002). However, working conditions are in a state of continual change, particularly in developed countries which have adopted more advanced working conditions to improve the quality measures of the workplace (EURFLWC, 2002).

Working conditions in the Saudi chemical and petrochemical industries are influenced by the labour regulations and the individual contracts between the employers and the employees. Working conditions influence a worker's earnings, so that unequal and unfair treatment, either explicit or implicit, in contracts contributes to earnings inequality among workers in the same occupations. In addition, earnings inequality is influenced by other factors that include demographic variables such as workers' age and marital status, as well as their human capital components, which mainly comprise education, training and work experience.

This chapter begins with a discussion of the sources and methods of information collection in the chemical and petrochemical industries. The chapter then focuses on the identification and interpretation of empirical patterns in the pay and employment structure of Saudi and non-Saudi workers as shown by the results of the cross-sectional survey. A formal investigation into the determination of wages and the extent of wage discrimination in these industries is presented in Chapter Five.

4.2 SOURCES AND DATA COLLECTION

Lack of data is a major constraint for economic research in Saudi Arabia. This problem stems from the laws that restrict access to the detailed micro data* of the census and surveys that are conducted by the Central Department of Statistics (CDS). However, macro data in the form of summary tables on the labour market is available, but the information is not comprehensive and is often inconsistent and/or unavailable. This study makes use of the released summary data on the labour force, wages, and employment that were irregularly prepared and issued during the 1980s and 1990s by the CDS. In addition, similar time series data reported by other government departments is drawn on.

Since very limited official data exist, the present study has had to rely on a specially-designed survey to collect primary information on the pay and working conditions in the chosen industries. This section discusses the various sources of secondary data and, in particular, details of the design and implementation of the survey for collecting primary information. The survey covers a sample of workers in the chemical and petrochemical industries in the three main cities of Saudi Arabia: Riyadh**, Jeddah and Dammam.

4.2.1 Sample cluster

The sample cluster refers to the location where a sample of respondents is chosen. In this research, the sample cluster corresponds to a chemical or a

* Statistics law (Articles 10 and 11) was enacted by the Royal Decree No 23 1959.

** Riyadh is the capital city of Saudi Arabia, Jeddah is the main sea port to the western part of the country, and Dammam is the main port on the Gulf to the east of Saudi Arabia. The three areas are far from each other. The distance between Riyadh and Jeddah is estimated as 1963Km, and between Riyadh and Dammam is estimated as 467Km.

petrochemical plant that is located in any of the industrial areas of the three main cities of Saudi Arabia: Riyadh, Jeddah, and Dammam. According to the industrial classification in Saudi Arabia, which adopts the International standard of Industrial Classification (ISIC), chemical industries include units that produce chemicals, refined petroleum, and petroleum-solvent products and plastics that include petrochemicals of Saudi Arabian Basic Industries Corporation (SABIC).

4.2.2 Sample frame

When a list of the sample population or the sample frame is constructed, the sample should then be selected on a random basis (Deaton, 1997). In the absence of adequate data and information about the workers in chemical and petrochemical industries (which is the population of the research), it is difficult to construct such a list. It is almost impossible to construct the necessary sample frame for workers in the three towns to select a random sample of the chemical and petrochemical industries due to resource constraints. Therefore, a quota sample system is adopted in this research.

Previous research on the labour market in Saudi Arabia has used quota-sampling techniques to collect cross-sectional data. For example, Al-Ghofaily (1980) selected a sample of 600 students for his study on attitudes of Saudi youth towards vocational education. Al-Towaijri (1992) collected data from a sample of two strata including workers in the government and private sectors. He did not predetermine his sample size, but distributed 1345 questionnaires to workers in both sectors and received 780 responses. This technique has been followed by other studies on social issues in Saudi Arabia.

4.2.3 Sample Size

The sample size is 600 workers in the chemical and petrochemical industries in the three cities. It was distributed proportionally on ratio 4:3:3 in 74 chemical and petrochemical plants (the cluster) in Riyadh, Jeddah, and Dammam, respectively. The number of plants covered by the survey represents about 50% of the total chemical and petrochemical plants in Saudi Arabia. Table (4-1) shows the sample and cluster distribution among workers and plants across the three main cities of Saudi Arabia.

A pilot questionnaire was designed, in both Arabic and English, and tested among a group of ten workers in three chemical plants in the Riyadh area, and then the required amendments to the questionnaire were made. A copy of the final version of the questionnaire is shown in the Appendix II. Data collection was conducted through different methods: in Riyadh, the questionnaires were handed directly to workers to be completed and then collected, as requested by the plant management. In some cases, they were completed through face-to-face interviews with workers, while in some other cases, plant managers insisted on checking the questionnaires before and after completion. Some managers were unwilling to cooperate and refused the questionnaires off-hand. In Jeddah and Dammam, the questionnaires were distributed by mail and followed-up by phone calls before and after they had been mailed to the plants. Some of the mailed questionnaires were not returned, even after frequent follow-up calls by phone. The total number of distributed questionnaires in the three towns was 2570 and the total number of replies was 610, representing a response rate of 24%. Of these 610 returns, 50 questionnaires had to be rejected due to severe incompleteness. Therefore, the total completed and valid questionnaires were 560.

Table 4-1
Sample Distribution across Plants
in the Three Main Cities of Saudi Arabia

Area	Riyadh	Dammam	Jeddah	Total
Plants	30	22	22	74
Workers	240	180	180	600

4.2.4 Scope of the survey questionnaire

Numerous variables determine the structure of wage and employment in the labour market. Given the constraints of the present study, the focus of the present survey questionnaire is to obtain information on these variables or factors that are related to the supply-side of the labour market in the Saudi chemical and petrochemical industries. More specifically, this study focuses on variables that reveal personal and productivity characteristics of the workers in order to examine

their influences on the compensation of these workers. These variables include: age, marital status, experience, education, training, occupation, insurance, mobility in the labour market, health services, job security, and work advancement or promotion. Other important variables include the workers' ethnicity and the mean monthly earnings of these workers, will be discussed in the next chapter.

4.3 THE FINDINGS

4.3.1 Earnings gap between Saudi and non-Saudi workers

Economists usually use the term 'earnings' to mean income gained in return for work, whether earned as wages and salaries or income from self-employment (Lerman, 1997). An earnings gap that arises between different groups of workers who have identical work characteristics and equal chances of employment is usually considered as a consequence of occupational discrimination.

Economists provide various explanations for earnings or wage differentials between these groups of workers. Tachibanaki (1998) referred to the importance of skills that are associated with education and training for different occupations as the main factors that influence earnings differential among workers across wages and occupations. In addition, the demand for and supply of labour have important implications for wage distribution between workers in these occupations (a detailed discussion of the demand and supply factors is provided in Chapter Five). However, wage differentials prevail in the Saudi labour market. Recent data shows that Saudi males have higher wages than other workers, both males and females, and especially non-Saudi and Saudi females. Table (4-2) presents the average monthly earnings distribution of Saudi and non-Saudi males and females over 1994-2002. It shows that Saudi males earn between 1.83 and 2.21 to their fellow female citizens over this period, and these males have earnings ratio calculated between 3.67 and 3.91 to that of their non-Saudi male counterparts over this period, while the earnings ratio of Saudi females to non-Saudi males is calculated between 1.7 and 2.03 in favour of Saudi females, over 1994-2002. This result is

Table 4-2

Average Monthly Earnings Saudi and Saudi Workers
Male and Female
Over 1994-2002

(SR)

Year	Saudi				non-Saudi				*Fs/Mn	Male	
	Male	Female	Total (average)	M/F	Male	Female	Total (average)	M/F		Saudi/non- Saudi	Saudi/No n-Saudi
1994	7298	3660	7220	1.99	2153	3133	2179	1.46	1.70	3.39	3.31
1995	7896	3864	7800	2.04	2142	3016	2166	1.41	1.80	3.69	3.60
1996	7711	4090	7620	1.89	2103	2966	2127	1.41	1.94	3.67	3.58
1997	7570	4144	7489	1.83	2046	2716	2062	1.33	2.03	3.70	3.63
1998	7473	3812	7369	1.96	1934	2740	1952	1.42	1.97	3.86	3.78
1999	7124	3489	7021	2.04	1858	2505	1870	1.35	1.88	3.83	3.75
2000	6877	3217	6757	2.14	1763	2391	1774	1.36	1.82	3.90	3.81
2001	6684	3151	6560	2.12	1710	2403	1722	1.41	1.84	3.91	3.81
2002	5984	2703	5824	2.21	1543	2221	1554	1.44	1.75	3.88	3.75

Source: Saudi Monetary Agency" Annual Report No.40

* Saudi Female/non-Saudi Male

not really surprising, as the Saudi female workers are largely concentrated in the public sector that offers generous pay and benefits.

Interestingly, among the non-Saudis, female workers earn more than their male colleagues. This result is rather unusual, as traditionally among workers of the same ethnic background male workers earn more than female workers. This anomaly may be due to the fact that non-Saudi female workers are particularly in high demand across a number of occupations for the following reasons. First, in Saudi Arabia, social custom dictates that women must not work alongside men (with the exception of the health services) so some jobs can only be done by women. Second, traditionally, the labour market participation rate among Saudi females is extremely low. Therefore, a significant number of job vacancies can only be filled by non-Saudi females. This tends to boost their market power and wage rates. The earnings ratio between the two groups is between 1.33 and 1.46 for non-Saudi females, over this period. However, the table shows the aggregate earnings ratios of Saudi to non-Saudi as between 3.31 and 3.81 for Saudi workers over this period.

The wage differential phenomenon exists in the chemical and petrochemical industries. In this chapter, a simple technique is used to investigate this phenomenon between Saudi and non-Saudi workers, while Chapter Five provides estimates of the earnings gap and its sources between the two groups of workers. The percentile technique is used to rank the observations of earnings for both Saudi and non-Saudi workers at lower (10%), middle (50%) and upper (90%) percentile points earnings in these industries. In different countries, earnings per hour are considered to be the basic measure of wage rate determination, while the common base of wage measurement in Saudi Arabia is the monthly wage, which is used in this study to analyse earnings distribution between the two groups of workers.

Table (4-3) presents the earnings distribution of Saudi and non-Saudi workers in the chemical and petrochemical industries across the three percentile ranks. A clear pattern of earnings inequality emerges between the two groups of workers in these industries. The monthly earnings ratio of Saudi to non-Saudi workers is calculated at 1.8 for the lower percentile, 1.75 for the middle percentile

and 1.85 for the upper percentile of workers. Further, the aggregate mean earnings ratio confirms the earnings differentials between the two groups of workers as 1.92 in favour of the Saudi workers. From this table, the coefficient of variation (C.V.)^{*} indicates that Saudi workers have a larger level of variation in their earnings than their non-Saudi counterparts, with the former group having a C.V. of 46% compared to the C.V. of 35% for the non-Saudis.

Table 4-3
Earnings of Saudi and non-Saudi Workers in Percentile

Earnings Rank	Mean Monthly Earnings		
	Saudi	non-Saudi	Ratio
10 th Percentile	4129	2286	1.81
50 th Percentile	6961	3989	1.75
90 th Percentile	12118	6558	1.85
Aggregate Mean	7904	4106	1.92
C.V.	0.46	0.35	

4.3.2 Earnings gap by demographic characteristics

This section presents monthly earnings of Saudi and non-Saudi across the three percentiles associated with their demographic features that comprise age, children and marital status.

i) Earnings gap by age

Age generally indicates a worker's physical condition and the stage of the worker's participation in the labour market. As the standard theory of labour supply and different empirical studies suggest, the time people spend at work tends to decline when they extend their time in education or take early retirement (Becker, 1965; Heckman, 1986; Sapsford, 1981; Rima, 1981; Dixon, 1996). Therefore, people at the extremes of the age structure have low participation rates. Usually the

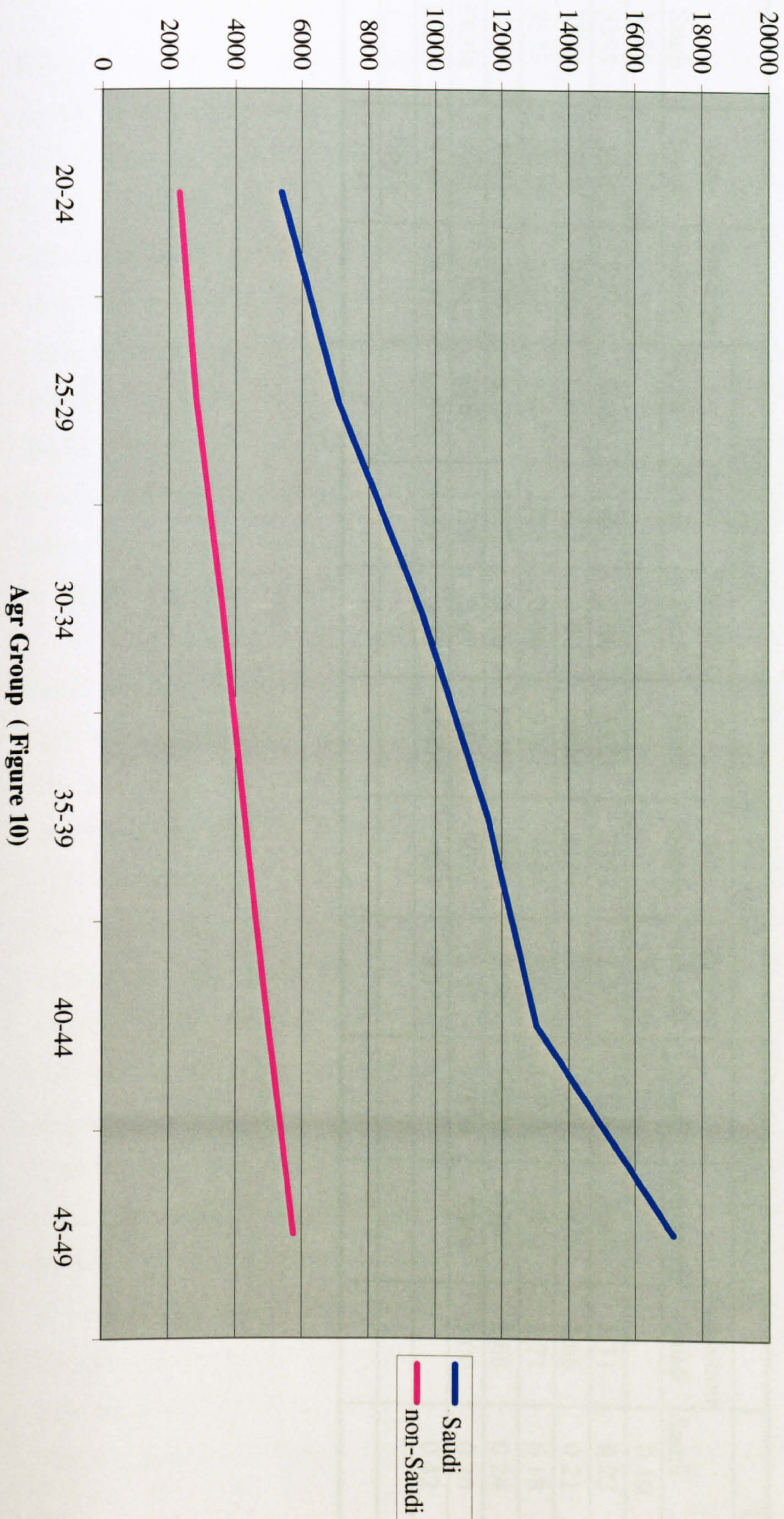
^{*} The CV is calculated as $CV = \text{standard deviation} / \text{mean}$. It measures data dispersion compared to the mean. When the CV is small, the data dispersion compared to the mean is small, but when the CV is large the amount of variation is large.

age variable is associated with job tenure, which obscures the effects of age on wage differentials in the labour market (Tachibanaki, 1998). Economists have confirmed the influence of age on the wage differentials across different age groups. They argue that earnings increase with age, which is taken to reflect experience and seniority in the workplace (Diaz-Gimenez *et al.*, 1997). Dixon (2000) attributed the influence of age on earnings to the educational level between younger and old workers as people attain education before entering the labour market and they become less interested in subsequent upgrading of knowledge. Tachibanaki (1998) found that age was responsible for a great part of wage differentials in Australia and Canada in comparison to gender, industry, and occupation.

This section examines the influences of age on the wage differentials between Saudi and non-Saudi workers across and within age groups of 15-60 year olds. Figure (10) shows that earnings of both Saudi and non-Saudi workers increase with age across age groups. Table (4-4) provides more details about the earnings differentials between the two groups of workers. It shows that Saudi workers have higher earnings than their non-Saudi counterparts across ages. In the comparable age groups between 20 and 49, the average monthly earnings of Saudis are more than twofold the average monthly earnings of the non-Saudis.

Considering the earnings distribution of the two groups of workers across the three percentile ranks, this table reveals that Saudi workers have higher earnings across age groups and percentile levels. Across the 20-49 age groups, the earnings ratios of Saudi to non-Saudi workers vary between 2.3 and 3.58 for the lower 10th percentile of earners, between 2.21 and 3.15 for the 50th percentile, and between 2.31 and 3 for the 90th percentile of earners. In the table, the last two columns present the earnings coefficient of variation (C.V) for Saudi and non-Saudi workers across age groups. The coefficients of variation for Saudi workers, which vary between 0.18 and 0.42, are generally higher than that for the non-Saudis at between 0.11 and 0.30. This shows the same trend as that for the disparity in the aggregate earnings between the two groups of workers.

**Distribution of Average Monthly Earnings of Saudi and non-Saudi in
The Chemical and Petrochemical (By Age Group)**



Distribution of Monthly Earnings of Saudi and non-Saudi in the Chemical and Petrochemical Industries (by Age)

Table 4-4

Age Group	Saudi	non-Saudi	Saudi/no n-Saudi	10th Percentile			50th Percentile			90th Percentile			C.V	
				Saudi	non-Saudi	Saudi/no n-Saudi	Saudi	non-Saudi	Saudi/no n-Saudi	Saudi	non-Saudi	Saudi/non-Saudi	Saudi	non-saudi
15-19	3188												0.19	
20-24	5395	2339	2.31	3909	1461	2.68	5323	2352	2.26	7125	3089	2.31	0.23	0.21
25-29	7094	2837	2.50	5339	1527	3.50	6896	3114	2.21	9237	3476	2.66	0.21	0.25
30-34	9570	3635	2.63	7285	2735	2.66	9767	3664	2.67	11918	4402	2.71	0.18	0.18
35-39	11571	4281	2.70	8326	2327	3.58	11416	4451	2.56	14872	5165	2.88	0.24	0.11
40-44	13046	4995	2.61	9386	3770	2.49	13065	5075	2.57	17576	5864	3.00	0.20	0.16
45-49	17160	5769	2.97	11876	5153	2.30	18479	5865	3.15				0.42	0.14
50-54		6635												0.16
55-59		7894												0.30

ii) Earnings gap by marital status

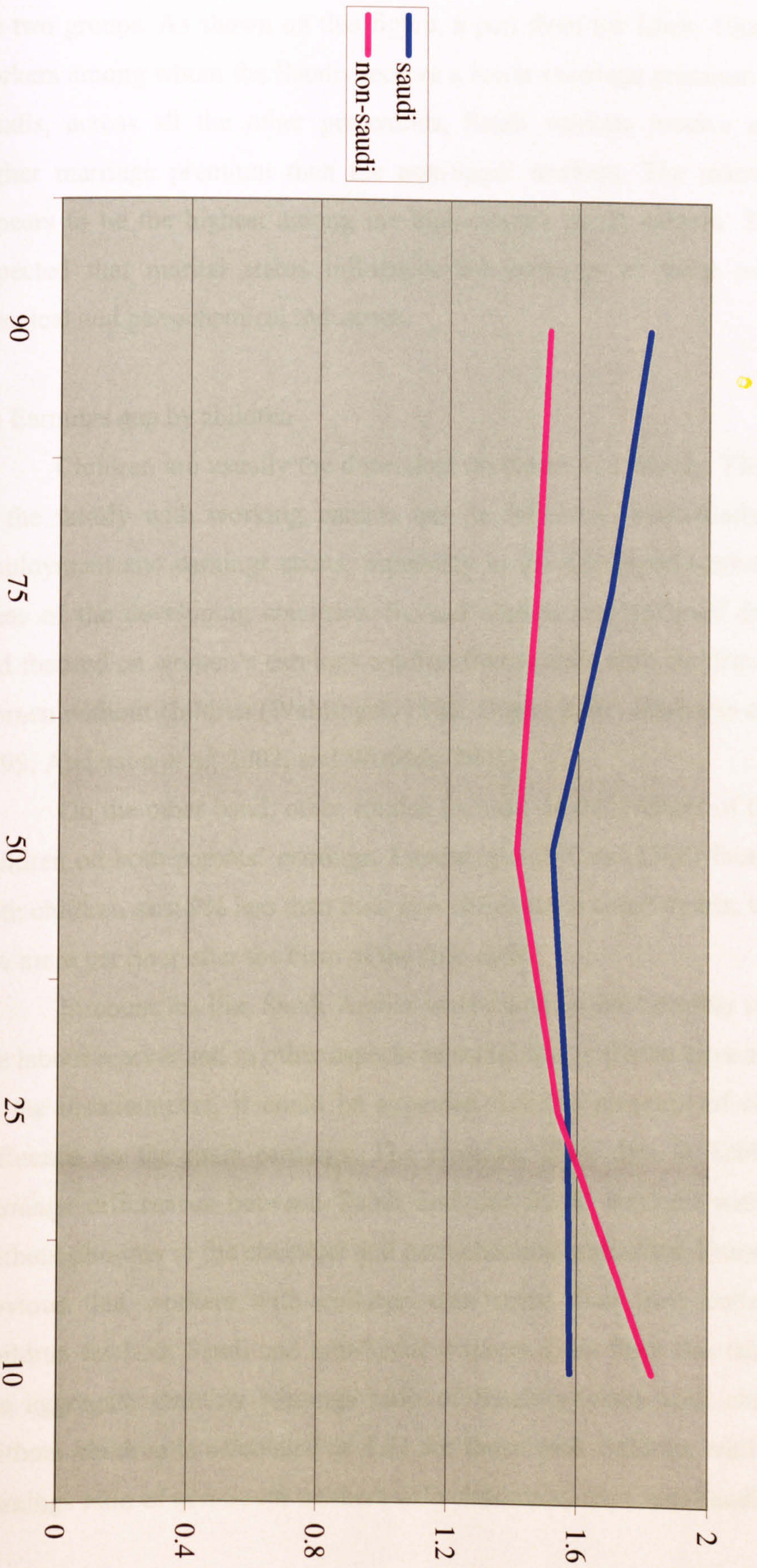
Several studies have examined the relationship between marriage and wage levels. These studies confirm that married workers have higher earnings than unmarried or single workers. Madalozzo (2002) estimated the impact of marital status on the earnings of women in the USA and found a small marriage premium in the wage at a ratio of 3.2%. Richardson (2000) revealed that the wage differential between married and unmarried Swedish workers significantly declined from 23% in 1986 to 8% in 1991, in favour of married workers. In the same study, while cohabiting and divorced men earned about 16% more than their unmarried colleagues in 1986, the earnings gap between the two groups declined to 4% and 5% in 1991, respectively. Chun and Lee (2000) found that married men earn 12.4% more than unmarried men in the USA. Rodgers and Stratton (2003) reported the wage differential between married and unmarried white men in the USA to be 9% in favour of married workers.

