THE EFFECTS OF SKILL BIASED TECHNOLOGICAL CHANGE (SBTC) AND TRADE ON THE RELATIVE DEMAND FOR LABOUR: A CASE STUDY IN MALAYSIA DURING 1983-1999

by

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ABSTRACT

This thesis is concerned with the two main causes of wage inequality in the Malaysian labour market during the period 1983-1999. These are the impact of changes in trade patterns and technological change. These two hypotheses have been well tested using the Heckscher–Ohlin and Samuelson (HOS) models following the pioneering work by Lawrence and Slaughter (1993), Haskel and Slaughter (1998;2002) and Wood (1994). This theoretical framework provides three methodologies to measure relative demand changes namely: a decomposition approach, a cost function approach and the use of earnings equations which can then be used to examine the significance of trade and technology in determining the changes. All of these are used in the study.

The study has employed two sets of data. Firstly, we have used the five-digit aggregate data for the manufacturing sector between 1983-1999 to estimate the changes that take place between, and within, industries in the sector. The second set of data comprises micro-level data from the Household Income Survey (HIS) for several years during the period 1984 to 1997. As far as the different sets of data are concerned, at a macro-level we have divided labour groups into skilled, semi-skilled and unskilled workers. On the other hand, the skills measured in the micro-level data are based on the workers' levels of education though we have based these on similar levels of skill as in the macro analysis.

The main finding of this thesis is that changes in the relative demand for labour favour semiskilled workers and that technological change is the main explanation for the changing pattern of employment in the Malaysian economy. The study also finds that changes in the pattern of trade have had only small effects in explaining the changes in the relative demand for labour. Notwithstanding this, this study finds a some support for the prediction of the basic HOS model in that trade can explain the changes in industry skill wage premia at higher levels of education. In addition, and not unexpectedly, trade is also found to increase the relative demand for production workers at low levels of education. Interestingly, the study also finds that technological change is more dominant in explaining changes in the relative demand for males whilst the effects of trade are most evident for female workers. Finally, the study also shows that changes in relative demand are most evident in terms of the way they affect employment rather than through changes in wage levels.

Dedicated To My Family

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CHAPTER 1
INTRODUCTION

1.1. Introduction

The issue of wage differentials between skilled and unskilled labour has attracted much interest from economists in the last few decades. Although the potential causes of changes in differentials are many, the literature has particularly focused on two factors, namely international trade and technological change. Using both aggregate and micro data, this study aims to provide empirical evidence of the causes of changes in wage differentials in the context of a developing country, Malaysia. It thus attempts to address a significant gap in the previous literature regarding the causes of wage differentials in developing countries, generally, and more specifically in Malaysia.

This chapter is structured as follows. We provide a background to the study in section 1.2. Section 1.3 then presents the main objectives the study aims to achieve. Section 1.4 discusses the scope and limitations of the study, and in the last section, Section 1.5, we provide the organization and structure of the thesis.

1.2. Research Background

In the 1980s, Malaysia initiated a comprehensive structural adjustment programme such that by 2020, Malaysia aimed to be an industrialised country and a developed nation. An important part of this program was a comprehensive industrial plan, called the Import Substitution 2 (IS2) plan (1980-1985), followed by the Export Orientation 2 (EO2) plan between 1985 and 2000. As their names suggest, the first stage in the industrial plan was to develop home industries that could meet local demand. The second stage, then sought to promote economic growth through the expansion of exports. Also, as part of the industrial plan in 1991, Malaysia introduced its Multimedia Super Corridor, which aims to introduce information technology (IT) to Malaysian society and workplaces. As a further part of the plan to develop a knowledge society, in the Third Outline Perspective Plan (OPP3), Malaysia is building up a knowledge-based economy and is working towards establishing a knowledge-based work force. In consequence, employment growth has rapidly increased. According to the International Labour Organization (ILO), this rapid employment growth may create its own problems. In many East Asian countries and in some Latin American economies, trade liberalization has increased the demand of skilled workers, which has occasionally fallen short of supply, despite increasing wages. In Malaysia, for example, between 1986 and 1994, a small fraction of the rising wage gap between skilled and unskilled workers is attributable to their differential demand elasticity. Skilled workers also had a smaller supply elasticity than semi-skilled and unskilled workers. In China, the pressure from improved competitiveness and the adoption of new technology has increased the demand for skilled and professional workers more than the supply and created an imbalanced labour market. This situation has also arisen in Chile since it underwent trade liberalization in the 1980s, Chile has been concerned with the increasing inequality between skilled and unskilled workers due to the scarcity of skilled workers. Although the patterns of movement in the Malaysian wage structure have been documented in a few studies, much disagreement remains concerning the fundamental causes of these changes and the nature of the changes that have taken place. Thus, this study sets out to assess and explore the nature and causes of skill differentials in the case of Malaysia.

As has been well documented in developed countries, especially in the U.S and the UK, rising wage inequality and the increasing employment share of skilled workers are due to the factors underlying shifts in the relative demand for skills, namely, trade and technology. As regards technology, the argument is based on the hypothesis of skilled biased technological change (SBTC). Increasing information technology (IT) is fostering the relative productivity of more educated workers and the employment shares of skilled workers. However, even amongst those economists who favour SBTC as an explanation of the changing nature of wage and employment structures, there are still disagreements about whether this originates from trade-related factors (and is sector biased) or whether its impact is factor-biased affecting particular groups of workers. Alternatively, there is the argument that the changes observed arise because of changes in the pattern of trade and are not skill-biased. These ideas are explained in more detail in Chapter 3 and are applied in the thesis to a developing country in Chapter 5 through to 7.

1.3. Objective of the Research

The thesis is thus concerned with the changing structure of the labour market in Malaysia during the 1980s and 1990s. It aims to identify the causes of the observed changes by examining the relative demand for different types of labour in Malaysia during that period using a theoretical framework based on the Heckscher Ohlin Samuelson (HOS) model. As the manufacturing sector has been the major contributor to Malaysian economic growth, the study also examines the nature of changes in relative demand in this sector. A number of different empirical techniques are used to assess the relative importance of technology and trade on the demand for skilled, semi-skilled and unskilled labour. The role of gender and level of education is also examined. More specifically, the objectives of the research are as follows:

1. To measure impact of technology and trade on relative demand and wages using different decomposition techniques and cost function analyses;
2. To measure the effects of trade and technological change by gender and level of education;
3. To measure the effects of trade and technological change on skill-based wage differentials;
4. To analyse the relative demand for labour using a supply and demand framework which enables us to measure the effects of trade under different assumptions;
5. To analyse inter-industry wage differentials and to compare changes over time in wage