This section examines the influence of the marital status of Saudi and non-Saudi workers on their wage rates in the chemical and petrochemical industries. Table (4-5) presents some descriptive statistical analysis for the cross-sectional data on marital status of the two groups of workers. From this table, the marital variable is classified as married, and 'unmarried' refers to single, divorced and widowed workers. Data in this table reveal impacts of marital status on earnings distribution of these workers, as the aggregate earnings ratio of the married workers to their unmarried counterparts is calculated at 1.42 for the married workers. As shown on this table, married workers earn more than their unmarried counterparts across the three percentile ranks as defined earlier. It reveals that the earnings ratios of Saudi married workers compared to that of their unmarried fellow citizens is calculated as between 1.52 and 1.82 in favour of married workers across the three percentiles. Among the non-Saudi workers, the earnings ratio between the married workers and the unmarried workers is calculated as 1.83 for workers in the lower earnings percentile, 1.41 for the middle percentile, and 1.51 for those in the upper earnings percentile. Figure (11) shows the earnings ratios between married and unmarried workers of both Saudi and non-Saudi nationalities. The diagram clearly depicts a marriage premium for the two groups of workers.

Table 4-5
Earnings of Saudi and non-Saudi in the Chemical and Petrochemical Industries
by Matial Status (Across Percentiles)

Earnings Rank	Saudi			Non-Saudi			All Workers		
	Married	Un-married	Ratio	Married	Un-married	Ratio	Married	Un-married	Ratio
10 th Percentile	5947	3765	1.58	2858	1561	1.83	3193	2258	1.41
50 th Percentile	8815	5805	1.52	4537	3217	1.41	5225	4025	1.30
90 th Percentile	14053	7715	1.82	6187	4096	1.51	11134	7103	1.57
Aggregate Mean	9805	5740	1.71	4537	3030	1.50	6347	4479	1.42
C.V.	0.40	0.28		0.30	0.30		0.56	0.42	

Married and Un-married Earnings Ratios of Saudi and non-Saudi in the Chemical and petrochemical Industries



Quartile and Percentile Measures (Figure 11)

However, there are also noticeable differences in the marriage premium between the two groups. As shown on this figure, a part from the lower 10th percentile of workers among whom the Saudis receive a lower marriage premium than the non-Saudis, across all the other percentiles, Saudi workers receive a significantly higher marriage premium than the non-Saudi workers. The marriage premium appears to be the highest among the high-income Saudi earners. Therefore, it is expected that marital status influences the earnings of these workers in the chemical and petrochemical industries.

iii) Earnings gap by children

Children are usually the dependant members of a family. Their appearance in the family with working parents has its influence, particularly on mothers' employment and earnings status, especially in the developed countries and urban areas of the developing countries. Several studies that analysed family earnings and focused on women's earnings confirm that women with children earn less than women without children (Waldfogel, 1998; Gupta, 2001; Harkness and Waldfogel, 1999; Anderson *et al*, 2002; and Wetzles, 2003).

On the other hand, other studies focused on the impacts of the presence of children on both parents' earnings. Lundberg and Rose (1998) found that women with children earn 9% less than their non-child bearer counterparts, while men earn 8% more per hour after the birth of the first child.

In countries like Saudi Arabia where women are severely marginalised in the labour market and in other aspects of social life, and men have a dominant role as the breadwinners, it could be expected that the presence of children has an influence on the male earnings. The cross-sectional data in Table (4-6) shows earnings differences between Saudi and non-Saudi workers with children and without children in the chemical and petrochemical industries. From this table, it is obvious that workers with children earn more than their colleagues without children for both Saudi and non-Saudi workers. Data from this table suggest that the aggregate monthly earnings ratio of Saudi workers with children to those without children is calculated as 1.71 for those with children, while the aggregate earnings ratio of non-Saudi workers with children to their non-Saudi colleagues

Table 4-6
Distribution of Earnings of Saudi and non-Saudi Workers
With and Without Children
in the Chemical and Petrochemical Industries

Earnings Rank	Saudi (Mean)			non-Saudi (Mean)			Saudi/non-Saudi	
	With	Without	Ratio	With	Without	Ratio	With	Without
10 th Percentile	5935	3769	1.57	3042	1653	1.84	1.95	1.24
50 th Percentile	8835	5813	1.52	4677	3321	1.41	1.89	1.24
90 th Percentile	14060	7703	1.83	6240	4413	1.41	2.25	1.23
Aggregate Mean	9832	5747	1.71	4656	3297	1.41	2.11	1.23
C.V.	0.28	0.40		0.28	0.36			

without children is calculated as 1.41, in favour of workers with children. The last two columns provide monthly earnings ratios between Saudi and non-Saudi workers, both with and without children. From this table, the aggregate earnings ratio of Saudi workers with children to their counterparts among non-Saudis is calculated at 2.11, for Saudi workers, whilst the aggregate earnings ratio of Saudi to non-Saudi among workers without children is 1.23 in favour of Saudi workers.

We now turn to look at the percentile ranks for the earnings gap between workers with and without children in the chemical and petrochemical industries. These measures also reveal earnings differences between the two groups of workers across the three percentile levels. In the 10th percentile, Saudi workers with children earn more than their fellow citizens without children; the earnings ratio in this percentile is 1.57 compared to their Saudi colleagues without children. In the median percentile (50%) the earnings ratio between the two groups is 1.52 for the Saudi with children, while those in the 90th percentile have earnings ratio of 1.83 for the Saudi workers with children. The monthly earnings ratio of non-Saudi having children to those without children in the lower percentile (10%) is calculated as 1.84. Among workers in the median and the upper percentiles, the earnings ratio between them is 1.41 for non-Saudis with children. Moreover, regardless whether or not they have children, non-Saudi workers earn less than Saudi workers across all the income percentiles. The coefficient of variation shows

that workers with children have a low variation in earnings in comparison to non-children workers for both Saudis and non-Saudis.

4.3.3 Earnings gap by human capital

i) Earnings gap by education and training

Education and training are the main factors which can augment the human capital of a worker throughout his/her life cycle in the labour market. They influence the individual workers' occupation and specific job status within it. The human capital literature shows that education and training have significant impact on workers' productivity. Becker (1975) pointed out that the productivity of employees depends not only on their ability and the investment in them, but also on their motivation, which depends on earnings that catalyse workers' ambition to increase their productivity. Therefore, earnings in the context of human capital are viewed as a return on the human capital that individuals accumulate in the labour market (Mincer, 1974). Therefore, the worker with higher educational qualifications earns a higher wage than those with less education (Mincer, 1993; Becker, 1975). Mincer (1993) showed positive effects of job training on workers' wage growth, particularly at younger ages. He also argued that there is a correlation between schooling and human capital investments as individuals with more schooling are induced to continue with longer investments in the labour market. Thus, training complements education, but without suitable schooling, training becomes inefficient because it cannot stand as an alternative to education. Goldin (1990) discussed earnings distribution between female and male in the USA. She argued that a 50% increase in the male-female earnings differential from 0.40 to 0.60 over the period 1890 to 1970 was due to the difference in education and work experience between males and females. Quinlan (2000) found that the pay gap between men and women in Canada tends to narrow as the level of education increases.

Table (4-7) presents the distribution of workers' monthly earnings of the respondents in the chemical and petrochemical industries by educational background and training characteristics. It shows higher average monthly earnings

for both Saudis and non-Saudis with higher educational qualifications. However, Saudi workers earn significantly more than non-Saudi workers with the same qualifications. For workers with primary qualifications, the monthly earnings of Saudis are more than three times the monthly earnings of their non-Saudi counterparts. For workers with intermediate qualifications, the ratio of the average monthly earnings of Saudis to the average monthly earnings of non-Saudis is 2.49, to the advantage of Saudi workers. For the other qualifications, this ratio is as follows: university: 2.46, secondary: 1.83, and technical: 1.99, in favour of Saudi workers.

Moreover, distribution of the cross-sectional earnings across percentile measures provides further evidence on the earnings differentials between Saudi and non-Saudi workers across educational qualifications. As seen on this table, earnings distribution among workers in the 50th percentile reveals that the earnings ratio between Saudi to non-Saudi workers with primary educational qualifications is 3.55 for Saudi workers, which is the highest earnings ratio across the educational qualification and percentile ranks. Among the lower and upper income percentile of workers with primary education qualifications, the earnings ratio between Saudis and non-Saudis is 2.58 and 3.36 in the two percentiles, respectively. The table shows that the monthly earnings ratios of the two groups of workers with intermediate qualifications range between 2.02 and 2.63 across the three percentile ranks. For Saudi and non-Saudi workers with secondary, technical and university qualifications, their earnings ratio ranges from 1.64 to 2.37 across the three income percentiles. From this table, it may be seen that the coefficients of variation (C.V.) across educational qualifications reveal that Saudi workers have higher earnings variation than their non-Saudi counterparts in the chemical and petrochemical industries. For example, this measure shows that earnings distribution among Saudi workers varies between 0.24 and 0.36 across educational qualifications, compared to the low variation rate of between 0.22 and 0.28 for the earnings of their non-Saudi counterparts across qualifications. The table shows the impact of training on the earnings gap among workers in the chosen industries. As shown on this table, Saudi workers who spent a period of training during the last three years of the survey have an opportunity to earn more than their fellow citizens who have

not this characteristic, as the earnings ratio between the groups is 1.49 for the trained Saudi workers, while the training earnings gap ratio between trained Saudi and non-Saudi is calculated at 1.97 for Saudi workers. On the other hand, the earnings ratio of the trained non-Saudi workers to the untrained non-Saudi workers is calculated at 1.16 for the trained non-Saudi workers. The percentiles ranks reveal the influence of training on the earnings differences between the trained Saudi and non-Saudi with rates between 1.56 and 2.26 in favour of Saudi workers across the three percentiles, while the earnings gap between trained and untrained Saudi workers across the three percentiles indicate a earnings ratios of 1.28 and 1.74 for the trained workers. Moreover, the percentiles reveal earnings gap between trained and untrained non-Saudi workers at ratios between 1.06 and 1.59 in favour of the trained workers.

Table 4-7
Earnings Distribution of Saudi and Non-Saudi by
Educational Qualifications

Qualification	Mean Earnings			Percentile Ratio (Saudi/non-Saudi)			C.V	
	Saudi	Non-Saudi	Ratio	10th	50th	90th	Saudi	Non-Saudi
Primary	5834	1785	3.27	2.58	3.55	3.36	0.34	0.22
Intermediate	6231	2502	2.49	2.02	2.63	2.59	0.30	0.23
Secondary	6873	3762	1.83	1.64	1.85	1.78	0.32	0.28
Technical	7643	3835	1.99	1.77	2.31	1.95	0.24	0.28
University	11775	4795	2.46	1.91	2.37	2.86	0.36	0.26
Trained	8675	4410	1.97	1.56	1.80	2.26	0.45	0.30
Not Trained	5804	3802	1.53	1.94	1.61	1.38	0.32	0.38
Trained /Not Trained Saudi			1.49	1.28	1.31	1.74		
Trained/Not Trained Non-Saudi			1.16	1.59	1.17	1.06		

ii) Earnings gap by experience

The theory of wage determination associates a worker's experience with his/her age profile. It considers age as a proxy for work experience, which explains workers' earnings profile (Mincer, 1974; Quinlan, 2002). The respondent workers in the chemical and petrochemical industries have reported their actual work

experience duration as between one year and 37 years, as shown in Table (4-8). This table reveals a substantial difference in labour market life cycle earnings between the two groups of workers with coefficient of variations (C.V) calculated between 0.28 and 0.42 for Saudi workers and between 0.16 and 0.30 for non-Saudi workers. It shows that most Saudi workers have less than 13 experience years in the labour market, while many non-Saudi workers have considerably longer experience of up to 29 years.

This table also presents the influence of work experience on earnings of these workers in the chemical and petrochemical industries. It shows that Saudi workers in general earn more than their non-Saudi counterparts, as the mean monthly earnings ratio of the two groups is between 1.85 and 3.67 in favour of Saudi workers in different experience categories. Moreover, the distribution of experience and earnings across the three percentiles indicates that Saudi workers are still recording earnings advantages over their non-Saudi counterparts. From this table, it may be seen that Saudis who have work experience of between 21 and 29 years earn more than their non-Saudi counterparts with the same experience. The earnings gap between the two groups of workers in this experience bracket reveal substantial earnings ratios, calculated to be between 1.84 and 6.91 in the 10th percentile, 1.84 and 2.87 in the 50th percentile, and 2.65 – 3.09 in the upper percentile in favour of Saudi workers across the three percentiles. Clearly, these findings suggest that the work experience of the non-Saudi workers is not adequately compensated in the chemical and petrochemical industries.

Turning to the influence of experience and education on the workers' earnings, Table (4-9) illustrates this relationship among Saudi workers, while Table (4-10) shows distribution of educational and experience earnings among non-Saudi workers. As shown on these tables, workers with lower educational qualifications and long experience have relatively higher earnings in comparison to workers with higher educational qualifications and few years of experience. For example, Table (4-9) shows that Saudi workers who have university education but less than 5 years of experience are paid less than their fellow citizens with secondary education qualifications but around 13 years of experience.

**Table 4-8
Earnings - Experience ratios of saudi and non-Saudi Workers**

Experience Years	Number		Mean Earnings				Percentile Ratio (Saudi/non-			C.V	
	Saudi	nonSaudi (Number)	Saudi	non-Saudi	Ratio	10th Percentile	50th Percentile	90th Percentile	Saudi	non-saudi	
1 less than 5	56	7	5357	2894	1.85	1.84	2.30		0.33	0.16	
5 less than 9	67	38	6637	2969	2.24	1.98	1.99		0.29	0.20	
9 less than 13	62	63	8378	3266	2.57	3.76	2.32		0.28	0.25	
13 less than 17	19	84	10220	3804	2.69	3.00	2.59		0.34	0.25	
17 less than 21	13	45	11136	4708	2.37	1.87	2.08		0.30	0.19	
21 less than 25	9	42	15315	4551	3.37	4.34	2.87		0.33	0.28	
25 less than 29	2	25	18673	5093	3.67	6.91	3.42		0.37	0.30	
29 less than 33	3	16	15868	6405	2.48	2.58	1.84		0.42	0.18	
33 less than 37	0	9	0	6946	0.00					0.28	

Table 4-9

**Educational -Experience Earnings of Saudi Workers in the Chemical and Petrochemical Industries
(Respondent Workers)**

Experience Years	1 <5	5 <9	9 <13	13 <17	17 <21	21 <25	25 <29	29 <33	33 <37
Primary	3431	5098	5993	6634	8017			11997	
Intermediate	4193	5798	6914	8584	10657				
Secondary	4884	6954	8046	8322	9176	12406			
Technical	6384	6630	9290	9074					
University	7314	9752	11210	14284	14608	18900			
Aggregate Mean	5357	6637	8378	10220	11136	15315		15868	
C.V	0.33	0.29	0.28	0.34	0.30	0.033		0.42	

Table 4-10
Earnings -Experience of non-Saudi Workers in the Chemical and Petrochemical Industries by Educational Qualifications
(Respondent Workers)

Experience Years	1 <5	5 <9	9 <13	13 <17	17 <21	21 <25	25 <29	29 <33	33 <37
Primary			1448	1657	1760	2003	2173		
Intermediate		1840	2190	2245	0	2847			
Secondary		2532	3016	3414	4074	4290	4936	5670	6130
Technical		2477	3200	3518	4286	4776	5293		
University	2664	3379	3886	4566	5232	5532	6142	6810	7522
Aggregate Mean	2894	2969	3266	3804	4708	4551	509	6405	6946
C.V	0.16	0.20	0.25	0.25	0.19	0.28	0.30	0.18	0.28

On the other hand, the Tables show that, for both Saudi and non-Saudi workers, earnings increase with the level of education within any particular experience group, or earnings increase with experience within any particular educational group. Therefore, both educational qualifications and work experience seem to be important factors in determining workers' pay in Saudi Arabia. Nevertheless, given a worker's experience and educational qualification, a Saudi worker is paid a significantly higher wage than a non-Saudi worker with the same experience and qualifications, as the tables reveal. For example, for workers with primary education and between 17 and 21 years of experience, a Saudi worker is paid 4.56 times the wage of a non-Saudi worker, whilst for workers with university education and the same years of experience, a Saudi earns 2.79 times the wage of a non-Saudi.

4.3.4 Earnings gap by occupational status

Workers augment their skills by education and training to engage in certain occupations in the labour market. The human capital literature considers occupation as a composite of skills acquired in schooling and on-the-job training. It focuses on occupational earnings differentials among different worker groups (Mincer, 1974, Steinman, 1999; Goldin, 2002; Bauer and Zimmerman, 1998; Borjas, 2002). The dissimilarity index or discrimination index is usually used to measure the degree of occupational differences among workers across occupations. It can be calculated as (Dolado *et al*, 2000; Wootton, 1997) in Equation (28):

$$D.I = 1/2 (\sum |X_{si} - Y_{ni}|) \quad (28)$$

where: X_{si} is the percentage of Saudi workers in the occupational category (i), and Y_{ni} is the percentage of the non-Saudi workers in the same occupational category (i). The index value varies between 0 and 100 and is taken to mean the percentage one group has to change occupation for employment distribution among both groups to be identical. Thus, a value of 0 means that the two groups of workers are identically distributed across the occupations and no one from either group needs to change occupation, whilst a value of 100 means that the distribution of occupations between the two groups is completely unequal and half of the workers from both groups need to change occupations to make the distribution equal.

Considering the influence of the occupational differences on wage determination, Hayforn (1997) contended that the occupational dissimilarity between immigrants and the native Norwegian workers leads to a wage gap of 79.6%, while the inter-occupational dissimilarity index between these workers causes a wage gap of 17.1%. He argues that either the natives or the migrants or a combination of both have to shift their jobs at this rate to reach identical occupational distribution.

The cross-sectional occupational data among workers in the chemical and petrochemical industries, as reported in Table (4-11), reveal clear differences in the distribution of Saudi and non-Saudi workers across the seven occupations that include managerial, professional, clerical, salespeople, foremen, and crafts-workers. It reports that Saudi workers are fairly concentrated in the white-collar jobs, especially in the managerial and clerical occupations. This table shows that they account for about 67% of the Saudi respondents, while their non-Saudi counterparts in these occupations represent about 29% of the non-Saudi respondents. As was elaborated in the previous chapter, the Saudisation policies of the 1980s and the 1990s restricted recruitment for these occupations to Saudi nationals. On the other hand, non-Saudi workers in the professional, production, and technical occupations account for 58% of total non-Saudi respondents, while Saudis in these occupations make up about 25% of total Saudi respondents. The occupational dissimilarity index for the two groups of workers is calculated to be around 40%, suggesting that about 40% of either Saudi or non-Saudi workers, or a combination of both, have to shift their jobs for the occupational distribution among them to be identical. Table (4-12) presents percentile earnings distribution by occupation and education. It reveals similar educational and occupational effects on workers' earnings in the selected industries. For example, among the lower 10th percentile of workers, the average inter-educational group difference in earnings is SR 882 whilst the average inter-occupational group difference in earnings is SR 886. The average inter-educational group difference in earnings among workers in the median percentile is SR 1158, which counts a ratio of 1.31 to those in the 10th percentile, which indicates a higher influence of educational status on the earnings inequality among workers in the two percentiles. This table

Table 4-11**Occupational Dissimilarity among Saudi and Non-Saudi**

Occupation	Saudi (Xi)	Non-Saudi (Yi)	$\Sigma = (Xi - Yi)$	Absolute Value
Professionals	8.7	23.7	-15.1	15.05
Managers	27.7	15.8	11.9	11.90
Clerks	39.0	13.7	25.3	25.28
Salesmen	8.2	5.2	3.1	3.06
Foremen	3.9	7.3	-3.4	3.40
Technician	1.7	14.0	-12.3	12.25
Craftsmen	10.8	20.4	-9.5	9.54
Total	231	329	-98.0	80.48
	100%	100%		
Difference Index $= 1/2(\Sigma xi - Yi)$			49.0	40.24

shows that the inter-occupational group difference in earnings among 50th percentile is SR 1123. This reflects a small difference for the inter-occupational earnings distribution among workers in the lower and median percentile with a ratio of 1.27, which indicates a minor influence of the occupational status on earnings inequality among workers in the Saudi labour market.

Considering the influence of the occupational status associated with education on earnings between Saudi and non-Saudi workers, Tables (4-13) and (4-14) present the percentile earnings distribution by education and occupation for the two groups of workers. From Table (413), it can be seen that the occupational status has influence on earnings inequality among Saudi workers rather than the inter-educational earnings distribution in the lower percentile. The average inter-educational group difference earnings among Saudi workers in the lower 10th percentile is SR 1074, while the average inter-occupational difference earnings for these workers in this percentile is SR 2724 with a difference ratio of 2.53. However, the average inter-educational group difference in earnings among Saudi workers in the 50th percentile is SR1417, while that for the inter-occupational

Table 4-12
Occupational - Educational Earnings Distribution of
Saudi and Non-Saudi Workers
in the Chemical and Petrochemical

Occupation	10% Percentile					
	Primary	Interm	Second	Technical	University	
Managerial		5278	4326	5024	4423	
Professional			3101	5292	3368	
Clerical	2738	3504	3205	3106	3294	
Salesmen	1659	2309	4321	3402	3494	
Foremen	4081	2815	3308	3046	2286	
Technicians		1813	3211	2406	2959	
Craftsmen	1434	1867	2304	2927		
Inter-educational differences in earnings among						
10th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Techncl	Universty	Total
Managerial		0	952	698	601	750
Professional		0	0	2119	1924	2057
Clerical		766	299	99	188	338
Salesmen		650	2012	919	92	918
Foremen		1266	493	262	760	695
Technicians		0	1398	805	553	919
Craftsmen		433	437	623	0	497
Average						882
Inter-occupational differences in earnings among						
10th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Technical	University	Average
Managerial						
Professional	0	0	1225	268	1055	
Clerical	0	0	104	2186	74	
Salesmen	1079	1195	1116	296	200	
Foremen	2422	506	1013	356	1208	
Technicians	0	1002	97	640	673	
Craftsmen	1434	54	907	521	0	
Total	1645	689	744	711	642	886

Continue/Table 4-12

Occupation	50% Percentile					
	Primary	Interm	Second	Techncl	Universty	
Managerial		7537	6438	8585	7332	
Professional			7659	8535	4858	
Clerical	6224	5914	5793	4067	3780	
Salesmen	6015	4350	6896	4534	4560	
Foremen	5401	3120	4125	4609	4135	
Technicians		3813	3723	3285	4354	
Craftsmen	2406	2753	3598	3842		
Inter-educational differences in earnings among						
50th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Techncl	Universty	Total
Managerial		0	1099	2147	1253	1500
Professional		0	0	876	3677	2277
Clerical		310	121	1726	287	611
Salesmen		1665	2546	2362	26	1650
Foremen		2281	1005	484	474	1061
Technicians		0	90	438	1069	532
Craftsmen		347	845	244		479
Average						1158
Inter-occupational differences in earnings among						
50th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Techncl	Universty	Average
Managerial						
Professional	0	0	1221	50	2474	
Clerical	0	0	1866	4468	1074	
Salesmen	209	1564	1103	467	780	
Foremen	614	1230	2771	75	425	
Technicians	0	693	402	1324	219	
Craftsmen	2406	1060	125	557	0	
Total	1076	1137	1248	1157	995	1123

group is SR 3067, which indicates the influence of the occupational status on earnings of Saudi workers. Table (4-14) shows the occupational earnings distribution of non-Saudi workers associated with their educational qualifications. The table reveals that the inter-educational group difference in earnings among

these workers in the lower 10th percentile is SR 662, which is closer to the average inter-educational group earnings of their colleagues in the 50th percentile, but lower than the inter-occupational group difference in earnings among workers in the lower 10th percentile, which is SR 1253. This table shows that non-Saudi workers in the 50th percentile have an average inter-occupational difference in earnings of SR 1558, which confirms the influence of the occupational status on the earnings distribution among non-Saudi as in the case of earnings distribution among Saudi workers.

Considering the influence of the occupational distribution on the earnings between the two groups of workers across the seven occupations, Table (4-15) reveals substantial earnings differentials between these workers expressed by the mean monthly earnings ratio of Saudi to non-Saudi in the different occupations. In the managerial jobs, the ratio is calculated at 2.02 in advantage of Saudi workers, which is the highest level across occupational earnings of the two groups of workers. In the technical jobs the earnings ratio is calculated at 1.41 for Saudi workers, which is the lowest level across occupational earnings of the two groups of workers. This table shows that the earnings ratio between the two workers in the professional jobs is 1.69 for Saudi workers. The table shows that both Saudi workers in salesmen and foremen occupations have similar earnings ratios, calculated as 1.79 of earnings of their non-Saudi in these jobs, whilst the earnings gap ratio between the two groups of workers in craftsmen occupations is 1.89 for Saudi workers. Moreover, the earnings inequality between the two groups of workers is also evident across all the percentile ranks of workers, particularly among the following groups of workers: high-income earners working in the managerial and salesmen occupations, and low-income earners working in the craftsmen occupation.

Table 4-13

**Occupational - Educational Earnings Distribution of
Saudi Workers
in the Chemical and Petrochemical**

Occupation	10% Percentile					
	Primary	Interm	Second	Technical	University	
Managerial		5278	5493	8485	7637	
Professional			7104	5292	5714	
Clerical	2738	3528	4095	5961		
Salesmen	6015	4110	4304	4460		
Foremen	4082			6827		
Technicians						
Craftsmen	3594		4026			
Inter-educational differences in earnings among 10th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Technical	University	Total
Managerial		0	215	2992	848	1352
Professional		0	0	1812	422	1117
Clerical		790	567	1866	0	1074
Salesmen		1905	194	156	0	752
Foremen		0	0	0	0	0
Technicians		0	0	0	0	0
Craftsmen		0	0	0	0	0
Average						1074
Inter-occupational differences in earnings among 10th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Technical	University	Average
Managerial						
Professional	0	0	1611	3193	1923	
Clerical	0	0	3009	669	5714	
Salesmen	3277	582	209	1501	0	
Foremen	1933	4110	0	2367	0	
Technicians	0	0	0	6827	0	
Craftsmen	3594	0	0	0	0	
Total	2935	2346	1610	2911	3819	2724

Continue/Table 4-13

Occupation	50% Percentile					
	Primary	Interm	Second	Techncl	Universty	
Managerial		6659	6659	8585	1139	
Professional			8214	8535	7334	
Clerical	6224	6047	6634	8214		
Salesmen	6430	4590	7334	5133		
Foremen	5401			7116		
Technicians						
Craftmen	5137		4036			
Inter-educational differences in earnings among 50th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Techncl	Universty	Total
Managerial		0	878	1926	2784	1863
Professional		0	0	321	1201	761
Clerical		177	587	1580	0	781
Salesmen		1840	2744	2201	0	2262
Foremen		0	0	0	0	0
Technicians		0	0	0	0	0
Craftmen		0	0	0	0	0
Average						1417
Inter-occupational differences in earnings among 50th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Techncl	Universty	Average
Managerial						
Professional	0	0	1555	50	4035	
Clerical	6224	6047	1580	321	0	
Salesmen	206	1457	700	3081	0	
Foremen	1029	0	7334	1983	0	
Technicians	0	0	0	0	0	
Craftsmen	5137	0	4036	0	0	
Total	3149	3752	3041	1359	4035	3067

Table 4-14
Occupational - Educational Earnings Distribution of
Non-Saudi Workers
in the Chemical and Petrochemical

Occupation	10% Percentile					
	Primary	Interm	Second	Technical	University	
Managerial		5278		5024	4211	
Professional					3330	
Clerical		2180	2645	2990	3285	
Salesmen				3371	3493	
Foremen			3308	2711	2286	
Technicians			3211	2399	2959	
Craftsmen	1391	1867	2245	2927		
Inter-educational differences in earnings among						
10th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Technical	University	Total
Managerial		0	0	0	813	813
Professional		0	0	0	0	0
Clerical		0	0	345	295	320
Salesmen		0	0	933	122	528
Foremen		0	0	597	425	511
Technicians		0	0	812	560	686
Craftsmen		476	378	682	2927	1116
Average						662
Inter-occupational differences in earnings among						
10th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Technical	University	Average
Managerial						
Professional	0	0	0	0	881	
Clerical	0	0	2645	2990	45	
Salesmen	0	2180	1659	381	208	
Foremen	0	0	996	660	1207	
Technicians	0	0	97	312	673	
Craftsmen	1391	1867	966	528	0	
Total	1391	2024	1273	974	603	1253

Continue/Table4-14

Occupation	50% Percentile					
	Primary	Interm	Second	Technical	University	
Managerial				6934	5431	
Professional					4656	
Clerical		2189	3780	3528	3775	
Salesmen				4180	4437	
Foremen			4023	3610	4135	
Technicians			3262	3261	4354	
Craftsmen	1710	2519	3448	3842		
Inter-educational differences in earnings among 50th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Technical	University	Total
Managerial		0	0	0	1503	1503
Professional		0	0	0	0	0
Clerical		0	1591	252	247	697
Salesmen		0	0	0	257	257
Foremen		0	0	413	525	469
Technicians		0	0	1	1093	547
Craftsmen		809	0	394	0	602
Average						679
Inter-occupational differences in earnings among 50th percentile of workers(in Absolute Values)						
Occupation	Primary	Interm	Second	Technical	University	Average
Managerial						
Professional	0	0	0	0	775	
Clerical	0	2189	3780	3528	881	
Salesmen	0	0	0	652	662	
Foremen	0	0	4023	570	302	
Technicians	0	0	761	349	219	
Craftsmen	1710	0	186	581	0	
Total	1710	2189	2188	1136	568	1558

Table 4-15
Occupational Earnings Distribution of Saudi and non-Saudi Workers
in the Chemical and Petrochemical Industries

Occupation	Average Earnings			Percentile Ranks (Saudi)			Percentile Ranks (non-Saudi)			Percentile ratio (Saudi/non-Saudi)		
	Saudi	NonSaudi	Ratio	10th	50th	90th	10th	50th	90th	10th	50th	90th
Managerial	11339	5600	2.02	6438	10985	18165	4245	5397	7327	0.66	0.49	0.40
Professional	7865	4652	1.69	5324	8078	10078	3307	4653	6099	0.62	0.58	0.61
Clerical	6525	3892	1.68	3998	6544	8611	2882	3642	5398	0.72	0.56	0.63
Salesmen	7369	4124	1.79	4287	6846	14013	2179	4181	5703	0.51	0.61	0.41
Technicians	5244	3711	1.41	4588	5287		2435	3446	5103	0.53	0.65	0.00
Foremen	7008	3921	1.79	3425	7104	8603	2663	3840	5365	0.78	0.54	0.62
Craftmen	5261	2788	1.89	3611	5049		1474	2673	4272	0.41	0.53	0.00

4.3.5 Earnings gap by worked hours

Work hours are another factor that is suggested to be associated with earnings differentials in Saudi Arabia. The standard theory of labour supply postulates that an increase in the hourly wage rate has two opposite effects on the hours that a worker supplies to the labour market: an income effect which reduces working hours and a substitution effect which increases working hours. Consequently, the relationship between worked hours and earnings is generally unambiguous and the matter can only be settled empirically. Moreover, different groups of workers may respond differently to a rise in the wage rate. Pencavel (1997) found that in the USA a 10% increase in real wages has induced a 2.3% increase in the annual work hours of white men and a 2.6% increase in the annual work hours of black men. This suggests the existence of a wage differential between the two groups of workers, as the black workers have to provide more working hours than their white counterpart workers to get the same earnings as these workers.

Moreover, the relationship between work hours and earnings varies by age, education and marital status, as is revealed by Pencavel (1997). He found that working hours among women tend to rise with age, but level off when they reach their fifties, while wages rise with age generally. He argued that both wages and working hours tend to rise with years of schooling. He showed that married women worked more hours and also earned higher hourly wages than unmarried women.

Table (4-16) reports working hours in the chemical and petrochemical industries in Saudi Arabia for both Saudi and non-Saudi workers. It presents the average monthly earnings associated with weekly working hours, age, and marital status for the two groups of workers. This table shows that the respondent Saudi workers provide weekly working hours between 45 and 53, while their non-Saudi counterparts provide weekly working hours between 45 and 60. It reveals that Saudi workers have a higher hourly wage rate than non-Saudi workers. For example, among workers who worked for 45-48 hours per week, the monthly earnings ratio of Saudi workers to non-Saudi workers is calculated at 1.85 for Saudi workers, whilst among workers who worked between 50-53 hours per week, the Saudis earn 1.97 times the hourly wage rate for the non-Saudis. Thus, it seems

that the wage differential between Saudis and non-Saudis is even more significant among workers who worked for longer hours. Moreover, regardless of nationality, workers who worked for longer hours (50-60 per week) received a lower hourly wage rate than workers who worked for shorter hours (45-48 per week).

We now turn to examining the influences of the demographic variables that include age and marital status on earnings associated with working hours. The table shows that earnings of Saudis who provide between 45-53 hours per week increased with age, except for a minor fall for those in the age bracket between 35-39. On the other hand, non-Saudi workers who provide the same weekly working hours have similar earnings-age profiles. Therefore, we can conclude that the monthly earnings of both Saudis and non-Saudis rise with their age. Nevertheless, earnings inequality still existed between the two groups of workers across ages and through different working-hour categories. For example, Saudi workers in the age group of 20-24 years and who provide between 45-48 hours earn about 2.19 times the amounts received by the non-Saudi workers in the same working-hour and age groups, whilst among workers who were between 20-24 years old and who worked for 50-53 hours a week, Saudis on average earned 2.13 times the amount received by non-Saudis.

A further demographic aspect is that regarding marital status, which is also illustrated in Table (4-16). It is clear that the average earnings were substantially higher for married workers than unmarried workers. For example, the average monthly earnings of married Saudis were 1.7 (for the 45-48 working hour group) and 1.49 (for the 50-53 group) times that of the unmarried Saudis, whilst the earnings of the married non-Saudis were 1.39 and 1.45 times that of the unmarried non-Saudis. Again, regardless of the marital status, the wage differential between Saudis and non-Saudis is apparent.

Table4-16
Distribution of Weekly Worked Hours Earnings by Age,
Martial Status and Education
for Saudi and non-Saudi

Worked Hours	Saudi		Non-Saudi			Ratios	
	45-48	50-53	45-48	50-53	60 >	45-48	50-53
Mean Earnings	8234	6055	4451	3078	3659	1.85	1.97
Age Group							
15-19	3214	3111				0.00	
20-24	5488	5126	2509	2407	1847	2.19	2.13
25-29	7148	6581	3161	2377	2583	2.26	2.77
30-34	9689	8586	3791	3143	3415	2.56	2.73
35-39	11905	8536	4549	3427	3716	2.62	2.49
40-44	13295		5174	3606	4299	2.57	0.00
45-49	17160		5689	6911	5392	3.02	0.00
50-54			6677		7695	0.00	
Martial Status							
Married	10000	7806	4723	3778	4061	2.12	2.07
Un-married	5879	5253	3393	2604	2806	1.73	2.02
Married/Unmarri ed	1.70	1.49	1.39	1.45	1.45		

4.3.6 Fringe benefits and earnings gap

The fringe or non-pecuniary benefits are used synonymously in this research to mean non-wage benefits of the workplace that exist in the chemical and petrochemical industries. Such benefits typically include health care services, insurance and pension coverage and paid leave. The non-wage pay represents an important part of the compensation package that is usually considered at wage negotiations. These benefits usually contribute to the segmentation of positions at the workplace into good ones with better fringe benefits and working conditions and bad ones with poor fringe benefits and poor working conditions.

The fringe benefits also contribute to wage differentials between different groups of workers. Many empirical researches have attempted to quantify the non-wage benefits (examples include Pierce, 1999 and Campbell, 2001). Pierce (1999) found that some fringe benefits such as paid leave, pensions, and health insurance increase the dispersion of compensation among the lower half of the wage distribution among workers, while pension alone increases the dispersion in the upper half of the distribution.

In Saudi Arabia, the regulated non-wage benefits do not apply equally to all the workers. For example, sick paid leave may apply to some workers but not to others (Barsalou, 1985). The interviewed workers in the chemical and petrochemical industries were asked about their satisfaction or dissatisfaction with fringe benefits in their workplace, including the promotion system, paid leave (for annual vacation), and access to the health services provided by the employer and how they evaluate job security. It should be pointed out that the evaluation of job satisfaction and its different components is a subjective matter, which, according to many economists, is beyond the purview of economic analysis (Hamermesh, 1999). Nevertheless, many economists still discussed the relationship between job satisfaction and work returns (see Hamermesh, 1977 and 1999; Clark *et al.*, 1996; Vanin, 2001; Grund and Sliwka, 2001; among others). Table (4-17) presents the distribution of satisfaction attitudes of Saudi and non-Saudi workers towards fringe benefits in the chemical and petrochemical industries. It reveals that most of the Saudi workers are satisfied with their workplace fringe benefits, but the ratio of the dissatisfied Saudi workers with the promotion and job security are appeared as high as 72.6% and 39% for the two benefits, respectively, despite applications of the Saudisation policy that encourages employment of Saudi workers, particularly in the private firms. On the other hand, the table shows that most of the non-Saudi workers are dissatisfied with their current job fringe benefits with the exception of paid leave, which makes 78% of these workers satisfied regarding their annual paid vacations.

Table (4-18) reports the monthly earnings of satisfied and dissatisfied Saudi and non-Saudi workers. It indicates large earnings differences between the two groups of workers across the selected fringe benefits. It shows that the satisfied Saudi workers have better earnings than their non-Saudi counterparts, as the average monthly earnings ratio between the two groups of workers was 1.94 in favour of Saudi workers. Even Saudi workers dissatisfied with their current job fringe benefits earn more than both satisfied and dissatisfied non-Saudis with earnings ratios of 1.94 and 1.74 in favour of Saudi workers in the two cases, respectively.

Table 4-17

**Distribution of Satisfied and Dissatisfied
Saudi and Non-Saudi Workers Relating to the Fringe Benefits**

Fringe Benefits	Saudi (%)			Non-Saudi (%)		
	Satisfied	Dissatisfied	Missing	Satisfied	Dissatisfied	Missing
Paid leave	72.3	27.7	-	78.1	21.1	0.8
Mobility	99.6	0.4	-	27.6	73.4	-
Insurance	94.4	5.6	-	-	73.6	26.4
Health Services	76.6	23.4	-	30.7	67.8	1.5
Job Security	60.6	39.4	-	30.1	69	0.9
Promotion	26.8	72.7	0.4	14	85.4	0.6

Table 4-18

**Fringe Benefits Ratio of Satisfied and Dissatisfied
Saudi and Non-Saudi Workers**

Fringes	Mean earnings (Satisfied)			Mean earnings (Dissatisfied)		
	Saudi	Non-Saudi	Ratio*	Saudi	Non-Saudi	Ratio*
Paid Leave	8179	4206	1.94	7187	3758	1.91
Job security	7949	4299	1.85	7836	4041	1.94
Mobility	7836	4430	1.77	0	3984	0.91**
Health Services	7694	3735	2.06	8594	4289	2.00
Promotion	9296	4752	1.96	7405	4022	1.84
Insurance	8094	0	0.00	0	4212	0.00
Job Satisfaction	8547	4397	1.94	6567	3770	1.74

* Saudi/non-Saudi

** non-Saudi (Difficulty to move/ Easy to move)

4.4 CONCLUSION

The previous sections discuss the descriptive analysis of the cross-sectional data on earnings that were collected among workers in the chemical and petrochemical industries in the three main cities of Saudi Arabia: Riyadh, Jeddah, and Dammam. The survey was conducted due to lack of adequate data and to the administrative restrictions on access to the households surveys that are run by the Central Department of Statistics in the country. The analysis covered various variables that related to demographic, human capital, and workplace characteristics of these workers. It used simple statistical measures that revealed proportional earnings gaps between the two groups of workers, and ranks such differentials across three percentiles of 10th lower, 50th middle, and upper 90th. The results of the descriptive analysis revealed substantial percentage differences in the average monthly earnings between the two groups of workers and in favour of Saudi workers across the variables of the three categories of characteristics: demographic, human capital, and workplace, and across the three percentiles. The demographic characteristics comprise age, marital status, and presence of children in the worker's family. The three variables have their influences on the earnings inequality between the two groups of workers with significant proportions. The human capital components include educational qualifications, training courses, and work experience; these variables impact on the earnings of workers in these industries. For example, training reveals its effects on the earnings gap in favour of both trained Saudi and non-Saudi in comparison to the untrained workers of the respective group. On the other hand, workplace characteristics indicate their influences on the earnings gap between the two groups of workers. Such characteristics cover mainly non-wage benefits of the workplace and comprise paid leave, promotion, job security, health services, injury risk insurance, and mobility. The impacts of these characteristics were analysed by examining the workers' job satisfaction with these characteristics. It is found that the Saudi workers enjoyed more job satisfaction than their non-Saudi counterparts on top of the earnings rates.

CHAPTER FIVE:
EMPIRICAL ANALYSIS OF THE STRUCTURE OF EMPLOYEES'
COMPENSATION IN THE CHEMICAL AND PETROCHEMICAL
INDUSTRIES IN SAUDI ARABIA

5.1 INTRODUCTION

Existing studies on the labour market in Saudi Arabia reveal a general lack of research on wage determination in that country. The present study has managed to identify a single report that was issued by the Riyadh Chamber of Commerce in 1995 about wage distribution among workers in the private and public sectors. It considers occupation, education, and experience as the main factors of wage distribution between workers in the two sectors. It has only recorded and compared absolute figures of wage levels, years of experience, and qualifications of employees in the private and public sectors. However, the report does not provide any statistical measure to explain the wage differentials or to decompose the sources of the earnings inequality between workers in the two sectors. Nor does it provide adequate conclusions on wage inequality between workers in the two sectors.

Chapters Three and Four of the current study have depicted the structure of the Saudi labour market in general and discussed various factors that relate to the pay and working conditions in the chemical and petrochemical industries in particular. These factors reflect the main characteristics of this labour market; such characteristics comprise government regulations and policies that cause segmentation of the labour market, labour participation, training and education among Saudi workers, and labour supply of the foreign workers in the country. Chapter Four provides a *prima facie* analysis of the cross-sectional data collected among workers in the chemical and petrochemical industries. This analysis is based on some descriptive statistical measures that showed the existence of an earnings inequality between the two groups of workers in favour of Saudi workers.

The cross-sectional data revealed the influence of potential supply-side determinants on earnings in these industries.

This chapter goes further to undertake a more systematic and rigorous empirical analysis of the wage structure of Saudi and non-Saudi workers in the chemical and petrochemical industries using the cross-sectional data. It presents the econometric analysis of the determination of wages for both the Saudi and non-Saudi workers and the decomposition techniques that are adopted in this study to reveal the extent of wage discrimination. From the discussion in the previous chapters, it is clear that Saudi workers gain superior benefits in the labour market over their non-Saudi counterparts. Saudi workers in the chemical and petrochemical industries generally enjoy the following privileges over their non-Saudi counterparts: higher earnings, better working conditions, and permanent jobs. These aspects all contribute to the wage differential and wage discrimination in these industries. As is discussed earlier, conceptually, a number of categories of factors can help to explain the occurrence of the wage differentials. These factors include i) human capital factors, such as workers' educational qualifications, on-the-job training, and work experience; ii) demographic factors, specifically workers' age, marital status and presence of children in the family; iii) workplace conditions that comprise occupational status, promotion, pension and work risk injuries, health services, and mobility in the labour market. In this chapter, wage discrimination mainly indicates a proportion of wage differential that, after controlling the explanatory variables, is still unexplained. Such unexplained portion of the wage differential between Saudi and non-Saudi workers measures how much the non-Saudi group is penalised because they are being paid lower than the other group of workers in the chemical and petrochemical industries.

To set up the analysis and decomposition of the wage structure of Saudi and non-Saudi workers in these industries, a number of stages are involved:

- 1) Specification of the econometric models of the wage determination for both Saudi and non-Saudi workers. This requires identification of the key explanatory variables for wage determination, and the source of data that are used to measure these variables.

- 2) Preliminary analysis of the data and econometric tests. The focus of this stage is on the investigation of a number of econometric issues such as multicollinearity and heteroskedasticity that usually arise in the context of cross-sectional data sets.
- 3) Estimation of the earnings equations for Saudi and non-Saudi workers. The third step is related to estimation of the earnings equations and verification of the assumptions of the impact of the personal and workplace characteristics of the Saudi and non-Saudi workers on their monthly earnings. In addition, this stage discusses the possible explanation of the wage differentials between Saudi and non-Saudi workers.
- 4) Application of the decomposition technique. At this stage, the study considers the empirical estimates of the wage differentials between Saudi and non-Saudi workers in order to apply the decomposition technique based on the Oaxaca-Blinder model to identify the extent of wage discrimination in the chemical and petrochemical industries between the two groups of workers in the Saudi labour market.

5.2 SPECIFICATION OF THE EARNINGS EQUATION

This section presents the specification of the empirical wage equation that is based on the standard earnings function proposed by Mincer in 1974 (Willis, 1986). The equation estimates the natural logarithmic monthly earnings for Saudi and non-Saudi workers in the chemical and petrochemical industries.

The earnings equation is specified in Equation (29) as:

$$\ln(W_i) = a_0 + \sum_{i=1}^n x_i B_i + u_i \quad (29)$$

where the dependent variable, $\ln(W_i)$, is the natural logarithmic monthly earnings of individual workers; x_i ($i = 1, \dots, n$) represent the explanatory variables, and the coefficient vector B_i measures the marginal effects of the above factors on the workers' earnings. The earnings cover all forms of compensation that are reported by the responding workers in the chemical and petrochemical industries. More specifically, these compensations include the basic monthly wage, transport allowance, housing allowance calculated on a monthly basis, bonuses calculated on

a monthly basis, travelling ticket(s) allowance for non-Saudi workers calculated on a monthly basis, and monthly pension and job injury risks premiums paid to the (GOSI) for Saudi workers. The pension premium is calculated at a premium of 8% of the basic salary, while the job injury risk premium paid to both Saudi and non-Saudi workers is calculated at a premium of 2% of their base salary. These premiums are paid by the employer so they are regarded as part of the monthly earnings of these workers. However, the compensation components differ between workers and not all workers receive all these privileges. The explanatory variables comprise the following:

- Human capital factors, i.e., educational qualifications, training, and actual experience expressed in years. The educational variable is a dummy variable indicating a worker's highest qualification, which is classified into: university qualification; academic secondary school qualifications referred to as secondary education; technical secondary qualification referred to as technical education, and intermediate qualification, while the excluded educational qualification is the primary educational level. Training is also a dummy variable indicating the class training a worker attained for a short period of more than one month during the previous three years before the data collection point, with a value of 1 if the worker had received training and 0 otherwise.
- Demographic variables, i.e., a worker's nationality, which is a dummy variable (= 1 if the worker is Saudi and 0 if non-Saudi), the worker's age, marital status (= 1 if the worker is married and 0 otherwise), and children (= 1 if the worker has children and 0 otherwise).
- Workplace characteristics comprising occupational status include managerial jobs, professional jobs, clerical and salesmen occupations, and craftsmen. In this study, the occupational status is a dummy variable that classifies the first five occupations as high-ranking posts compared with "craftsmen" which is regarded as the alternative category. In addition, this category includes some non-pecuniary benefits, which mainly comprise health services, job security, work-injury risk insurance, promotion, mobility in the labour market, and paid leave. These variables are dummy variables, which indicate whether the worker is satisfied or not satisfied with these working conditions, with 1 if the

worker is satisfied and 0 if not satisfied. The mobility variable is also a dummy variable indicating 1 if the worker can move in the labour market without objection of the employer, and 0 otherwise.

The data for all the variables are obtained from the cross-sectional survey of a sample of workers in the chemical and petrochemical industries, as described in Chapter Four. The variables used for the regression analysis are discussed in detail below.

5.3 VARIABLES OF THE STUDY

As is discussed above, the variables are grouped into three broad categories: human capital, demographics, and workplace characteristics. Table (5-1) presents a complete list of the variables used for the study.

5.31 Human Capital Factors

Education and training are the main components of human capital that a worker can accumulate to influence his/her payment compensation in the labour market. Mincer (1974) argued that spending on any form of human capital, i.e., education, on-the-job training, and health, tends to augment an individual's earnings capacity. Thus, such spending should be viewed as investments. The standard theory of human capital considers earnings as a return value on education and training that a worker has accumulated over his/her life cycle. In addition, the theory assumes that work experience has an influence on the workers' earnings profile. Therefore, the theory postulates that personal differences in human capital characteristics among workers largely account for wage differentials among these workers (Mincer, 1993). Many studies have confirmed a positive influence of the human capital components on the wage differentials among workers with different skills (Oaxaca, 1973; Blinder, 1973; Dixon, 2001; among others). In this study, the descriptive analysis in Chapter Four indicates positive effects of education on the wage distribution among workers in the chemical and petrochemical industries (see Table (4-7)). This table shows that educated workers have higher earnings across the percentile ranks. Moreover, Table (4-8) shows a substantial influence of work experience on the workers' earnings in these industries. Therefore, this provides an evidence to estimate the effects of human capital factors on earnings distribution

among workers in the chemical and petrochemical industries, and to examine their contribution to wage inequality between Saudi and non-Saudi workers in these industries.

5.3.2 Demographic Factors

The demographic variables usually include age, marital status, and the presence of children. The descriptive analysis in Chapter Four indicates a positive influence of age on the earnings distribution among workers in the chemical and petrochemical industries. But the test of collinearity (presented below) shows that this variable causes severe multi-collinearity, and thus it has to be dropped from the estimated Equation (29). Therefore, the study will focus on the other two variables, i.e., marital status and children.

i) Marital Status

Most of the empirical research on wage determination has considered the influence of a marriage premium on wage differentials between married and unmarried workers in the labour market (Oaxaca, 1973; Korenman and Neumark, 1991; Mumford and Smith, 2001; among others). In this study, analysis of the influence of marital status on earnings distribution will focus on males, who are the main breadwinner in the chemical and petrochemical industries. Since employment of women in the manufacturing sector in Saudi Arabia is almost non-existent, especially in the chemical and petrochemical industries, there is no need to examine the marriage premium among female workers. The absence of female workers from the manufacturing sectors is largely due to social and cultural attitudes.

The descriptive analysis in Chapter Four reveals a positive influence of marital status on wage distribution between married and unmarried workers in these industries. It confirms the influences of this variable on both Saudi and non-Saudi workers, and between the two groups (see Table 4-5). Therefore, it is assumed that estimates of this variable would provide evidence of its influences on the earnings of workers in the chemical and petrochemical industries in Saudi Arabia, as it is confirmed in other countries.

Table 5-1
Variable of the Study

Variable	Description
$W_{s,N}$	The monthly compensation for a Saudi (w_s) and a non-Saudi (w_n) worker. It includes: basic pay, transportation allowance, housing allowance, travelling allowance, pension premium at 8%, injury risks insurance premium at 2 % of the basic pay and bonus. All these variables are on a monthly basis
Nationality	It is dummy variable with Saudi = 1, and non-Saudi = 0.
Education	It expresses workers' educational qualification as the following dummy variables: intermediate = 1, otherwise = 0; secondary = 1, otherwise = 0; technical = 1, otherwise = 0; and university =1, otherwise = 0; with primary education as the base variable.
Training	The training courses for a period longer than a month during the last three years before the data collection. Trained workers = 1 and otherwise = 0.
Work Experience	Indicates the actual number of working years the worker had spent in the labour market. They comprise work years inside and outside Saudi Arabia.
Marital Status	A dummy variable: if married=1; otherwise = 0
Occupation	It is represented by dummy variables : managers=1, otherwise=0; clerks=1, otherwise=0; salesmen=1, otherwise=0; and technician=1, otherwise=0, with craftsmen as the base variable.
Children	It is a dummy variable: workers with children =1 and without children=0
Work Conditions	This variable comprises different non-pecuniary components, which include: health services: Having access =1, otherwise=0; injury insurance: satisfaction =1, dissatisfaction = 0; mobility in the labour market: possibility to move=1, otherwise=0; job security: satisfaction =1, dissatisfaction= 0 ; paid leave: satisfaction =1, dissatisfaction=0; promotion: worker have a chance for promotion=1, otherwise=0.

ii) Children (Dependents)

Existing studies of labour market issues have examined the impact of children who are less than 18 years old on the family and the mother's earnings in developed countries. In developing countries, children as dependents might include all family members who are not working, even those above 18 years of age. In most of these countries, as in Saudi Arabia, working family member(s), particularly the eldest, are responsible for the non-working members, including non-working adults, especially among unmarried females. This indicates a significant influence of custom and tradition within the extended family. Chapter Four shows the impact of children on the wage structure of the workers in the chosen industries in Saudi Arabia (see Table 4-6). It reveals that workers with children earn more than their colleagues without children, especially among Saudi workers. This provides evidence to estimate the influences of this variable on the earnings distribution among workers in the chemical and petrochemical industries.

5.3.3 Workplace Characteristics

The literature on wage determination attributes some sources of the wage inequality to the differences in workplace characteristics. Empirical studies in this area discussed some of these characteristics, which include firm size, hours of work, unionism, part-time and full-time contracts, industry, and occupational status (Oaxaca, 1973; Preston, 1999; Drolet, 2002). Moreover, Pirece (1999) adds paid leave of various types, pensions and savings plans, and health insurance. Mumford and Smith (2001) controlled other workplace variables that comprised many traditional variables as well as grievance procedures, rewards for seniority, workplace teams, workplace circles, difficulty in hiring, and union recognition. Many of these variables are potential candidates in this research, but the most applicable to the chemical and petrochemicals industries include:

i) Occupational Status

This variable is mainly a proxy for human capital, specifically, the education and training that a worker has gained. The worker's occupational status improves over his/her life cycle in the labour market due to influences of his/her human capital characteristics, particularly on-the-job training and experience. It

might be expected that there could be collinearity between the occupational status variables and the human capital variables. However, association between these characteristics reveals low inter-correlation indications. As seen on Table (presented below 5-5), the correlation coefficients of these variables range between -0.24 and 0.45.

So, occupational distribution in the workplace has an influence on workers' wage determination. From a practical point of view, empirical studies usually examine the impact of occupational segregation on wage differentials among workers, particularly on the basis of gender. It is argued that the wage differential mainly exists due to differences in occupations that are caused by differences in skills needed by a specific occupation (Tachibanaki, 1998). However, both human capital components and occupational characteristics are considered important determinants of earnings in the labour market. Vartianien (2002) confirmed the impact of both variables on the gender gap in the Finnish labour market. She found that the estimated effect of education on gender wage differentials is different with and without controlling the occupational variable. She found that the impact of education on the gender earnings gap, without controlling for occupation, is calculated at 1.35% for males, and it decreased to 0.97% when controlling for occupation, which influences the gender earnings gap by 5.22%. Preston (1999) discussed the gender earnings differential in the public and private sectors in Australia. He first estimated the impact of human capital on earnings without occupation, and found that the effect of the human capital variable is calculated at 4% of the gender earnings difference in the private sector, while it accounts for 12% of the difference in the gender wage gap in the public sector. When the occupational characteristics are controlled in the model, the impact of the human capital in the private sector remain the same, and the occupation variable provides women 4.69% more earnings than males in the private sector, and 2.87% for males in the public sector, while the impact of human capital decreased to 0.54% for males in this sector.

However, many researchers attempted to examine and estimate the impact of the occupational status on the wage differentials in the labour market (Brown *et al.*, 1980; Blau and Khan, 2000; Dixon, 2000; among others). It is argued that

high-status occupations, especially those in the public sector, are highly valued and competed for in Saudi Arabia (Al-Khouli, 1985; Woodward, 1988). Therefore, it is expected that occupational status would have an influence on wage determination in the chemical and petrochemical industries. Table (4-15) presents simple statistical indicators of the impact of occupational distribution on the wage structure among workers in these industries. It shows that the higher occupational positions provide workers with higher earnings, particularly those in managerial and professional jobs. This may be confined to the assumption that job characteristics have influences as explanatory variables on the wage differentials in the labour market (Dixon, 2000). This research covers six categories of occupations, including managerial, professional, clerical, sales, technical, and foremen jobs, with the craftsmen as the base occupation for the estimates.

ii) Mobility in the Labour Market

Free movement of labour in the marketplace is a fundamental feature of a competitive market economy. This movement is usually induced by international or inter-regional or inter-sectoral differences in wages and employment opportunities and the workers' ability to match their skills and expertise with the labour market's needs. But a worker may be restricted in his/her movement within the labour market to seek alternative jobs. Under monopsony, which means a single buyer of goods or services (the monopolist), the supply curve should be elastic. Then the monopsonist firm in the market can buy as much as it needs at the current price (Robinson, 1961). In the labour market, the buyer is the employer and the worker is the seller of his/her labour services (Boal and Ransom, 2002). The literature has examined some typical cases of the monopsony phenomenon, such as the reserve clause in the sport of baseball. The clause restricts the player's ability to negotiate with another team, while the owner's choices at the end of the contract are wide. Accordingly, the employer can renew, sell or terminate the contract unilaterally (Scully, 1974). On the contrary, the player's choices are more limited. Therefore, the monopsony influences the player's earnings. Scully argues that the reserve clause reduces the player's salaries below his/her marginal revenue product (MRP).

In Saudi Arabia, the personal contract is the basis for recruiting foreign workers. This contract ties the worker to the employer, as the worker cannot move to another employer unless he or she gets a release from his current employer. This restriction is imposed by the residency regulations that govern the foreign workers in the labour market. These regulations give the employer the right to deport the worker instead of releasing him, and the employer has the right to prevent the employee from returning to work in the country over the two consequent years of deportation. In contrast, a Saudi worker in this sector can move freely in the labour market to match his/her opportunity on cancellation of the existing contract. It is obvious that the personal contract has an influence on the earnings of workers, particularly those who suffer from the refusal to negotiate with another employer and have to stay with the monopsonist employer. So, this is assumed to affect earnings of the workers in the chemical and petrochemical industries. Mincer (1993) argued that mobility responds to perceived gains in wages, and it promotes individual wage growth in the labour market. In keeping with the literature, this study also attempts to examine the effects of mobility in the labour market on the earnings of these workers. In this research, the mobility variable indicates the possibility for the worker to change his employer.

iii) Health Services

Several researchers discussed various aspects of the non-wage or fringe benefits that influence wage determination in the labour market. Some of these researchers paid attention to health insurance and its effects on the worker's participation in employment in the labour market (Kalb, 1998; Hamermesh, 1999; Edwards, 2002). In addition, the literature assumed that there is some relationship between wage distribution and access to health services. Dustmann and Windmijer (1999) confirm that individuals with low wages suffer from poorer health conditions, while those with higher permanent wages have a better health profile. They argued that health services affect longevity and generate benefits from improving the workers' productivity; therefore, many governments across the world intervene to improve healthcare services. In Saudi Arabia, the health services system consists of two forms: the occupational health services and the general health services. The former services are restricted to work-related injuries

and diseases. Expenses of this form of health service are covered by the employer in the form of charges of 2% of the worker's monthly salary paid to the General Organization for Social Insurance (GOSI). The general health services are provided by either the public or private health care institutions. The public health care services are only available to Saudi households, whereas non-Saudi workers are denied access to such services except for those working in the public sector or being employed as housemaids, family drivers, and house servants. The employers in the private sector should provide their employees with health services operated by the private health care institutions. Saudi workers in this sector have the right to benefit from the employers' health services, as well as that provided by the public sector. The health services that are provided by the employer may be extended to cover the worker and his/her family or they may be restricted to cover only the worker, and for certain types of health care. It is obvious that healthcare as a non-wage benefit should have an influence on the workers' earnings, as workers who are satisfied with the health services provided by the employer are expected to have better wages than those who are dissatisfied with such services. It is expected that workers' satisfaction with health services that are provided by the employer would explain a portion of the wage differentials between workers in the chemical and petrochemical industries.

iv) Paid Leave

Paid leave as a non-wage benefit has received a close examination in some recent works. These works argued that the low-income groups have little paid leave, little flexibility in work, and little support for dependent care in comparison to higher income groups (Lettau and Buchmeller, 1999; Naples, 2001; Heymann *et al.*, 2002; Watkins, 2004). Limited paid leave may have a negative impact on the worker's earnings. Pierce (1999) attributed the increase in compensation inequality between workers in the USA in the 1980s to the decline in health insurance coverage and the falling costs of paid leave. He contended that this comprised various sorts of paid leave that included paid vacation time, holidays, sick leave, and other categories. In Saudi Arabia, workers do not enjoy the benefits of paid leave on equal terms in either the private or the public sectors. Chapter Three shows how regulations differentiate between Saudi and non-Saudi workers

regarding paid leave privileges. Firms in the private sector may offer little paid vacation to their employees and distinguish between them to access the regulated vacations (Barsalu, 1985). The prevalence of the unequal distribution of paid leave in the Saudi labour market as manifested in various labour laws and revealed by the cross-sectional data (Table 4-18) spurs this research to examine its impact as a non-wage benefit on wage determination in the chemical and petrochemical industries

v) Job Security

Job security is usually associated with employment protection and work stability. It encourages workers to advance in their human capital accumulation in the labour market through improving their work skills and upgrading their productivity (Holzer and Lalonde, 1998; Cazes and Nesporova, 2003). However, it is known that changes in job security have negative impacts on the workers' welfare, as the job loser may spend a long time unemployed, which, in turn, makes a worker suffer earnings losses (Steward, 2002). This research is motivated by job satisfaction measures to estimate the effects on earnings of the workers' satisfaction with the characteristics of their job security in the chemical and petrochemical industries. As the descriptive analysis of the cross-sectional data in Chapter Four shows, workers' satisfaction with the characteristics of their jobs reveals both positive and negative effects on wage inequality. Therefore, these aspects provide evidence to decompose the influences of this variable on the wage differentials between Saudi and non-Saudi workers in these industries.

vi) Other Workplace Characteristics

In addition to the above workplace characteristics, this research covers promotion or advancement in the workplace that indicates the workers' seniority in the ladder of the occupational structure. Moreover, job advancement provides the worker an opportunity to improve his/her earnings. In this research, the promotion characteristic is a dummy variable that indicates whether or not the worker has a chance for advancement in his/her career.

Furthermore, pension and injury risk compensations are considered as the main sort of social security in the private sector. These compensations are paid by the GOSI, as is mentioned elsewhere in this study. It is known that GOSI pays for

permanent pensions for Saudi workers and injury risks compensation for both Saudi and non-Saudi workers. It is assumed that workers' satisfaction with the injury risks and occupational diseases compensations have an influence on the earnings of workers in the chemical and petrochemical industries, particularly among those who face occupational diseases.

Having discussed the general specification of the earnings equation and the variables that are used in the regression analysis, this chapter now turns to examining a number of technical issues that confront the empirical investigation.

5.4 TESTING MULTI-COLLINEARITY

As the number of explanatory variables in the current study is large, the data of the study is tested for multi-collinearity, which means the existence of a perfect or exact linear relationship among some or all explanatory variables of the regression equation. Under the presence of multi-collinearity, the regression model has difficulty telling which explanatory variable(s) is/are influencing the dependent variable (Koop, 2000), as the interpretation of the standard regression equation depends on the assumption that the explanatory variables are not strongly linearly correlated. Economists contend that there is no decisive method of detecting or measuring the degree of multi-collinearity. Rather, there are a number of rules of thumb for detecting this phenomenon (Gujarati, 1988; Koutsoyiannis, 1987). The main rules of thumb include:

1 – High R^2 (greater than 0.8) with small t -ratios and the F test usually rejects the hypothesis that the slope coefficients are equal to zero (Gujarati, 1988).

2- Testing statistical significance of R^2 with the observed F^* as follows:

$$F^* = \frac{(R^2_{x_i, x_1 x_2 \dots x_k}) / (k - 1)}{(1 - R^2_{x_i, x_1 x_2 \dots x_k}) / (n - k)} \quad (30)$$

Where $R^2_{x_i, x_1 \dots x_k}$ is the multiple correlation coefficient among the explanatory variables, n = the size of the sample and k = the number of explanatory variables. The hypothesis being tested is:

$$H_0 : R^2_{x_i, x_1 x_2 \dots x_k} = 0 \quad (31)$$

and the alternative hypothesis is

$$H_1 : R^2_{x_1 \cdot x_2 \dots x_k} \neq 0 \quad (32)$$

The observed F^* value is compared with the tabulated $F_{0.05}$ with $v_1 = (k-1)$ and $v_2 = (n-k)$ degrees of freedom. If $F^* > F_{0.05}$, then we reject the null hypothesis, that is, the variable x_i is correlated with the other explanatory variables. If $F^* < F_{0.05}$, then we accept that the variable x_i is not multi-collinear.

3- The variance inflation factor (VIF) is another rule for detecting multi-collinearity. It should be noted that the variance of the OLS estimator for a typical regression coefficient (β_i) can be shown to be the following (Wooldridge, 2000):

$$\text{Var}(\hat{\beta}_i) = \frac{\sigma^2}{S_{ii}(1-R_i^2)} \quad (33)$$

where σ^2 is the variance of the residual term; $S_{ij} = \sum_{j=1}^n (X_{ij} - \bar{X}_i)^2$; and R_i^2 is the unadjusted measure of the goodness of fit when X_i is regressed against the constant term and all the remaining explanatory variables. In the absence of multi-collinearity, R_i^2 becomes zero and the variance of OLS estimator becomes $\text{Var}(\hat{\beta}_i) = \frac{\sigma^2}{S_{ii}}$. On the basis of the two variances, it is straightforward to obtain the variance inflation factor for the i th variable as:

$$\text{VIF}_i = \frac{1}{1-R_i^2} \quad (34)$$

Thus, the larger the VIF becomes, the stronger the indication of multi-collinearity. It is suggested that a VIF exceeding 10 is a sign that multi-collinearity may cause a problem (Chatterjee and Price, 1977).

4 – Tolerance Factor: it is the amount of variability of the selected independent variable not explained by the other independent variables. It is the inverse of the VIF and is calculated as:

$$\text{Tolerance} = 1-R_i^2 = \frac{1}{\text{VIF}} \quad (35)$$

Small values of tolerance (close to zero) indicate significant problems with multi-collinearity.

5 – Condition Index: It is a simple function of the eigenvalues of the matrix $X'X$. It is calculated as:

$$\text{Condition Index (CI)} = \sqrt{\frac{\text{Maximum Eigenvalue } s}{\text{Minimum Eigenvalue } s}} \quad (36)$$

It is suggested that if (CI) is between 10 and 30, there is moderate multi-collinearity, but if it exceeds 30, there is severe multi-collinearity (Gujarati, 1988).

6 – Variable Proportion: The variable proportion might be interpreted as the proportion of variance of coefficient β_i that is attributed to the collinearity associated with the eigenvalue level. A high variance proportion with a small eigenvalue indicates serious linear dependency among the explanatory variables.

However, none of these criteria by itself is considered a satisfactory measure of multi-collinearity. Therefore, in assessing the multi-collinearity of the variables in this research, a combination of these rules is applied by using SPSS (Statistical Package for Social Sciences). Table (5-2) displays the OLS estimation of Equation (29) by using the cross-sectional data for the controlled data of the responding workers in the chemical and petrochemical industries. Estimates of this equation indicate that the observed F^* is calculated at 232.8, while the tabulated F value at the 5% level of significance with $v_1 = 23$ and $v_2 = 532$ is 1.52. This indicates that $F^* > F_{0.05}$ and we accept that some explanatory variables are causing multi-collinearity for the estimated variables of Equation (29).

Further evidence of the existence of multi-collinearity is shown by the high value of R^2 and the t -ratios for some coefficients that are insignificant. The estimates of the cross-sectional data reveal low levels of standards errors, but this does not indicate insignificant multi-collinearity of these estimates, because large standards errors do not always appear, even in functions in which the regressors are strongly multi-collinear (Koutsoyiannis, 1987).

Table (5-3) presents additional statistical measures of multi-collinearity that include the variance inflation factor (VIF), condition index (CI), and variance proportion associated with eigenvalues. On this Table, the condition index lies between 1 and 67.8, which suggests the presence of severe multi-collinearity.

Table 5-2
Estimates of Earnings Equation for All Workers
in Chemical and Petrochemical Industries

Variables	Coefficient (B)	Std. Error	t	Collinearity	
				Tolerance	VIF
(Constan	6.7900	0.110	63.670		
National	0.9310	0.030	33.580	0.228	4.380
Marital	0.0219	0.030	0.690	0.181	5.532
Children	-0.0146	0.030	-0.460	0.181	5.538
Manager	0.0980	0.030	2.910	0.228	4.385
Salesmen	0.0602	0.030	1.790	0.625	1.600
Professionals	0.0502	0.030	1.550	0.282	3.540
Clerks	0.0973	0.030	3.830	0.360	2.778
Technicians	0.0655	0.030	2.120	0.547	1.828
Foremen	0.0916	0.030	2.660	0.647	1.547
Intermediate	0.0091	0.000	3.770	0.181	5.529
Secondary	0.1180	0.030	4.010	0.532	1.879
Technical	0.2880	0.030	10.520	0.394	2.537
University	0.4130	0.030	13.260	0.319	3.130
Experience	0.4870	0.040	13.500	0.135	7.411
Training	-0.0135	0.020	-0.910	0.778	1.285
Mobility	0.0215	0.020	1.120	0.468	2.138
Paid Leave	0.0171	0.020	1.080	0.932	1.073
Injury Risks	0.0186	0.010	1.540	0.586	1.705
Health Services	-0.0138	0.020	-0.910	0.743	1.346
Job security	0.0148	0.010	1.050	0.869	1.151
Promotion	0.0194	0.020	1.110	0.898	1.114
Age	0.0279	0.000	13.680	0.146	6.828
Work hours	-0.0021	0.000	-1.100	0.717	1.395

Model	Sum of Squares	df	Mean Square	F
Regression	127.613	23	5.548	232.774
Residual	12.776	536	0.02384	
Total	140.389	559		

R	R ²	\bar{R}^2	Std.
0.959	0.919	0.915	0.1462

Table 5-3

Collinearity Diagnostics (First Test)

Dimension	Eigenvalue	Condition Index	(Constant)	National	Marital Status	Children	Manager	Salesmen	Professional	Clerks	Technicians	Foremen	Experience years	Intermediate	Secondary	Technical	University	Training	Mobility	Paid leave	Injury Risks	Health Services	Job Security	Promotion	Age	Work hours		
1	10.615	1.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.927	2.350	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1.637	2.550	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.05	0.02	0.00	0.00	0.00	0.04	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00
4	1.188	2.990	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.01	0.01	0.06	0.00	0.00	0.04	0.03	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
5	1.046	3.190	0.00	0.00	0.00	0.00	0.00	0.27	0.01	0.02	0.01	0.00	0.00	0.10	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
6	1.004	3.250	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.15	0.35	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.946	3.350	0.00	0.00	0.00	0.00	0.01	0.23	0.01	0.01	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.898	3.440	0.00	0.01	0.00	0.00	0.02	0.00	0.05	0.01	0.03	0.01	0.00	0.06	0.00	0.01	0.00	0.03	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.00
9	0.755	3.750	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.631	4.100	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.07	0.00	0.02	0.00	0.01	0.00	0.04	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.593	4.230	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.04	0.18	0.09	0.00	0.03	0.05	0.08	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.514	4.540	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.02	0.02	0.00	0.00	0.04	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.493	4.640	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.00	0.06	0.00	0.00	0.00	0.01	0.00	0.00	0.43	0.00	0.00	0.02	0.00	0.00	0.00	0.00
14	0.389	5.220	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.01	0.00	0.03	0.02	0.02	0.02	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.383	5.270	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.13	0.02	0.03	0.01	0.10	0.09	0.04	0.02	0.00	0.00	0.03	0.10	0.29	0.04	0.00	0.00	0.00	0.00	0.00
16	0.306	5.890	0.00	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.25	0.03	0.10	0.00	0.08	0.00	0.00	0.00	0.00	0.00
17	0.214	7.040	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.05	0.02	0.02	0.01	0.00	0.02	0.10	0.50	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
18	0.195	7.380	0.00	0.00	0.00	0.00	0.10	0.06	0.03	0.08	0.01	0.03	0.04	0.06	0.09	0.07	0.05	0.07	0.02	0.34	0.16	0.01	0.04	0.00	0.00	0.00	0.00	0.00
19	0.105	10.050	0.00	0.72	0.00	0.00	0.01	0.00	0.04	0.00	0.03	0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.59	0.00	0.16	0.05	0.04	0.00	0.00	0.00	0.00	0.00
20	0.075	11.910	0.01	0.01	0.00	0.01	0.27	0.13	0.30	0.25	0.24	0.19	0.05	0.00	0.00	0.00	0.03	0.08	0.01	0.08	0.00	0.07	0.01	0.00	0.00	0.00	0.00	0.01
21	0.040	16.290	0.01	0.11	0.10	0.13	0.42	0.17	0.34	0.20	0.14	0.11	0.03	0.28	0.33	0.44	0.55	0.06	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
22	0.035	17.390	0.00	0.03	0.85	0.80	0.05	0.01	0.04	0.01	0.01	0.01	0.01	0.02	0.05	0.06	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.008	37.500	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.73	0.05	0.13	0.11	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.002	67.820	0.98	0.05	0.00	0.00	0.03	0.03	0.03	0.10	0.01	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.10	0.00	0.00	0.88

It should be noted that the proposed measures of collinearity do not always give consistent indications for each variable. As a summary, Table (5-4) presents all the variables that have at least one indicator whose value is higher than the threshold levels as suggested by the literature.

As shown on this table, the age variable satisfies almost four measures of the collinearity test. However, it has a high condition index that exceeds the critical level, the variance proportion is high and associated with a small eigenvalue close to zero, and its tolerance factor is quite small. Thus, there is quite a strong indication of the existence of multi-collinearity between age and other explanatory variables. It is noted that age has a high correlation coefficient with the experience variable (see Table 5-5). Further investigation has also shown quite a significant multi-collinearity problem with the following variables: promotion, working hours, marital status, and children. The usual remedy for multi-collinearity is to drop the severely multi-collinear variable(s). When the age variable is dropped and Equation (29) is re-estimated, the new estimates reveal low collinearity values for the remaining variables in this table, with the exception of the weekly worked hours variable, which still has a high variance proportion, calculated at 0.96 with a low eigenvalue of 0.0025, and the CI for the variable is still high, at 63. These measures still exceed the suggested minimum level of collinearity. Therefore, the monthly earnings equation is re-estimated after dropping age and worked hours.

Table 5-4

Variable with High Multi-collinearity Factors

Variable	Tolerance Factor	VIF	Eigenvalue	Variance (Highest)	C.Index
Age	0.146	6.83	.0075	0.89	37.5
Experience	0.181	5.53	0.593	0.73	0.59
University	0.135	7.41	0.383	0.55	5.37
Working Hours	0.717	1.46	0.002	0.88	67.81
Children	0.181	5.53	1.19	0.80	2.99
Marital status	0.181	5.53	1.63	0.85	2.55
Promotion	0.898	1.11	0.035	0.59	17.4

Table (5-6) presents the new estimates with low multi-collinearity values in comparison to the suggested critical values. From this table, the VIF values fall between 5.53 and 1.11 across estimates, and the tolerance factor is between 0.18 and about 0.94 for these estimates, which suggests moderate collinearity. Moreover, the condition index is between 1 and 18.15, which lends further support to the suggestion of a moderate level of multi-collinearity. On the other hand, the variance proportion shows that the children and marital status variables have relatively high values of 0.89 and 0.84, respectively, but with relatively high eigenvalues of 1.84 and 1.62, and small condition indices at 2.19 and 2.33 for the two variables, respectively. The two variables are not regarded as showing significant collinearity problem; therefore, they will be included in the model, as they represent major demographic variables in the study and it is expected that they will have an influence on earnings of workers in the chosen industries, although the observed F^* is 182, (presented below Table 5-8) which is still greater than tabulated F (but lower than before).

Table 5-5

Correlation between the Collinear Variables*

Variable	Age	Experi- -ence	Unive- -rsity	Work Hours	Children	Marital	Promo- -tion
Age	1.00	0.85	0.43	-0.033	-0.15	-0.176	0.066
Experience	0.85	1.00	0.19	-0.001	-0.112	-0.131	0.063
University	0.43	0.19	1.00	-0.227	-0.141	-0.144	0.111
Work Hours	-0.033	-0.001	-0.227	1.00	0.19	0.027	-0.119
Children	-0.15	-0.112	-0.141	0.19	1.00	0.902	0.130
Marital Status	-0.176	-0.131	-0.144	0.027	0.902	1.00	0.107
Promotion	0.066	0.063	0.111	-0.119	0.130	0.107	1.00

- Based on descriptive data of estimates in Table (5-2)

5.5 HETEROSCEDASTICITY

The linear regression model for the observations (Equation 29) assumes that the random error terms (u_i) have a constant variance. This represents the assumption of homoscedasticity, which is expressed as

$$\text{Var}(u_i) = \sigma_u^2 \quad (37)$$

Table 5-6

Collinearity Diagnostics Dropping Age Variable (Second Test)

Dimension	Eigenvalue	Condition Index	(Constant)	National	Marital Status	Children	Manager	Salesmen	Professional	Clerks	Technician	Foremen	Experience years	Intermediate	Secondary	Technical	University	Training	Mobility	paid leave	Injury Risks	Health Services	JobSecurity	Promotion	
1	8.824	1.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.844	2.190	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1.623	2.330	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.05	0.03	0.00	0.00	0.00	0.05	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.01	
4	1.184	2.730	0.00	0.00	0.00	0.00	0.03	0.00	0.04	0.01	0.01	0.06	0.00	0.00	0.04	0.03	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.03	
5	1.045	2.910	0.00	0.00	0.00	0.00	0.00	0.27	0.01	0.02	0.02	0.00	0.00	0.10	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
6	1.004	2.970	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.15	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7	0.946	3.050	0.00	0.00	0.00	0.00	0.01	0.23	0.01	0.01	0.00	0.00	0.00	0.15	0.08	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.878	3.170	0.00	0.01	0.00	0.00	0.02	0.00	0.05	0.01	0.03	0.01	0.01	0.06	0.00	0.01	0.00	0.04	0.00	0.01	0.08	0.03	0.01	0.01	
9	0.751	3.430	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.04	0.61	
10	0.622	3.770	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.08	0.00	0.01	0.01	0.01	0.00	0.04	0.00	0.01	0.00	0.00	0.00	0.01	0.14	0.06	
11	0.593	3.860	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.04	0.18	0.09	0.00	0.03	0.05	0.08	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.12	
12	0.511	4.150	0.00	0.00	0.01	0.01	0.00	0.02	0.00	0.00	0.03	0.02	0.00	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.02	0.32	0.02	
13	0.484	4.270	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.01	0.00	0.05	0.06	0.00	0.01	0.32	0.00	0.03	0.00	0.00	0.26	0.09	
14	0.388	4.770	0.00	0.00	0.00	0.00	0.01	0.03	0.02	0.05	0.04	0.02	0.01	0.05	0.04	0.03	0.01	0.01	0.01	0.00	0.39	0.23	0.00	0.02	
15	0.380	4.820	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.11	0.01	0.02	0.03	0.09	0.09	0.04	0.02	0.00	0.00	0.00	0.08	0.28	0.05	0.01	
16	0.301	5.410	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.06	0.01	0.01	0.00	0.00	0.27	0.01	0.01	0.12	0.27	0.04	0.00	
17	0.204	6.570	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.01	0.01	0.23	0.00	0.00	0.00	0.00	0.02	0.06	0.67	0.02	0.00	0.07	0.00	
18	0.193	6.760	0.00	0.00	0.00	0.00	0.10	0.05	0.03	0.06	0.00	0.02	0.32	0.07	0.11	0.08	0.06	0.07	0.04	0.16	0.02	0.01	0.00	0.00	
19	0.105	9.170	0.00	0.75	0.00	0.00	0.01	0.00	0.04	0.00	0.03	0.02	0.03	0.01	0.00	0.00	0.01	0.02	0.59	0.00	0.16	0.05	0.04	0.00	
20	0.054	12.790	0.11	0.08	0.00	0.01	0.65	0.29	0.63	0.50	0.37	0.30	0.00	0.07	0.09	0.13	0.37	0.01	0.01	0.07	0.00	0.03	0.00	0.00	
21	0.036	15.550	0.03	0.00	0.84	0.89	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.05	0.03	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
22	0.027	18.150	0.86	0.09	0.11	0.05	0.09	0.02	0.05	0.01	0.00	0.00	0.28	0.21	0.32	0.39	0.45	0.18	0.00	0.03	0.00	0.04	0.01	0.00	
VIF				4.177	5.527	5.535	4.254	1.556	3.430	2.529	1.817	1.537	1.312	1.811	2.256	2.805	6.013	1.281	2.131	1.067	1.699	1.325	1.149	1.114	
Tolerance Factor				0.239	0.181	0.181	0.235	0.643	0.292	0.395	0.550	0.651	0.762	0.552	0.443	0.356	0.166	0.780	0.469	0.937	0.589	0.755	0.871	0.898	

This means that the variance of the error term (u_i) remains the same regardless of the values of the explanatory variables (X). In contrast, when the variance of (u_i) changes as (X) changes, this results in heteroscedasticity. Symbolically, this is expressed as:

$$\text{Var}(u_i) = \sigma_{u_i}^2 \quad (38)$$

where the subscript (i) signifies the fact that the individual variances may all be different. However, the form of heteroscedasticity depends on the form of the relationship between $\sigma_{u_i}^2$ and X_i . There are three main forms of heteroscedasticity: 1) monotonically rising form that exists when the variance of the u_i increases as X increases, 2) decreasing heteroscedasticity when the variance of u_i changes in the opposite direction as X , and 3) the variance of u_i decreases initially as X assumes higher values, and then increases with X . However, it is difficult to know the true form of heteroscedasticity as the u 's are not observable. In this study, because there are significant variations in the distribution of earnings and the explanatory variables among workers in the chemical and petrochemical industries, it is expected that the assumption of constant variance of the error term does not hold. Hence, the existence of heteroscedasticity is detected by using the White test as proposed by Halbert White (1980). This technique is based on the auxiliary regression approach where the residuals from the original regression are used to run a second regression that enables the test to be conducted. In this technique, the auxiliary equation is specified as:

$$e^2 = \gamma_0 + \sum_{i=1}^k \gamma_i X_i + \sum_{i=1}^k \beta_i X_i^2 + \sum_{i \neq j}^k \alpha_i X_i X_j \quad (39)$$

where e^2 is the residual squared from the original regression. Based on Equation (39), the White test is formulated as follows:

$$nR^2 \sim \chi_{k-1}^2 \quad (40)$$

where (n) is the sample size, and the R^2 is the unadjusted R^2 from the auxiliary regression model. The test is distributed as χ^2 (chi-square) with ($k-1$) degrees of freedom when (k) is the number of regressors included in the auxiliary specification. If the test statistic exceeds the critical χ^2 value, then this indicates the presence of heteroskedasticity. Following Pryce (2002), the White test is calculated

by using the SPSS software package. From the original OLS equation, the residual is calculated (Unstandardised Residual in SPSS) and used as the dependent variable; the independent variables age, work hours, and experience were squared up regardless of collinearity with the exclusion of the dummy variables (Equation 41), and all the original independent variables (age, work hours, and work experience) expressed as cross products in Equation (41):

$$e^2 = b_0 + b_1X_1^2 + b_2X_2^2 + b_3X_3^2 + b_4X_4 * X_5 + X_4 * X_6 + b_5X_5 * X_6 + b_6X_6 \quad (41)$$

On Table (5-7), multiplying $n = 559$ by $R^2 = 0.099$, the product is 55.34. Compared with $\chi^2 = 505$ with degrees of freedom = 559 at the 5% level of significance, the White test suggests that heteroscedasticity is not confirmed, as the value of (nR^2) is less than the tabulated χ^2 .

Table 5-7
White Test for Heteroscedasticity

	B	St .Error	T
(Constant)	0.0562	0.0110	5.1560
AGE2	0.0002	0.0000	2.4270
EXP2	0.0004	0.0000	4.0220
WHRS2	0.0000	0.0000	2.4900
AGEEXP	-0.0005	0.0000	-2.9270
AGEWRK	-0.0002	0.0000	-2.5760
EXPWRK	0.0002	0.0000	2.2180
R	R Square	Adjusted R Square	Std. Error
0.3290	0.1080	0.0990	0.0300

5.6 THE ESTIMATED EARNINGS EQUATIONS

The study first estimates the aggregate earnings function, Equation (29), for the full sample of Saudi and non-Saudi workers to examine the factors that influence the monthly earnings of workers in the chosen industries. Following the conventional approach to the examination of the impact of nationality on earnings, which is introduced as a dummy variable. Then, the earnings equation for Saudi

and non-Saudi workers is estimated separately. Comparable explanatory variables are used for the determination of the wage rate for both groups of workers. The estimated earnings equations for the two groups of workers are used in the final stage of the analysis to examine the sources of wage differentials and the extent of wage discrimination between the two groups of workers in the chosen industries.

5.6.1 Earnings Equation for the Aggregate Workforce

The conventional approach to the investigation of wage differentials is usually based on the estimation of an aggregate wage equation that incorporates a number of personal characteristic variables, such as nationality or ethnicity. Essentially, this approach regards the coefficients on the other explanatory variables as equal across different groups of workers (Oaxaca and Ransom, 1994). In such cases, economists estimate the wage equation using the full sample, controlling for the differences in characteristics of Saudi and non-Saudi workers with the assumption of wage equality between the two groups of workers (Neumark, 1988; Allanson, 1999; Knight and Sabot, 1995).

The purpose of estimating the aggregate wage equation in the current study is to calculate the influence of the controlled variables on the monthly earnings determination of workers in the chosen industries.

In this equation, B_i are assumed to be identical for both Saudi and non-Saudi workers. Table (5-8) reports the estimates of the earnings equation for the aggregate workforce. On this table, the first column shows the values of the estimated slope coefficients B_i on the workers' characteristics X_i . The coefficients are measured in percentage terms to interpret their percentage effects on the mean monthly earnings. The second column indicates the standard errors of the coefficients. The third column presents the t -statistics or t -ratios. The following sections discuss the empirical results for each of the determinant factors of the aggregate earnings.

Table 5-8
Re-estimates of the Monthly Earnings
Full Sample

Variable	Beta	Std. Error	T-Ratio
(Constant	7.164	0.040	178.189
National	0.877	0.031	27.898
Marital	0.009	0.037	0.235
Children	-0.006	0.037	-0.161
Manager	0.098	0.039	2.546
Salesmen	0.040	0.039	1.040
Professionals	0.030	0.037	0.808
Clerical Jobs	0.083	0.028	2.938
Technicians	0.042	0.036	1.174
Foremen	0.084	0.040	2.114
Intermediate	0.196	0.034	5.809
Secondary	0.413	0.030	13.780
Technical	0.547	0.034	15.987
University	0.702	0.038	18.619
Experience	0.038	0.001	27.763
Training	-0.004	0.017	-0.215
Mobility	0.037	0.022	1.659
Paid Leave	0.018	0.018	0.973
Injury Risks	0.013	0.014	0.958
Health Services	-0.011	0.017	-0.654
Job security	0.008	0.016	0.515
Promotion	0.021	0.020	1.025

Model	Sum of Squares	df	Mean Square	F
Regression	123.09	21	5.862	182.4
Residual	17.29	538	0.0321	
Total	140.389	559		
R	R ²	\bar{R}^2	Std.	
0.936	0.877	0.87	0.179	

i) Nationality

From the Table, it appears that nationality is a major determinant of earnings in the labour market in the selected Saudi industries, even after controlling for the influences of the other factors. As the estimated equation, Equation (29), confirms, being a Saudi provides the worker with a significant increase in his/her mean monthly earnings (compensation). This is because the coefficient of the ethnicity variable (B_i) is estimated to be 87.7% with a substantial t -ratio, which indicates a substantial positive effect of this variable on the earnings of Saudi workers over their non-Saudi counterparts. Therefore, nationality has an influence on the monthly earnings of the workers in the chosen industries, as those with Saudi nationality gain an advantage over their non-Saudi counterparts. This indicates the existence of discrimination in the labour market, because the variable is a non-income personal characteristic that is induced by labour regulations. As explained before, these regulations clearly instructed employers in both the private and public sectors to pay Saudi nationals higher wages than their non-Saudi counterparts and provide the former with various workplace privileges over the non-Saudi workers. Such policies segment the labour market in the country into distinct categories: one for Saudi workers with good working conditions and various benefits, and the other for non-Saudi workers with poor pay and poor working conditions. As shown on this table, significance measures reveal that the variable has a standard error of 0.031 and a t -ratio of 27.9; these measures confirm that the null hypothesis of no nationality effect is rejected at the 5% level of significance.

ii) Demographic Factors

The table shows the estimates for the main demographic variables that include marital status and the presence of children. It reveals that the estimated coefficient of marital status has a minor positive influence on the earnings of workers in the chosen industries. The value of coefficient is calculated at 0.9% with standard error of 0.037 and a t -ratio of 0.24. As the t -ratio has a marginal positive value, the result tends to support the null hypothesis of no marital status effect at the 5% level of significance. This may indicate that the married male workers, as the main breadwinners in the labour market in Saudi Arabia, should be

adequately compensated in order to support their families. But these workers in the chemical and petrochemical industries have a minimal marriage premium. This confirms conclusions in other empirical studies about the positive influence of marital status on the earnings of workers (Cornwell and Rupert, 1995; Mumford and Nicalou, 2001; Madalozzo, 2002; Chun and Lee, 2000; Ginther and Zavodny, 1998).

Insofar as the children variable is concerned, the table shows a negative influence of this variable on the monthly earnings of the respondent workers in the chemical and petrochemical industries. This means that workers with children have smaller monthly earnings than their colleagues without children. On this table, the coefficient of this variable is estimated at -0.06% with a standard error of 0.037 and a t -ratio of -0.161 . The negative t -ratio confirms the null hypothesis to reject the effect of the appearance of children at the 5% level of significance.

iii) Human Capital Factors

The standard theory of human capital postulates that worker's earnings are considered to be a return on the skills that he/she has accumulated over his/her life cycle. Mincer (1974 and 1993) argued that positive differences in schooling or in occupations that require different levels of schooling are the returns on investment in education. Besides, Weiss (1986) contended that firms have the technology to convert worker's time and human capital into products. Therefore, a worker should be compensated for his/her augmented human capital.

In this research, educational qualifications are classified into four categories, including intermediate, secondary, technical, and university qualifications. These qualifications are dummy variables from the base variable, primary education. On this table, the coefficients (B_i) denote the estimated average rates of return on the workers' investments in different educational qualifications in the chemical and petrochemical industries. These estimates confirm that workers with more advanced educational qualifications have higher earnings than their colleagues with primary qualifications. Moreover, the estimates confirm that the higher a worker's education, the higher his/her earnings. As shown on this table, the coefficient of university characteristics is estimated at 0.702, which indicates that these workers earn 70.2% above the earnings of their colleagues with base

educational qualifications. The coefficient has a standard error of 0.038 and a t -ratio of 18.62; these measures provide evidence of statistical significance of the university coefficient on earnings at the 5% level of significance. Meanwhile, those with technical qualifications earn 54.7% more than their colleagues with basic qualifications. The coefficient of technical education has a standard error of 0.034 and a t -ratio of 15.98; this result provides strong evidence of statistical significance to reject the null hypothesis of no technical education effect on earnings at the 5% level of significance. However, the influence of education on earnings of workers in the chosen industries decreases to 41.3% and 19.1% for those with secondary and intermediate qualifications, respectively. The standard errors of these coefficients are estimated at 0.03 and 0.034 with t -ratios of 13.78 and 5.81 for the secondary and intermediate coefficients, respectively. These results all suggest that the estimated effects from these variables are all significant at the 5% level of significance. The positive impact of education on the workers' earnings in the chosen industries is consistent with the assumption of the standard theory of human capital (Becker, 1971; Mincer, 1974).

Training is another form of human capital that has its effects on workers' earnings. The regression analysis of the cross-sectional data in this table indicates that training courses have a rather small influence on the workers' earnings. The value of the training coefficient is estimated to be -0.004 with a standard error of 0.017 and a t -ratio of -0.215. Therefore, this result supports the argument of true null hypothesis of no effect for training on earnings at the 5% level of significance. This result is not necessarily inconsistent with the theory of human capital, which suggests that if training is firm-specific, then the relationship between training and earnings is weak. Becker (1975) defines this kind of training as one that only increases the productivity of trainees within the firm, whilst it has no effect on the productivity of trainees working outside the firm. He assumed that in the case of firm-specific training, the wage that an employee could get elsewhere would be independent of the amount of training, and thus the wage paid by the firm would also be independent of training. Therefore, firms in these industries consider all kinds of training as specific training, and so workers who paid for their training

would lose the opportunity cost to be compensated for their investments in such training.

The experience variable is another component of human capital. In this research, the workers were asked to report the actual years of experience they had in the labour market. This table shows that the coefficient on work experience has a relatively significant positive influence on the worker's earnings, estimated at 0.033 with a standard error of 0.001 and a *t*-ratio of 27.04. These measures provide evidence that experience has a strongly positive, statistically significant effect on the aggregate monthly earnings in the chosen industries, at the 5% level of significance.

iv) Workplace Characteristics

Workplace characteristics reveal working conditions that have their influences on wage determination in the labour market. The personal contract system in the Saudi labour market, particularly in the private sector, allocates different working conditions among its workers. So, it is assumed that differences in work conditions have their influences on the workers' earnings in the chemical and petrochemical industries. The table reports the results for the impact on earnings of some work characteristics that include occupational status, possibility of movement within the labour market, job security, health services, paid leave, work injury insurance, and promotion. The results confirm that workers in managerial occupations are compensated more than their colleagues in the base occupation (craftsmen). This confirms the assumption of the influence of occupational status on the workers' wage determination even after controlling for the human capital factors in the chemical and petrochemical industries. For example, the "occupational premium" associated with the managerial jobs as compared with the base jobs is estimated to be about 10%, as the managerial coefficient has a value of 0.098 with a standard error of 0.039 and a *t*-ratio of 1.04. The results also reveal that workers in the technical occupations are rewarded at a level that is comparable with other types of professional occupations. Compared with the base jobs, the wage premiums for different types of occupations are: technical, 4.2% with a standard error of 0.036 and a *t*-ratio of 1.17; salesmen, 4% with a standard error of 0.039 and a *t*-ratio of 1.040; professionals, 3% with a

standard error of 0.036 and a t -ratio of 0.81. However, the statistical significance of the coefficients of occupational variables reveal low t -ratios, which might not support the argument to reject the null hypothesis suggested to deny the effect of the occupational variables at the 5% level of significance. This result may reflect the influence of education on occupational status that was shown on Tables (4-12 to 4-14) in Chapter Four, and that was supported by the theoretical argument that the occupational status variable reflects the component of schooling attained by the workers who invest in education in order to join a certain occupation (Rima, 1981), and reflects on-the-job training and experience due to the influences of seniority under the administrative structural labour market.

Concerning other workplace characteristics, the table shows that some of these characteristics have positive effects on the monthly earnings of workers in the chosen industries. These characteristics include paid leave, job risk insurance, job security, promotion, and the possibility of movement within the labour market. The slopes (B_i) of these variables produce positive values that fall between 0.008 and 0.037 with t -ratios ranging between 0.52 and 1.025. The standard errors of these coefficients reveal values between 0.014 and 0.022. However, as the t -ratios are very low, this suggests that the null hypothesis of no effect of these variables is accepted at the 5% level of significance. The table also shows that some other workplace characteristics have negative influences on the aggregate earnings. The coefficient of the health services that are provided by the employer is estimated to be -0.011 with a standard error of 0.017 and a t -ratio of -0.016 . Therefore, the negative impact of the variable on the aggregate monthly earnings in the chosen industries is statistically insignificant at the 5% level of significance. On the other hand, the mobility variable reveals a little influence on the monthly earnings of the workers in the chosen industries. Labour regulations completely bind non-Saudi workers to the employer, while giving the right to Saudi workers to move in the labour market rather freely. It is clear that workers who get a release from their employer can gain positively, as indicated by the positive value of the coefficient on mobility at 3.7% with a standard error of 0.022 and a t -ratio of 1.66. Therefore, the result tends to confirm the null hypothesis that the coefficient is statistically insignificant at the 5% level of significance.

5.6.2 Estimation of the Earnings Equation for Saudi Workers

This section discusses estimates of the earnings equation for Saudi workers based on the cross-sectional data collected in the chemical and petrochemical industries. The equation is expressed as:

$$\ln(w_s) = a_s + \sum \beta_{si} X_{si} \quad (42)$$

Table (5-9) presents the OLS regression results of the estimated earnings equation for the Saudi workers. The explanatory variables are mostly the same as those for the aggregate earnings equation and the estimation results are discussed in detail below.

Table 5-9
OLS Earnings Estimates for Saudi and non-Saudi Workers

Variable	Saudi			Non-Saudi			Beta (Difference)
	Beta	StD. Error	T-Ratio	Beta	StD. Error	T-Ratio	
(Constant	7.791	0.183	42.616	7.037	0.047	148.754	0.754
Marital	0.018	0.041	0.440	-0.049	0.064	-0.760	0.067
Children	0.008	0.039	0.192	0.036	0.064	0.564	-0.029
Manager	0.092	0.055	1.683	0.102	0.045	2.261	-0.010
Salesmen	0.064	0.055	1.169	0.090	0.047	1.900	-0.025
Professionals	-0.018	0.059	-0.310	0.053	0.042	1.257	-0.071
Clerks	0.093	0.042	2.233	0.047	0.036	1.322	0.046
Technicians	0.030	0.089	0.332	0.007	0.037	0.193	0.022
Foremen	0.151	0.068	2.219	0.035	0.043	0.804	0.116
Experience	0.043	0.002	21.837	0.034	0.002	21.027	0.009
Intermediate	0.090	0.039	2.320	0.408	0.053	7.704	-0.318
Secondary	0.261	0.038	6.933	0.717	0.043	16.764	-0.456
Technical	0.339	0.050	6.763	0.786	0.044	18.030	-0.447
University	0.619	0.049	12.571	0.889	0.049	18.272	-0.270
Training	-0.003	0.029	-0.105	0.009	0.019	0.492	-0.012
Mobility	0.097	0.169	0.573	0.021	0.020	1.017	0.076
Paid Leave	-0.005	0.025	-0.208	0.009	0.022	0.404	-0.014
Injury Risks	0.233	0.051	4.582	-0.006	0.013	-0.462	0.239
Health services	0.026	0.026	1.019	-0.008	0.020	-0.375	0.034
Job Security	0.009	0.023	0.393	0.005	0.020	0.235	0.004
Promotion	0.023	0.026	1.281	0.004	0.027	0.136	0.019

i) Demographic Factors

Considering the influence of the controlled components of the demographic factors on the compensation of Saudi workers in the chemical and petrochemical industries, this table confirms that the coefficient of the marital status variable for Saudi workers reveals a positive influence on their earnings. The value of this coefficient is estimated at 1.8%, with a standard error of the coefficient estimated at 0.041, and a *t*-ratio of 0.44. It indicates that married Saudi workers earn relatively more than their unmarried fellow citizens. Therefore, marital status has a marginally positive impact on the monthly earnings of the workers in the chemical and petrochemical industries. However, as the *t*-ratio is very low, the result tends to support the null hypothesis of no marital status effect at the 5% level of significance.

The children variable is the other demographic component that influences household earnings. As seen on the table, results of the estimated coefficient of the children variable suggest that this variable has a slightly positive effect on earnings of Saudi workers in the chemical and petrochemical industries, estimated at 0.008. This means that because of the appearance of children in the family, these workers might be compensated for having children by a relatively low proportion, calculated at 0.08%, in comparison to their fellow citizens without children. This generally confirms the other empirical studies that argued for the positive impact of children. Lundberg and Rose (1998) calculated the positive impact of the children on the earnings of American fathers, who could increase their hourly earnings with each additional child at 4.5%. However, the significance measures of this variable indicate that the standard error has a value of 0.039, and a *t*-ratio of 0.192. Therefore, as the *t*-ratio is very low, this provides evidence of true null hypothesis that the children coefficient is insignificant at the 5% level of significance.

ii) Human Capital Characteristics

The table reports significant returns from education for Saudi workers across different educational levels. The coefficient of this variable for Saudi university graduates is estimated at 61.9% higher than their colleagues with only a primary education, with a standard error of 0.049 and a *t*-ratio of 12.57, while

those with technical educational qualifications have earnings returns estimated at 33.9% relative to their colleagues with the base education; the coefficient has a standard error of 0.05 and a *t*-ratio of 6.76. The table reports that Saudi workers with secondary school qualifications have an earning advantage of 26.1% over their colleagues with primary education, with a standard error of 0.038 and a *t*-ratio of 6.93, while Saudi workers with intermediate qualifications have an opportunity to earn 9% more than their colleagues with primary education, the base qualification, with a standard error of 0.039 and a *t*-ratio of 2.32. Therefore, the significance measures of these variables all suggest that their estimated effects are all statistically significant at the 5% level of significance.

In addition, this table presents data on training characteristics. The data shows that Saudi workers are not adequately compensated for any period they spent in training during the three years prior to the data collection, as the coefficient of this variable is estimated to be -0.003 . This suggests that Saudi workers in the chemical and petrochemical industries have a lost opportunity cost that would be considered to compensate them for any additional training period. The standard error of this coefficient is estimated at 0.029 with a *t*-ratio of -0.105 . Therefore, the impact of training on the monthly earnings of Saudi workers in the chosen industries is statistically insignificant at the 5% level of significance.

Considering the effect of experience on the monthly earnings of the respondent Saudi workers in the chemical and petrochemical industries, the table shows a positive value for the estimated coefficient of this variable calculated at 0.043, which indicates that Saudi workers could increase their monthly earnings with one additional year of experience by 4.3%, with a standard error of 0.002 and a *t*-ratio of 21.84. The significance measures of the coefficient confirm that the null hypothesis of a no experience effect on the monthly earnings of Saudi workers in the chosen industries is rejected at the 5% level of significance.

iii) Workplace Characteristics

The results from the occupational status variables have revealed some unexpected and interesting phenomena. For example, Saudi foremen earn 15.1% more than the workers in the base occupations, with a standard error of 0.068 and a significant *t*-ratio of 2.219, while their fellow citizens in the other occupations earn

less than the foremen. Saudi workers in clerical jobs have monthly earnings estimated at 9.3% more than their colleagues in the base occupations, with a standard error of 0.042 and a *t*-ratio of 2.233. The standard errors and *t*-ratios all confirm that the estimated effects of these variables on the monthly earnings of Saudi workers in the chemical and petrochemical industries are statistically significant at the 5% level of significance. The table shows that workers in the managerial jobs have mean monthly earnings estimated at 9.2% higher than the monthly earnings of their colleagues in the base occupations and sales occupations. The variable has a standard error of 0.055 and a *t*-ratio of 1.683. However, the relatively low *t*-ratio tends to support acceptance of the null hypothesis that the coefficient is statistically insignificant at the 5% level of significance. However, workers in the managerial occupations are not adequately compensated as compared to their colleagues in the foremen jobs, as the coefficient of the managerial occupations is estimated less than the coefficient of the foremen and clerical jobs by 5.2%. This indicates that Saudi workers in high-ranking positions are younger and have fewer years of experience than their fellow citizens in the foremen jobs. On the other hand, from the table, Saudi workers in the professional jobs are not adequately compensated for their occupational skills, as the value of the professional occupation coefficient is estimated at -1.8% with a standard error of 0.059 and a *t*-ratio of -0.310. Therefore, the negative *t*-ratio confirms the null hypothesis of no effect for this coefficient at the 5% level of significance.

Estimation with the ordinary least square (OLS) is extended to cover the effects of fringe benefits on the monthly earnings of the Saudi workers in the chemical and petrochemical industries. The table shows how satisfaction of Saudi workers with these benefits influences their monthly earnings. It indicates that the coefficient of mobility in the labour market is estimated at 9.7%. Estimation of the coefficient of this variable reveals a positive influence on earnings of Saudi workers who are able to move freely in the labour market without severe administrative limits on utilising their privilege to match their skills with employment opportunities. The standard error of this variable is estimated at 0.169 with a *t*-ratio of 0.573. However, as the *t*-ratio is very low, the result tends to confirm the null hypothesis of no mobility effect at the 5% level of significance.

On the other hand, Saudi workers are significantly satisfied with their injury risk insurance, as the coefficient of the variable is estimated at 23.3% with a standard error of 0.051 and a *t*-ratio of 4.582. Therefore, the effect of this variable on monthly earnings of Saudi workers is statistically significant at the 5% level of significance. Moreover, the table shows that these workers are only slightly satisfied with the health services they get from their employers in the chemical and petrochemical industries. The coefficient of the health services is estimated at 2.6%; it has a standard error of 0.026 and a *t*-ratio of 1.019. The low value of the *t*-ratio provides evidence of the null hypothesis of a no health services effect on the earnings of these workers at the 5% level of significance. Although labour policies have tried to secure employment for Saudi workers in order to enhance their participation in the labour market, it seems that Saudi workers in the chosen industries are not very satisfied with their job security privileges, as the coefficient of job security is estimated at 0.09%, which indicates a minor impact for this characteristic on the monthly earnings of Saudi workers. The variable has a standard error of 0.023 and a *t*-ratio of 0.393. Again, the low value of the *t*-ratio supports rejection of its effect at the 5% level of significance. The table spells out that the satisfaction of Saudi workers with the job advancement privileges in these industries has a positive effect on their monthly earnings, as the promotion coefficient is estimated at 3.3% with a standard error of 0.026 and a *t*-ratio of 1.281. Therefore, the result might confirm the insignificance of the coefficient at the 5% level of significance. On the other hand, as shown in the table, some Saudi workers are not satisfied with their annual paid leave fringe benefits. The value of the annual paid leave coefficient is estimated at the low rate of -0.05% with a standard error of 0.025 and a *t*-ratio of -0.208. Therefore, the negative impact of this variable on the monthly earnings in the chosen industries is statistically insignificant at the 5% level of significance.

5.6.3 Estimation of the Earnings Equation for Non-Saudi Workers

As in the previous section, estimates of the wage determination Equation (43) specified for non-Saudi workers are based on the cross-sectional data collected in the chemical and petrochemical industries. The same previous variables are repeated here; they are expressed as:

$$\ln(w_n) = a_n + \sum B_{ni} x_{ni} \quad (43)$$

The results of the OLS estimates are presented in Table (5-9).

i) Demographic Factors

The table confirms that the coefficient of marital status has a negative influence on the earnings of the non-Saudi workers. The coefficient is estimated at -4.9% with a standard error of 0.064 and a *t*-ratio of -0.760. Therefore, the significance measures suggest accepting the null hypothesis of no impact of a marriage premium on the monthly earnings of these workers at the 5% level of significance. This reveals that marital status is not an influential determinant of earnings for non-Saudi workers; therefore, the married non-Saudi workers bear a burden as they are not adequately compensated for their marriage premium, particularly in the absence of their spouses from the labour market due to wide social and recruitment barriers to their participation in the Saudi labour market. Regulations prevent the household members of non-Saudi workers, particularly women who accompany their husbands, to search for work in the labour market. In addition, most female employment is in the public departments, which mainly recruit Saudi women and, then, only in certain jobs. It was mentioned elsewhere that these departments are prevented from recruiting non-Saudis in the local labour market, but they can recruit among non-Saudi women from outside the country. In addition, work opportunities for women in the private sector are very rare. Moreover, many of the foreign workers, particularly those with a lower educational level than secondary school, are not allowed to bring their families with them to Saudi Arabia; therefore, their spouses remain out of the Saudi labour market. However, this result is contrary to the results in the last two sections and to the many empirical studies that provide evidence concerning the positive impact of the marriage premium on the earnings of the married workers (Korenman and Neumark, 1991; Krashinsky, 2000; Richardson, 2000).

The table also reveals that the presence of children has a positive influence on the earnings of non-Saudi workers, with a coefficient of 3.6%, a standard error of 0.064, and a *t*-ratio of 0.564. However, the low value of the *t*-ratio makes it difficult to reject the null hypothesis of a no children effect on earnings at the 5%

level of significance. On the other hand, the reason behind the positive impact of children's presence might stem from the increased working hours of married workers in these industries, as indicated by the descriptive analysis in Table (4-6). This confirms the assumption of the relationship between child presence and male earnings (Pencavel, 1986; Lundberg and Rose, 1998; Waldfogel, 1998), as this relationship showed a positive impact on the fathers' earnings resulting from their increased hours of work (Waldfogel, 1998). Lundberg and Rose (1998) confirm that fathers with high earnings in the U.S. work 201 hours per year more than their unmarried colleagues.

ii) Human Capital Characteristics

The OLS regressions of the cross-sectional data in Table (5-9) present estimated effects of human capital components on the monthly earnings of non-Saudi workers in the chemical and petrochemical industries. The estimates provide evidence that higher educational levels are associated with higher earnings among these workers. The estimated coefficient for the university graduates provide them with mean monthly earnings of 88.9% more than their colleagues in the base educational qualification, with a standard error of 0.049 and a significant *t*-ratio of 18.27. Non-Saudi workers with technical qualifications have a positive effect from their educational qualifications over those in the base qualifications. The coefficient of the variable is estimated at 78.6% with a standard error of 0.044 and a *t*-ratio of 18.030. Those who have secondary academic qualifications earn 71.7% more than their colleagues in the base educational qualifications (primary education). The standard error of the variable is estimated at 0.043 with a *t*-ratio of 16.764. The table reports that non-Saudi workers with intermediate qualifications have an earnings advantage of 40.8% over their colleagues with primary education. The standard error of the variable has a value of 0.053 and a *t*-ratio of 7.704. It is clear that education, as a main component of human capital, has a significant influence on the monthly earnings of these workers. This confirms the theoretical assumptions of the positive impact of education on workers' earnings, because this variable has its explicit effects on the workers' skills. The table confirms that more highly educated workers earn more than their colleagues with less education, as the percentage difference between the university graduates and those who have

technical education is about 10.3%, and the difference between the former group of workers and those with secondary qualifications is about 17.2%. Moreover, the standard errors and *t*-ratios all suggest that the estimated effects from these variables are all statistically significant at the 5% level of significance.

As regards the effect of training on the earnings of non-Saudi workers, the table suggests that the effect is positive, but only marginally. The coefficient of the training variable is estimated at 0.09% with a standard error of 0.022 and a *t*-ratio of 0.404. This variable indicates that non-Saudi workers are marginally compensated for their training. Therefore, the low value of the *t*-ratio provides evidence to support the null hypothesis that the training coefficient has no statistically significant effect on the dependent variable at the 5% level of significance.

From this table, the estimated coefficient of the actual work experience has a positive influence on the earnings of non-Saudi workers. The value of this effect is estimated at 3.4% with a standard error of 0.002 and a *t*-ratio of 21.03. Thus, work experience is a highly significant variable in determining the earnings for non-Saudi workers in these industries. Moreover, it appears that the location of the non-Saudi worker's previous work experience, either inside or outside Saudi Arabia, does not matter in the determination of the worker's current earnings.

iii) Workplace Characteristics

The table also reports the results of estimations for workplace characteristics for the non-Saudi workers. It confirms that the occupational status of non-Saudi workers reveals some consistency of influence from the hierarchically-structured occupational distribution on their monthly earnings in the chemical and petrochemical industries. Judging from this table, recruitment of these workers in managerial positions provides them with 10.2% more monthly earnings than their colleagues in the reference occupation, with a standard error of 0.047 and a *t*-ratio of 1.90, while salesmen earn 9% more than their colleagues in the base occupation, with a standard error of 0.047 and a *t*-ratio of 1.9. The coefficient of the professional occupations is estimated at 5.3% higher than the monthly earnings of their colleagues in the reference occupations, with a standard error of 0.042 and a *t*-ratio of 1.26. The table shows that non-Saudi workers in

clerical occupations earn 4.7% more than their colleagues in the base occupation, with a standard error of 0.036 and a *t*-ratio of 1.32. As the *t*-ratios are relatively low, they could not confirm that the coefficients of these variables are statistically significant at the 5% level of significance. On the other hand, the table shows that the coefficient of foremen occupations has an effect on the monthly earnings of the non-Saudi workers estimated at 3.5% higher than their colleagues in the base occupations, with a standard error of 0.043 and a *t*-ratio of 0.193. Non-Saudi workers in technical jobs earn marginally more, at 0.07%, than their colleagues in the base occupations, with a standard error of 0.037 and a *t*-ratio of 0.804. However, as the *t*-ratios are very low, this provides evidence to confirm the null hypothesis of no effect of the coefficients of these variables at the 5% level of significance. The table further reports the effects of other workplace characteristics on the monthly earnings of non-Saudi workers in the chosen industries. Most of the controlled variables reveal positive influences on monthly earnings of non-Saudi workers in these industries with the exception of the health services and injury risks insurance variables, which have negative effects. The coefficient of the paid leave characteristic has a marginal influence on the monthly earnings of non-Saudi workers, estimated at 0.09%, with a standard error of 0.022 and a *t*-ratio of 0.404, while the mobility variable has a relatively larger positive influence, estimated at 2.1%, with a standard error of 0.020 and a *t*-ratio of 1.017. The table confirms that non-Saudi workers who are satisfied with their job security working conditions earn 0.05% more than their dissatisfied colleagues. The standard error of the variable is estimated at 0.02 with a *t*-ratio of 0.235. Moreover, the coefficient of promotion benefits indicates that satisfied non-Saudi workers earn only 0.04% more than their dissatisfied colleagues, with a standard error of 0.027 and a *t*-ratio of 0.136. However, again the low values of the *t*-ratios support the null hypothesis of no effect of the respective coefficients of these variables at the 5% level of significance. On the other hand, satisfaction with the injury risks insurance variable among non-Saudi workers reveals a negative impact on their monthly earnings. The estimated coefficient of this variable is calculated at -0.06%, which means that non-Saudi workers pay more to buy insurance against work risks they face, or it means that their employers do not contribute to their subscription to the

GOSI according to labour regulations. The standard error of the variable is estimated at 0.013 with a *t*-ratio of -0.462. Moreover, satisfaction of the non-Saudis with their health services has a marginally negative effect on their earnings. The variable coefficient is estimated at -0.08% with a standard error calculated at 0.020 and a *t*-ratio of -0.375. Therefore, the significance measures of the coefficients of these variables confirm the statistical insignificance of these coefficients at the 5% confidence level.

5.7 TESTING ESTIMATES

In the above two sections, the compensation regressions for Saudi and non-Saudi workers are specified separately (Equations 42 and 43) in order to estimate the effects of different characteristics on the compensation or earnings of each group of workers. A test must be conducted to determine whether or not the effects of such characteristics on earnings differ significantly across the two groups of workers. The Chow test provides a technique that is generally used to examine equality between coefficients of two or more different subsamples (Koutsoyianmis, 1987). This test is based on the F test and is formulated as:

$$F^* = \frac{(\sum e_p^2 - (\sum e_s^2 + \sum e_n^2))/k}{(\sum e_s^2 + \sum e_n^2)/(n_1 + n_2 - 2k)} \quad (44)$$

where e_p^2 is the residual sum of squares (RSS) in the aggregate or pool regression of all workers; e_s^2 is the RSS in the Saudi workers regression equation; e_n^2 is the RSS in the equation of non-Saudi workers; *k* is the total number of the explanatory variables; and n_1 and n_2 are the number of observations in the subgroup samples of Saudi and non-Saudi workers, respectively. Then, the observed F^* ratio has to be compared with the tabulated $F_{0.05}$ with $v_1 = K$ and $v_2 = (n_s + n_n - 2K)$ degrees of freedom. If $F^* > F_{0.05}$, reject the null hypothesis that $B_{si} = B_{ni}$, otherwise the null hypothesis is accepted.

In this research, application of the Chow test is based on estimates of the analysis of variance (ANOVA) for the pooled sample of the two groups of workers, and the estimates of each group of workers as presented in Table (5-10). Looking at this table, the Chow test is calculated in (45) and (46) as:

$$F^* = \frac{17.293 - (5.383 + 7.793)/21}{(5.383 + 7.793)/538} \quad (45)$$

$$\frac{0.196}{= 0.024} = 8.167 \quad (46)$$

The tabulated $F_{0.05}$ with $v_1 = 21$ and $v_2 = 538$ degrees of freedom produces a critical value of about 1.81. As the $F^* > F_{0.05}$, the test provides evidence to reject the null hypothesis that estimates of the coefficients of the characteristics of Saudi workers B_{si} and that of non-Saudi workers B_{ni} are equal. Therefore, there appears to be a strong indication that comparable explanatory variables have different effects on the monthly earnings of Saudi workers as opposed to non-Saudi workers. Therefore, the conventional approach of pooling workers from different groups, especially from different nationality backgrounds, seems to be invalid.

Table (5-10)
Analysis of Variance for Estimates of Saudi and
Non-Saudi Workers and their Pooled Sample

Sample	e_i^2	n_i	K
Pooled	17.293	538	21
Saudi	5.383	210	
Non-Saudi	7.793	328	

5.8 COMPARISON OF SAUDI AND NON-SAUDI EARNINGS:

Based on the results of the estimated earnings functions (Equations 42 and 43) for the two groups of workers, this section discusses the differences in the wage determination mechanism across the two groups of workers. The last column in Table (5-9) shows differences in the variables' coefficients of Saudi workers and non-Saudi workers. As shown in this table, the estimated coefficients of the personal and workplace variables of these workers confirm the existence of an earnings differential between them across the three categories of the variables, as follows:

i) Demographic Variables

The impact of the marital status on the determination of the monthly earnings between the two groups of workers is calculated at 6.7% in favour of Saudi workers. This means that a married Saudi worker is compensated 6.7% as a marriage premium more than the married non-Saudi worker. On the other hand, the presence of children pays a non-Saudi worker 2.9% more than a Saudi worker.

ii) Human Capital Variables

Non-Saudi workers are significantly better compensated for their educational qualifications when compared to the Saudi workers. The university qualification influences the average monthly earnings of non-Saudi workers by 27% more than their Saudi counterparts, while the difference in the earnings of the two groups due to technical educational is calculated at 44.7% in favour of non-Saudi workers who have such a qualification. Moreover, the possession of a secondary education has a greater influence on the monthly earnings of the non-Saudi workers than it does on their Saudi counterparts. Considering this variable, *ceteris paribus*, it influences the monthly earnings of the non-Saudi workers by 45.6% more than it influences the monthly earnings of their Saudi counterparts. Moreover, the difference in the monthly earnings of the two groups due to the impact of the intermediate qualification is calculated at 31.8% in favour of non-Saudi workers.

Saudi workers gain marginally more than their non-Saudi counterparts from their working experience, which rewards Saudis at 0.9% higher than non-Saudis. However, the training variable influences a difference in monthly earnings between the two groups at 1.2% in favour of non-Saudi workers.

ii) Workplace Characteristics

The influence of occupational status indicates that non-Saudi workers in professional jobs earn 7.1% more than their Saudi counterparts in these occupations, while recruitment of non-Saudis in the salesmen jobs puts their monthly income at 2.5% higher than Saudi workers. The table further shows that non-Saudis in the managerial occupations can get an additional 1% of compensation more than their Saudi counterparts in such jobs. In contrast, Saudi workers in the foremen jobs have estimated monthly earnings of 11.6% more than

that of the non-Saudis, and Saudis in the clerical jobs earn 4.6% more than the non-Saudis in these occupations. From this table, technical occupations marginally influence the difference in the monthly earnings of the two groups by 2.2% in favour of Saudis in these jobs.

However, the other workplace characteristics reveal differences in the monthly earnings of the two groups of workers and confirm earnings inequality between them across these characteristics. From the table, the difference in the estimated coefficients of injury risks is calculated at 23.9% in favour of Saudi workers. The difference in the value of the mobility coefficient between the two groups of workers shows that Saudi workers earn 7.6% more monthly than non-Saudi workers in the chosen industries. The estimated coefficient of health services allows Saudi workers to gain 3.4% more than their non-Saudi counterparts, while satisfaction with promotion fringe benefits influences the monthly earnings inequality between the two groups of workers by 2.9% in favour of Saudi workers. On the other hand, the difference in the estimated coefficient of paid leave influences monthly earnings of non-Saudi workers at 1.4% more than the Saudi workers. Contrariwise, Saudi workers benefit marginally from the positive effect of job security, which allows for an inequality difference in the monthly earnings between the two groups of workers of 0.4% in favour of Saudi workers.

However, it is obvious that non-Saudi workers in the chemical and petrochemical industries are dissatisfied with their fringe benefits in the workplace in comparison with their Saudi counterparts. Hamermesh (1999) argued about the importance of the job satisfaction concept as a measure to compare the welfare of workers and how they perceive that their work affects their economic outcomes. This confirms the conclusion by Grund and Sliwku (2001) and Vanin (2001) regarding the relationship between earnings and job satisfaction. Non-wage or fringe benefits represent a major part of the working conditions that are provided to workers either through regulations or collective agreements. Therefore, workers' satisfaction with such benefits, in the chosen industries, is widely influenced by their personal contract of employment that governs the work relationship, particularly in the case of non-Saudi workers. This contract is largely influenced by labour regulations that show little support for workers, particularly foreign

workers, as indicated in Chapter Three, in the private sector, and do not provide them with job security and employment. Such regulations have ambiguous and weak disciplinary actions regarding hiring and firing, and they have no comprehensive rules concerning occupational health and safety. Moreover, the Saudi labour market is a highly regulated one which suffers various structural problems, as there are no autonomous labour courts, nor is there a standard employment contract, as the contracts are personal and differ from one worker to another even in the same workplace. Therefore, the results of these workplace characteristics confirm the existence of the segmentation phenomenon in the Saudi labour market, as some workers (Saudi employees) have better working conditions that provide them with job security and employment protection.

5.9 WAGE DIFFERENTIALS BETWEEN SAUDI AND NON-SAUDI WORKERS

Since the 1970s, most of the empirical studies on wage differentials between two or more groups of workers have attempted to identify the causes of the earnings gap between these workers. Generally speaking, these studies have applied multiple regression analysis to the decomposition of such earnings gaps. The decomposition technique of Oaxaca-Blinder, as discussed in Chapter Two, is largely adopted in most empirical studies using natural logarithmic (log) earnings as the dependent variable. In this technique, coefficients for the two groups of workers (Saudi and non-Saudi in this study) are estimated separately, instead of using the subjugated or disadvantaged group as the reference group, as in the traditional regression equation that uses a dummy variable that ignores this group.

In this study, the technique is applied by using the monthly earnings estimates of Equations (42 and 43) for Saudi and non-Saudi workers. The standard decomposition technique requires that either the slopes of Saudi workers (β_{si}) or the slopes of non-Saudi workers (β_{ni}) be used as a reference point to weigh the differences in the attributes of the two groups of workers and to estimate such differences. The two equations are combined together in Equation (47), as expressed by Goldin (1990), using the slopes of Saudi workers (B_{si}) as the reference point:

$$(\bar{w}_s - \bar{w}_n) = [(\hat{a}_s - \hat{a}_n) + \sum \bar{x}_{ni} (\hat{B}_{si} - \hat{B}_{ni})] + \sum \hat{B}_{si} (\bar{x}_{si} - \bar{x}_{ni}) \quad (47)$$

Based on the estimates of this equation, Table (5-11) presents the decomposition of the wage differentials and wage discrimination in the chosen industries. On the table, the intercepts of the first term on the right hand side are shown in columns (1) and (4); the second term is provided in column (7); and the third term is in column (8). In this study, the difference in the attributes of Saudi and non-Saudi workers is weighted by slopes of Saudi workers, which is expressed by the third term in Equation (47) on the right hand side as $\sum \hat{B}_{si} (\bar{x}_{si} - \bar{x}_{ni})$. This term expresses the part of the earnings gap between the two groups of workers that is explainable by the differences in the characteristics of the two groups of workers. The first two terms in this equation represent the unexplained portion of the wage differentials and is expressed as:

$$(\bar{w}_s - \bar{w}_n) = |(\hat{a}_s - \hat{a}_n) + \sum \bar{x}_{ni} (\hat{B}_{si} - \hat{B}_{ni})| \quad (48)$$

Following Gosse (2002), since Saudi workers make up the comparison group, positive coefficients of the characteristics indicate higher earning power for Saudi workers, thus increasing the wage differentials and wage discrimination between the two groups of workers. On the other hand, negative coefficients indicate greater earning power for non-Saudi workers and decrease the wage differentials and wage discrimination between them. The explained and unexplained components of the wage differentials between Saudi and non-Saudi workers are analysed as follows:

5.9.1 The Unexplained Wage Differentials

As seen in this table, the first part of the unexplained portion is the difference in the intercepts of the two groups of workers, while the second part expresses the difference in the coefficients of the characteristics of these workers weighted by the average value of the characteristics of non-Saudi workers. According to the standard decomposition theory, the unexplained components of the earnings gap refer to the differences in the pay of the two groups of workers that is attributable to the same set of characteristics. Therefore, the differences in the earnings of the two groups in the unexplained portion arise from the differences

**Table 5-11
Decomposition of Saudi and non-Saudi Earnings**

	Bs	Xs	XBs	Bn	Xn	XBn	Xn(Bs-Bn)	Bs(Xs-Xn)
(Constan	7.791	1.000	7.791	7.037	1.000	7.037		
Marital	0.018	0.750	0.013	-0.049	0.560	-0.027	0.037	0.003
Children	0.008	0.720	0.005	0.036	0.530	0.019	-0.015	0.001
Manager	0.092	0.280	0.026	0.102	0.160	0.016	-0.002	0.011
Salesmen	0.064	0.082	0.005	0.090	0.052	0.005	-0.001	0.002
Professionals	-0.018	0.087	-0.002	0.053	0.240	0.013	-0.017	0.003
Clerks	0.093	0.390	0.036	0.047	0.140	0.007	0.006	0.023
Technicians	0.030	0.017	0.001	0.007	0.140	0.001	0.003	-0.004
Foremen	0.151	0.039	0.006	0.035	0.073	0.003	0.008	-0.005
Experience	0.043	8.870	0.381	0.034	12.450	0.422	0.112	-0.154
Intermediate	0.090	0.182	0.016	0.408	0.046	0.019	-0.014	0.012
Secondary	0.261	0.238	0.062	0.717	0.131	0.094	-0.060	0.028
Technical	0.339	0.091	0.031	0.786	0.216	0.170	-0.096	-0.042
University	0.619	0.268	0.166	0.889	0.520	0.462	-0.140	-0.156
Training	-0.003	0.270	-0.001	0.009	0.510	0.005	-0.006	0.001
Mobility	0.097	1.000	0.097	0.021	0.270	0.006	0.021	0.071
Paid Leave	-0.005	0.720	-0.004	0.009	0.780	0.007	-0.011	0.000
Injury Risks	0.233	0.940	0.219	-0.006	0.055	0.000	0.013	0.206
Health services	0.026	0.770	0.020	-0.008	0.310	-0.002	0.011	0.012
Job Security	0.009	0.610	0.005	0.005	0.300	0.001	0.001	0.003
Promotion	0.023	0.270	0.006	0.004	0.140	0.001	0.003	0.003
Total			8.881			8.255	-0.147	0.020

in the coefficients of the two groups (Equation 48). The decomposition of this portion analysed across the three main categories comprise these characteristics as follows:

i) Demographic Characteristics

From this table, the marital status has a positive value indicating that Saudi workers earn 3.7% more than non-Saudis due to the difference in the coefficients of the two groups, which means that the marital status positively contributes to an increase in the monthly wage differentials between the two groups in the unexplained portion. The table shows that, the coefficient of children reveals that the difference in the two coefficients provides non-Saudis with relatively more earnings than their Saudi counterparts and, thus, reduces the monthly wage differentials between the two workers with relatively small value of 1.5% in the unexplained residual.

ii) Human Capital

From the table, the difference in the value of the university coefficients remunerates non-Saudi workers more highly than their Saudi counterparts and, then, contributes to a reduction in the monthly earnings gap between the two groups of 14%. Technical education acts to decrease the monthly earnings gap in the unexplained portion by 9.6% due to higher coefficients of non-Saudis for this characteristic. This is followed by the secondary qualification coefficient that increases the earnings power of non-Saudis to reduce the monthly earnings gap in the unexplained residual 6%. The intermediate qualification coefficient contributes marginally at 1.4% to the reduction in the monthly earnings gap in the unexplained portion. The difference in the experience coefficients between the two groups contributes to a rise in the monthly wage differentials in the unexplained portion of 11.2% in favour of Saudi workers, whilst training increases the earnings power of non-Saudis to earn relatively more than their Saudi counterparts at 2.1% and, then, decreases the monthly earnings gap in the unexplained residual.

iii) Workplace Characteristics

The occupational categories have marginal influences on the monthly earnings gap in the unexplained residual portion. The difference in the professional coefficient makes non-Saudis earn marginally more than their Saudi counterparts

at 1.7%; this reduces the earnings gap in the unexplained portion. Another marginal influence arises from the managerial jobs coefficient that contributes to a reduction in the earnings gap in the unexplained residual at 0.2%, as non-Saudi workers have more earnings than their Saudi counterparts in managerial jobs. Salesmen occupations contribute marginally to the reduction in the earnings gap in the unexplained portion at 0.1%. In contrast, foremen, clerical, and technician occupations act to widen the monthly earnings gap between the two groups of workers at 0.8%, 0.6%, and 0.3% for the three occupations, respectively, due to marginally higher Saudi coefficients.

The table also presents the contribution of fringe benefits to the wage differentials and wage discrimination between the two groups of workers in the chosen industries. The injury risks coefficient increases earnings of Saudi workers by a marginal amount of 1.3%, which contributes to a widening of the monthly earnings gap between the two groups of workers. The health services coefficient again widens the earnings gap, due to the remuneration of Saudis more than their non-Saudi counterparts at 1.1%, while the difference in the paid leave benefit contributes to a decrease in the earnings gap between the two groups of workers at 1.1%, due to the higher coefficient for non-Saudi workers. The coefficients of the job security and promotion fringe benefits make Saudis earn marginally more than non-Saudi workers at 0.1% and 0.3% for the two coefficients, respectively.

The overall portion of the unexplained earnings differentials is estimated at 60.6%. The constant terms make a significant contribution to the unexplained portion. The difference in the intercepts of the two groups of workers is calculated at 0.754 in favour of Saudi workers. This difference indicates that a Saudi worker has an opportunity to earn 75.4% more each month than a non-Saudi worker, *ceteris paribus*. This indicates that earnings of Saudi workers might continue to increase with improvements in their working conditions in comparison with that of their non-Saudi counterparts, whose wages increase more slowly. The other part of the unexplained earnings is calculated at -0.147, which indicates that the coefficients of non-Saudi workers (B_{ni}) reduce the earnings gap between the two groups of workers to 14.7%. However, the unexplained portion in the monthly earnings differentials between the two groups of workers in the chosen industries

may be partially due to differences in the characteristics between the two groups of workers, which might not be included in the model and may be partially due to discrimination in the labour market. Such discrimination might be the result of labour regulations that favour Saudi workers rather than their foreign or non-Saudi counterparts.

5.9.2. The Explained Earnings Gap

The other part on the right-hand side of Equation (47) shows the differences in the characteristics of the two groups of workers weighted by the coefficients of the characteristics of the Saudi workers, which is expressed as $\Sigma \hat{B}_{si} (\bar{x}_{s_i} - \bar{x}_{n_i})$. This term represents the explained portion of the earnings differential between Saudi and non-Saudi workers. The earnings differential between the two groups of workers arises due to the difference in their personal and productivity characteristics that compose three categories: demographic, human capital, and workplace characteristics. These are further decomposed in the table as follows:

i) Demographic Characteristics

From the table, the marital status and children characteristics have marginal influences to increase the explained monthly earnings gap between Saudi and non-Saudi workers at 0.3% and 0.1% for the two characteristics, respectively, because married Saudi workers earn more than their non-Saudi counterparts.

ii) Human Capital Characteristics

As shown on the table, educational qualifications generally have little ability to explain the monthly earnings gap between the two groups in the chosen industries. The largest contribution is from the university qualification characteristic which decreases the monthly earnings gap in the explained portion by 15.6%; this is attributable to the fact that a higher proportion of non-Saudi workers are university educated compared to the Saudis, among the interviewed workers*. Technical education again contributes to decreasing the earnings gap in the explained portion by 4.2%, as non-Saudi workers earn more than their Saudi

* The interviewed non-Saudi workers in the chemical and petrochemical industries with a university education count 30% in the quota sample, while Saudi workers with such a qualification comprise about 11% of the total sample.

counterparts who have such qualifications. The secondary qualifications characteristic provides Saudi workers with a power to earn 2.8% more than their non-Saudi counterparts and, then, increases the monthly earnings gap in the explained portion. The intermediate characteristics weighted by the Saudi coefficients produce marginally positive earnings for Saudi workers at 1.2% and serve to widen the monthly earnings gap in the explained portion. On the other hand, training characteristics marginally influence the earnings power of Saudi workers to earn 0.1% more than their non-Saudi counterparts for each training period and, then, increase the monthly earnings gap between the two groups of workers. Experience characteristics make quite a high contribution to the earnings of non-Saudi workers at 15.4% more than their Saudi counterparts and decreases the monthly earnings gap in the explained portion.

iii) Workplace Characteristics

Occupational characteristics of the workers in the chemical and petrochemical industries marginally influence the explained wage differentials between the two groups of workers. Clerical jobs provide Saudi workers with an opportunity to earn more than non-Saudis at 2.3% and, then, increase the monthly wage differentials between them. The managerial category contributes marginally at 1.1% to increase the monthly earnings gap between the two groups, favouring Saudi workers. However, non-Saudi workers in the foremen and technician jobs earn marginally more than their Saudi counterparts at 0.5% and 0.4% for the two posts, respectively, and reduce the monthly earnings gap between the two groups. However, Saudi workers in the professional and salesmen occupations also earn marginally more than their non-Saudi counterparts at 0.3% and 0.2% in the two jobs, respectively. This increases the monthly earnings gap in the explained portion. On the other hand, Saudi workers are benefited by other workplace characteristics, which provide them with more earnings than their non-Saudi counterparts; this increases the monthly earnings gap between the two groups in the explained portion. The injury risk characteristic makes a significant contribution to the monthly earnings of Saudis by 20.6% more than the non-Saudis and, thus, widens the earnings gap between the two groups. The mobility characteristic increases the explained monthly earnings gap by 7.1% in favour of

Saudi workers. The health services characteristic again contributes to increase the gap between the two groups of workers by 2.1% due to biased compensation favouring Saudi workers over their non-Saudi counterparts with the same characteristics. Mobility provides Saudi workers more earnings than non-Saudis, but only marginally at 0.2% and, then, increases the earnings gap in the explained portion. On the other hand, the paid leave fringe benefit weighted by the Saudi coefficient has no effect on the explained wage differentials between the two groups of workers in the chosen industries. Therefore, both of the two groups receive a similar benefit for their paid leave attribute. However, the decrease and increase in the estimated influences of the variables of the three categories, i.e, the demographic characteristics, human capital characteristics, and workplace characteristics, produce an aggregate sum of the explained portion of the wage differential, which counts 0.020, (from the last cell in the last column in the table); this contributes about 3% to the aggregate wage gap between the two groups of workers.

5.10 CONCLUSIONS

Using estimates of table 5-11, the aggregate monthly wage differential between Saudi and non-Saudi workers in the chosen industries given by Equation (47) is calculated at 62.6% in favour of Saudi workers*. The unexplained portion is given by the first right hand side of Equation (47); it calculates as 0.606, which is a proportion of 97% of the raw wage gap. The large proportion of the unexplained portion is attributed to the high value of the constant term of the equation ($\hat{a}_s - \hat{a}_n$) that calculates 0.745. However, the unexplained portion may be attributed partially to differences in other characteristics between the two groups of workers, which might not be controlled in the model, and partially to discrimination in the labour market. On the other hand, the explained portion, as mentioned above (in section 5.9.2), represents the aggregate sum of the differences between characteristics of the two workers weighted by the coefficients of Saudi

*The absolute figures for equation (47) as estimates in Table (5-11) are calculated as:

$$\begin{aligned} \bar{W}_s - \bar{W}_n &= [(7.791 - 7.037) + (-0.147)] + 0.02 \\ &= (0.754) + (-0.147) + 0.02 \\ &= 0.606 \text{ (unexplained portion)} + 0.020 \text{ (explained portion)} \\ &= 0.626 \end{aligned}$$

workers. This portion is calculated at 0.02, which is a proportion of 3% of the aggregate wage gap between the two groups of workers. These proportions are largely different from those in other countries. Oaxaca (1973) estimated the unexplained or wage discrimination portion of raw wage differential in the U.S. at 74% for white workers and 92% for black workers. The remainder is the explained portion estimated at 26% and 8%, respectively, due to personal and productivity characteristics such as occupation, health problems, education, experience, on-the-job training, and other characteristics shown elsewhere. Blinder (1973) found that the unexplained portion of the wage differentials between white males, white females, and black workers in the U.S. ranged between 30-40%, while the explained portion ranged between 60-70% due to education and other characteristics discussed in the previous section. Swaffield (2000) decomposed earnings differentials between males and females in the U.K. and estimated the unexplained gender gap to be between 12 and 43%, with the remaining portion being the explained wage differentials arising from differences in experience, education, participation in the labour force, work-oriented women, non-work-oriented women (labour market motivation), marital status, and some other characteristics. Cohen and House (1993) found that the unexplained earnings differentials between males and females in Sudan is 32%, with the explained portion at 62% due to education, potential experience and its square, job experience, working in a public or a foreign firm, occupation, and industry. Knight and Sabot (1995) discussed labour market discrimination in Tanzania; they concluded that wage discrimination between Africans and non-Africans is estimated at 69% after controlling for differences in education, job tenure, employment status, age, training, and occupation. Further, they found that if occupation is excluded from the analysis, the discrimination or the unexplained wage differential is estimated at 78%. Therefore, compared with the findings in the literature, the unexplained portion of the earnings gap between the Saudi and non-Saudi workers is significantly higher than it is for any other two groups of workers.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

The overall aim of this study is to examine the extent of wage differentials and wage discrimination between Saudi and non-Saudi workers and to analyse their sources by examining the structure and operation of the labour market in Saudi Arabia. In this study, analysis of the wage determination is based on cross-sectional data that was collected directly among workers in the chemical and petrochemical industries in the three main cities of the country. The information extracted from the survey relates to: demographic features of workers, their human capital, and workplace characteristics, as well as the workers' monthly earnings.

The previous chapters discussed various issues related to the structure of employees' compensation in the country. They discussed the main characteristics of the Saudi labour market. The main characteristic was the persistent skills shortage that faced this labour market, particularly during the 1970s and 1980s when the country adopted development plans in five-year phases. Foreign workers were allowed to enter the country under specific and restricted conditions in order to meet the labour demand arising from the new projects that dramatically increased the number of labour participants in the labour market and brought new occupations that were unknown in Saudi Arabia before the 1970s. Meanwhile, the government exerted considerable effort to change the structure of the labour force for the benefit of its indigenous workers. It provided various free educational and training programmes for Saudis and encouraged them for recruitment in the public sector, which provides good work conditions and social prestige for workers, although foreign workers are still present across all the occupations, including the prestigious ones. In the 1990s, the government started to freeze recruitment for various jobs in the public sector and instructed private firms to substitute Saudi nationals for their foreign or non-Saudi workers. This policy is known as Saudisation, under which some occupations are completely restricted for recruitment of Saudi workers. This policy has fundamentally distorted the structure and the incentive scheme of the Saudi labour market. On the other hand, the policy has substantially raised the reservation wage of the Saudis and cultivated a

dependency culture among them. This is reflected by the very low labour market participation rates among the Saudis. Although the rate marginally increased from 31.2% in 1980 to 35.8% in 2000, it is nonetheless substantially lower than the participation rates elsewhere in the world. On the other hand, non-Saudi workers are severely restricted from employment in certain occupations, especially the highly skilled ones. As a result, a mismatch between the demand for and supply of skills in the Saudi labour market has emerged, which has given rise to the unemployment phenomenon for the first time since the discovery of oil in Saudi Arabia, despite an overall labour shortage that is primarily caused by the very low labour market participation rate among the indigenous workforce.

Also, the Saudi labour market is characterised as a highly regulated one: there are many labour regulations that govern employment and working conditions in both the private and government sectors. These regulations provide Saudi workers with various privileges that are not extended to their non-Saudi counterparts in these sectors. These regulations comprise: labour law, pension act for workers in the public sector, residential regulations for foreign workers, risk injury insurance regulations for workers in the private sector, and various civil service regulations for workers in government departments. These regulations contribute to the segmentation of the labour market into a dual market: one sector for Saudi workers who experience secure employment, better pay, and good working conditions, including various short and long vacations, pension pay, and free public health facilities. The other sector that is crowded with foreign workers who have poor working conditions, very limited labour market mobility, low pay, and working without pension. Besides differences in the working conditions of the two groups of workers, these regulations largely contribute to wage inequality in the labour market, as they require the employer to pay more for Saudi workers than non-Saudi workers. Although the Saudi labour market has undergone many changes over the past few decades, there has been little amendment to the labour regulations since their enactment in the 1960s. Moreover, labour regulations together with other regulations assigned the relevant authorities the power to interpret and implement various policies on different aspects of the labour market rather freely. The labour law applies to workers in the private sector, but it does

not provide adequate recruitment procedures, as the individual contract is the main instrument that governs relations between the employer and employees. Neither does the law support collective bargaining because trade unions are not allowed in the country. Therefore workers, especially those in the private sector, are largely subject to informal and arbitrary remuneration schemes that could easily give rise to earnings inequality and discrimination in the private sector. Barsalou (1985) stated that labour law articles on wages do not protect Saudi and non-Saudi workers equally, as the earnings difference is an obvious phenomenon between the two groups of workers in the labour market. In 2002, the wage distribution of Saudi and non-Saudi workers revealed a consequent substantial increase in the earnings gap between the groups, the aggregate monthly wage ratio of Saudi to non-Saudi workers calculated at 3.7 in 2002 in comparison to 3.3 in 1994 in favour of Saudi workers over the two periods.

Economists provide their interpretations of the determinants and causes of the wage inequality that usually arises between two or more groups of workers. From a conceptual point of view, the inequality can be attributed to both the labour supply and demand factors. The labour supply determinants are usually categorised into different broad groups, which include personal characteristics or endowments, human capital factors, the social welfare system, and workplace characteristics. The first group mainly contains the workers' age, marital status, family size, sex, race etc. Such factors have been extensively examined in previous studies (see, for example, Koreman and Neumark 1991; Lillard and Waite 2000; Dixon 1996, Chayny et al.2001). The second group of factors reflect the workers' effort to augment their earnings potential in the labour market. These determinants mainly contain educational qualifications, work experience, physical health of the worker, and job training. Many economists also argue about the impacts of human capital investments on the wage differentials in the labour market (Mincer, 1974 and 1993; Becker, 1975; and Killingsworth, 1975; among many others).

Moreover, social benefits and taxes influence labour supply and, in turn, have their impacts on the workers' earnings in the labour market. The literature on these issues assumes that the labour market is in a state of equilibrium before the imposition of labour taxes. But with the tax imposition, wages are decreased, so

the workers must increase their labour supply if they wish to make up for the earnings cut. The social security system is another factor that has an influence on the labour supply and, in turn, on the workers' earnings. Smith (2000) argues that reduction of welfare benefits induces substitution effects, which causes individuals under the welfare programme to reduce their work hours to zero.

On the other hand, the labour demand side is influenced by factors include technological change, international trade, and consumers' tastes. The technological change has its impact on the demand for labour, since technology allows the society to achieve greater and more varied consumption possibilities. Meanwhile, technology helps to create scale effects, which in turn enlarge and change the mix of output. Economists (Johnson, 1997; Card, 2002, Borjas; 2002) argue that a relative rise in wages and employment due to technological change suggest that demand for labour must have risen at a faster rate than supply. Moreover, they contend that the difference in earnings between skilled and unskilled labour is determined by changes in relative demand for, and supply of, labour, as well as by a parameter reflecting the degree of substitution between the two categories of labour (Acemoglu, 2002; Johnson, 1997). It is envisaged that low substitutability between different groups of workers contributes to the occurrence and persistence of wage differentials.

Trade is another demand factor that has its positive and negative influences on wage determination in the labour market. Borjas and Ramey (1995) explain that with the advent of international trade, foreign firms capture returns that would go to the domestic industry. They argued that when foreign firms enter markets in which domestic firms have market power, their entry increases the wages of highly-educated workers in two ways. First, because revenues of domestic firms have fallen, the wage ratio of workers remaining in these industries decreases. Second, to the extent that foreign competition reduces employment in the concentrated industries, many of the workers move to lower-paying competitive sectors, while the wages of less-educated workers fall relative to the educated workers. The conventional theory of the labour market assumes that while the marginal revenue product for labour (MRP_L) determines a firm's demand for labour in the short run, the demand under the conditions of the aggregate industry

level is determined by the prevailing wage rate in the industry. The theory postulates that the responsiveness of labour in industry to changes in the wage rate is measured by the elasticity of labour demand.

Labour market segmentation is another issue influencing earnings and recruitment of the workers in this market. Under the segmentation phenomenon the labour market comprises two segments, the primary and the secondary sectors. Doeringer and Piore (1979) argue that the two sectors are interconnected, as the workers' movement between these sectors occurs at certain job classifications that form ports of entry to, and exit from, the internal or primary labour market. The internal labour market provides workers with certain privileges such as better pay, work advancement, employment stability, training opportunities, and better working conditions. In this segment, workers have specific administrative rules that could protect them from the competition of the external labour market, and their workplace is more structured in comparison to their counterparts in the secondary segment. The theory of labour market segmentation attributes the existence of barriers between the two sectors to the characteristics of the secondary sector. These characteristics mainly comprise: instability of employment, high unemployment rates, low wages and poor chances for advancement, poor training opportunities, and absence of administrative rules for work.

This study covers various issues related to the compensation structure of employees in the Saudi labour market. It finds that with the booming oil revenues of the 1970s, Saudi Arabia adopted ambitious development plans that aimed to raise the standard of living and to build some new economic activities through financing of both public and private projects. These plans obliged authorities to import skilled and unskilled workers and to contract with multi-national companies, which brought their experts and skilled workers to endeavour to rebuild the country and change it from its subsistence state into a modern economy.

Foreign workers came from different parts of the world to meet the new demand for labour in different occupations. They actually formed the labour force in the country, as their participation rate in the labour market hovered around 70% in the 1980s. This study found that Saudi workers preferred recruitment in

government departments rather than with the private sector, but with restrictions and freezing of recruitment for these departments in the 1990s, unemployment emerged among these workers for the first time since the discovery of oil in the 1930s.

This pushed the authorities to adopt new policies that aimed at decreasing the number of non-Saudi workers in the labour market. Therefore, many jobs occupied by non-Saudi workers started to be substituted by Saudi workers, in both the government departments and the private sector. This is what is known as the Saudisation policy.

The study finds that regulations strictly control the labour market in the country either directly, through labour law, civil service regulations, pension, and social security insurance acts, or indirectly, through migration regulations.

Consequently, these regulations have largely contributed to increase labour market segmentation in the country, as they allocate many preferential work privileges to Saudi workers rather than to their non-Saudi counterparts. The residency regulations that are applied only to non-Saudis require a Saudi sponsor before workers enter the country and allow them to move in the labour market only under certain conditions. More regulations are in place to restrict the mobility of non-Saudi workers across firms and occupations once they are admitted to Saudi Arabia. These regulations allow the foreign or non-Saudi workers to stay in the country only for a temporary renewable period.

In contrast, labour market regulations provide Saudi workers with better working conditions in the areas of recruitment, payment, work hours, vacations, training, work advancement, compensation, and pension, while their non-Saudi counterparts in both the government departments and the private sector are denied these privileges. This largely contributes to the wage differentials between the two groups of workers, and increase segmentation of the labour market.

The study examines a range of variables that affect the wage differentials and these are classified into three categories: demographic factors, human capital components, and workplace characteristics. These variables provide an instrument to interpret the earnings differentials (compensation) between Saudi and non-Saudi workers in the chemical and petrochemical industries.

Due to the paucity and restrictions in official data, the present study employs a survey among the workers in the Saudi Chemical and Petrochemical industries. As an initial step to analyse the survey information, simple descriptive statistical methods are used to reveal the structure of employee compensation according to various classification schemes. The descriptive analysis shows percentile ranking of the earnings distribution between Saudi and non-Saudi workers in the chemical and petrochemical industries.

The aggregate earnings ratio of Saudi to non-Saudi workers in the lower 10th percentile is 1.8; the ratio in the median percentile is 1.75; and the ratio in the upper percentile is 1.92. Ranking of the earnings distribution based on the demographic characteristics, human capital components, and workplace characteristics provides further evidence of higher earnings by Saudi workers than their non-Saudi counterparts.

Age as a demographic factor shows an influence on workers' earnings, which increase as the worker's age increases. Application of the percentile measures to the demographic factors reveals that Saudi workers in different age groups have higher earnings than their non-Saudi counterparts across the three percentile ranks. The relationship between marital status and earnings differentials shows a positive influence of the marriage institution on the workers' earnings in the Saudi labour market. It reveals that married workers in the chemical and petrochemical industries earn more than unmarried workers by 42%. The cross-sectional data has recorded the same result among workers in each of the two groups. The Saudi married workers earn more than their unmarried fellow workers by 52% to 82% across the three percentile ranks, while the earnings differentials between the non-Saudi married and unmarried workers ranges between 41% and 83%.

The presence of children is another demographic factor that influences the workers' earnings. The study finds differences in earnings between workers with children and workers without children between the two groups of workers. The earnings ratios of Saudis without children to non-Saudi workers with and without children show higher earnings in favour of Saudi workers without children.

Considering influences of the human capital components on earnings differentials between the two groups of workers, the descriptive analysis shows

positive impacts of education, training, and experience on the earnings of these workers. The earnings ratio of Saudi workers with various educational levels to their non-Saudi counterparts range between 2 to 3 across the educational levels from primary to university. The percentile ranking measures reveal the same trend with earnings differential ratios ranging between 1.64 and 2.55 in favour of Saudi workers with different educational qualifications.

In addition, the study examines the influence of years of work experience on the earnings inequality between the two groups of workers. The descriptive analysis shows that Saudi workers in the chemical and petrochemical industries have less experience than their non-Saudi counterparts by 16 years on average, but Saudi workers receive higher earnings than their non-Saudi counterparts. The earnings inequality ratio between the two groups of workers range between 1.85 and 3.67 for Saudi workers across experience years.

The occupational status of the workers in the chemical and petrochemical industries has influence on the earnings distribution among these workers as well. The dissimilarity index or discrimination index shows some differences in distribution of the two groups of workers across occupations. The study finds that Saudi workers are relatively concentrated in white-collar jobs, particularly in managerial and clerical jobs, as they make up about 67% of the Saudi respondents, while the non-Saudi workers are relatively concentrated in the professional, production, and technical occupations, with a proportion of 58% of the non-Saudi respondents. The study finds that about 49% of either, or both, Saudi and non-Saudi workers have to shift their jobs for the occupational distribution among them to be completely identical. The occupational earnings ratio tells of a continuity of earnings inequality in favour of Saudi workers who earn between 49% and 71% more than their non-Saudi counterparts, as is indicated by the earnings ratios of Saudis to non-Saudis across occupations.

Considering the relationship between earnings and worked hours in the chemical and petrochemical industries, the study finds that Saudi workers earn more than their non-Saudi counterparts even when both of them work the same number of hours. The earnings ratio of the two groups of workers who work between 45-48 hours per week records earnings differentials between them as 1.85

for Saudi workers, while the earnings differentials between the two groups who work between 50-53 hours is 1.97 in favour of Saudi workers.

The study tries to examine the workers' job satisfaction in terms of non-pecuniary benefits that include: health services, paid leave, mobility in the labour market, and job security. It finds that the Saudi workers enjoyed more job satisfaction than their non-Saudi counterparts on top of the earnings ratio of 1.94 in favour of the Saudi workers.

To further enhance the understanding of the wage determination mechanism in the selected industry, the techniques of regression analysis and the Oaxaca-Blinder decomposition analysis have been employed. Regression analysis of the labour supply side factors is divided into two main parts: estimation using the overall sample, and estimation using the sub samples of each of the two groups of workers (Saudi versus non-Saudi).

The results of the regression analyses show that the ethnicity or nationality variable has a substantial influence on the workers' earnings in these industries. Workers with Saudi nationality receive a premium of 87.7% more in their monthly earnings than their non-Saudi counterparts.

The estimates of the impact of the demographic variables that comprise marital status and children reveal that the former variable has a positive effect on the workers monthly earnings, while the children appearance has a negative effect on workers' monthly earnings in the chemical and petrochemical industries.

Estimates of the human capital components that comprise education, training, and experience reveal significant influences on workers' earnings. The coefficient on education is estimated at 70.2% for university qualifications and 54.7% for technical qualifications, while workers with secondary qualifications have a lower earnings return than their colleagues with technical qualifications, but higher than those with intermediate qualifications.

The study finds that training has a negative influence on a worker's earnings in the chemical and petrochemical industries as the training courses a worker had attended during the previous three years were not considered to be a compensation factor. It finds that the actual work experience variable has a

marginally positive effect on the earnings of these workers (with a coefficient estimated at 3.8%).

The workplace variables comprise occupational status, possibility of job mobility, job security, health services, paid leave, work advancement, and work injury insurance. The occupational status variable reveals relatively low influence on earnings of the workers in professional and technical jobs in comparison to their colleagues in the foremen occupations, as well as for those in clerical and managerial jobs. Some workplace variables such as paid leave, health services, job security, and job mobility produce marginally positive effects on the workers' earnings with rates ranging between 3.7% and 0.8% for all workers, with the exception of the health services variable which produces a negative impact on the workers' monthly earnings in the chosen industries.

Insofar as separate regression analyses for Saudi and non-Saudi workers are concerned, it is found that the coefficients of the marital status and children reveal relatively low positive effects on Saudi workers' monthly earnings in comparison to a negative estimate for the marital status coefficient on the monthly earnings of the non-Saudi workers who do, however, gain by having children.

The results of the regression for the two groups of workers indicate that education has a positive influence on earnings for both groups of workers. Rather interestingly, non-Saudi workers are rewarded more for their education than their Saudi counterparts. This suggests that these workers are more educated than their Saudi counterparts and confirm that the earnings variation is mainly due to the nationality or ethnicity variable. It is found that between the two groups of workers high education levels are associated with higher earnings; also, the estimates of the impact of the work experience provide positive effects on the earnings of both groups. It is found that an increase in the experience of the Saudi workers by one year could provide them a 4.3% increase in his/her monthly earnings, while non-Saudi workers can gain 3.4% in their monthly earnings. This piece of evidence may be an indirect indictment of the discriminatory labour market policy in Saudi Arabia: earnings variation is mainly due to nationality or ethnicity variable rather than human capital variables.

The estimates of the workplace characteristics indicate irrelevant results for occupational status on the earnings of Saudi workers, as it is found that foremen are rewarded better for their occupation than their fellow workers in other occupations. This is in contrast to the non-Saudi workers whose earnings profile is generally consistent with their hierarchical occupational status.

The results of the regression analysis explain advantages and disadvantages of working conditions provided for employees in the chemical and petrochemical industries. The workplace variables have their positive influence on the monthly earnings of Saudi workers, except for the paid leave characteristic, which has a negative effect on the monthly earnings of these workers, while these variables have marginally positive effects on the monthly earnings of non-Saudi workers for such privileges, except for health services and job security, which have negative effects on their monthly earnings.

Based on Goldin's (1990) suggestion of the decomposition technique, the study decomposed compensation of Saudi and non-Saudi workers in the chemical and petrochemical industries. It found that Saudi workers are compensated higher than their non-Saudi counterparts, as the earnings differential between the two groups of workers is estimated at 62.6% in favour of Saudi workers, while the aggregate value of the explained portion of the compensation structure of the two groups of workers is estimated at 3% of the total wage differentials and the unexplained portion reveals extreme estimates at 97% of the total wage differentials. This unexplained portion is much higher than the estimates in other similar studies. There are a number of possible reasons for this unusually high estimate in the present study. On the one hand, the level of wage discrimination in the Saudi labour market can indeed be much higher than elsewhere, as discrimination is actively encouraged or protected by government policies in Saudi Arabia but generally discouraged or rectified elsewhere. On the other hand, the present estimate may be subject to error because some other relevant variables may be missing from the estimated earnings equations. One potential source of error is the omission of demand-side factors in the estimated wage equations, which is a standard practice in the literature on wage differential and wage discrimination. However, this omission cannot significantly change the basic findings of this

study. Although the demand-side variables are omitted from the wage equations, the chosen supply-side variables explain very well the log-wage variable (the dependent variable) as the coefficient of determination (R^2) for the estimates of the pool sample indicates that these variables can explain 87.7% of variation in log-wage of workers in the chemical and petrochemical industries. Therefore, it can be claimed with confidence that labour market discrimination is significantly higher in the Saudi labour market than elsewhere.

The current investigation does not attempt to capture directly the quantitative effects of the Saudisation policy on the extent of labour market segmentation and wage discrimination, it is nonetheless beyond reasonable doubt that the Saudisation policy is a major source of the substantial wage discrimination in the selected Saudi industries. Although not a focus of the current research, the far-reaching effects of the Saudisation policy on the Saudi labour market and the Saudi economy need to be carefully examined. It is worth noting that there have been some improvements in the performance of the labour market for the Saudi nationals, as the overall unemployment rate decreased from 13% in 1992 to 8.1% in 2000 and the labour market participation rate increased from 31.1% to 35% over the same period. However, the improvement, especially in terms of labour market participation, seems to be rather small. Moreover, there are potentially significant adverse effects associated with the Saudisation policy, both in the short-run and over the long-run.

First of all, the Saudisation policy has led to a significant problem of mismatch between jobs and skills. As many Saudi workers are new entrants to the labour market and thus lack the relevant skills and experience for the usually demanding skilled jobs, they are not as qualified as the non-Saudi workers whom they are replacing. As a result, the overall productivity of the workforce must be reduced. Moreover, as the Saudi workers usually have a higher reservation wage than the non-Saudi workers across the board, the cost of labour and thus the cost of production must have been increased. This has an adverse supply-side effect which tends to increase wages and prices in the economy whilst reduce the rate of employment in the meantime.

Second, the Saudisation policy and the substantial level of wage discrimination distort the labour market incentive structure and the relative prices system in the economy. As a result, the problem of misallocation of labour and other economic resources arises or deteriorates. Moreover, the use of government subsidies to the private sector for the purpose of recruiting Saudi nationals will strain the public finance, which calls into question the long-run sustainability of the policy.

Finally, this policy over-protects Saudi workers from competition in the labour market, which could lead to a dependency culture among the Saudi workers. The over-protection could lead to reduced efforts to compete, innovate, invest in human capital, and search for alternative job opportunities. Moreover, the marginal rise in the labour market participation rate among the Saudis is an indication of the limited effect on the work attitude of the economically inactive Saudi nationals. This adverse impact on the long-run competitiveness of the Saudi workforce and thus the Saudi economy is a particular cause for concern, as an increasing number of Saudi firms are establishing cross-border production such as SABIC and as the country is about to join the WTO. Therefore, the Saudisation policy has to be seriously re-evaluated and reformed in order to improve the competitive standing of the Saudi economy in the context of increasing globalisation.

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Appendix I
Source of Official Document on the
Saudisation Policy


Saudisation or nationalisation refers to the labour policy adapted in Saudi Arabia in the 1980s and applied to different economic sectors such as foreign banks in the country, oil companies, and to the labour market when the expatriates in the top ranks were substituted by Saudi nations. Although the implementation of the saudisation policy started in the 1980s, there are no a high rank official decree on the policy. So the practice of Saudisation was largely informal and on a limited scale. In the 1990s, this policy is widely applied in the labour market and covers all occupations. The policy aims to replace foreign workers by Saudi nationals. It mainly based on the Ministerial Decree No.50 of 1994, which states that firms employing over20 workers to have reduce the number of foreign worker by 5% a year.

APPENDIX II :
Questionnaire to
Workers in Chemical and Petrochemical Industries

Purpose of this Questionnaire:

This questionnaire aims to collect data on some aspects of labour economics among workers in the Chemical and Petrochemical industries in Riyadh , Jeddah and Dammam the main three cities of Saudi Arabia . This to fulfill requirements of Ph.D. degree .

Information and answers to this questionnaire will be consolidated and generalized in the study , in addition your answer will not be used as example in any part of the study and will not be used in any other purpose except the academic .

It is not require to mention name or address .Please, sure your answer to all question is valuable and will contribute to the results and conclusions of the study. In most cases you are required to tick in the appropriate box to the answer that is the most appropriate to you please, in such cases, use (X) 

Part I

Area..... Age Nationality.....

Marital Status:

(please tick the appropriate answer)

Married

Unmarried

Number of Children

Daily Work Hours

Part II : Experience and Training

1-Total Experience *(in home & Saudi)* years

2-Work Experience in Saudi years

3-What is your current occupation?

Managerial job Professional Sales Clerical

Technician Craft Job

4-Did you change your job in the local labour market before?

Yes No

If (yes) What reason(s) ?

(Please tick the appropriate answer)

work itself not suitable to my experiences

looking for higher wage

looking for a secured job

others *(States)*

.....

5-Please, what reason (s) make you to stay at the current work?

work satisfaction

employer objection

exhaustion of the allowed period

6- Do you think it is easy to change your employer in the local market ?

Yes No

7-Did you ever be unemployed during last three years?

Yes No

8-Education:

primary intermediate secondary
technical education university & Higher

9-Did you receive any type of training during the last three years?

Yes No

Part III -Wage and Benefits .

10-What factor(s) determine your wage in the current job?

(Tick the appropriate answer(s))

For Saudis

For non-Saudis

qualifications

qualifications

experience

experience

personal negotiation

personal negotiation

kinship relation to the employer

standard of living in country home

family size

standard of living in the local market

hours of work

family size

type of work itself

hours of work

wage levels in the same occupation

type of work itself

wage level of other colleagues in the

wage levels in the same occupation

same work

wage level of other colleagues in the

nationality

same work

language skills

wage level of the same nationality

rate my national currency to SR

language skills

driving experience

other (states).....

11-Do you face any problem to receive your wage on the date?

Yes No

If yes, state this problem (s).....

12-Please, what are main components of your usual wage ?

A- Pecuniary Benefits:

- basic monthly wage (in figures) SR
- transportation allowance (in figures) SR
-
- housing allowance (in figures) SR
-
- traveling expenses (in figures) SR
- annual allowance (in figures) SR
- bonus(in salary month equivalent)

B-Non- pecuniary Benefits

(Please, check the appropriate box for the suitable answer)

	Satisfied	dissatisfied
- promotion	<input type="checkbox"/>	<input type="checkbox"/>
-earnings	<input type="checkbox"/>	<input type="checkbox"/>
- job security	<input type="checkbox"/>	<input type="checkbox"/>
- working free	<input type="checkbox"/>	<input type="checkbox"/>
-hours of work	<input type="checkbox"/>	<input type="checkbox"/>
- post status	<input type="checkbox"/>	<input type="checkbox"/>
-work relations	<input type="checkbox"/>	<input type="checkbox"/>
-health services	<input type="checkbox"/>	<input type="checkbox"/>
- paid leave	<input type="checkbox"/>	<input type="checkbox"/>
-injury risks insurance	<input type="checkbox"/>	<input type="checkbox"/>

13-What period does this wage cover?

(Tick the most appropriate answer)

Weekly

Bi-monthly

Monthly

Others (states)

14-Are you subscribe to the Social Insurance Organization?

Yes

No

⇒ skip to Q 16

What risks do you insured against?

(Tick the appropriate answer):

-pension (include accident)

-accident only

15-When you get close to retirement age(or 65 old years) ; what are you planning to do?

(Tick the appropriate answer)

A- For Saudis

- run own business
- look for another job
- stop work and stay at home

B-For non-Saudis

- look for another job
- back home and run own business
- back home and stay at home

16- Are you satisfy with your current pay ?

Yes

No

17-Do you think there is other colleague(s) who in a similar occupation of yours and

receive more pay than you?

Yes No

If yes , what do you think is the reason(s)?

- education
- training
- experience
- nationality
- martial status
- family size
- work hours

other(s)

states.....

18-Do you have a chance to change your current wage level?

Yes

No

If (yes), how can that be ?

- Through:
- promotion
- applying a request
- arguing to labour office

if (No) what is the reason(s)?

- lack of promotion system
- in the firm
- restrictions of the contract
- rigidity of job evaluation s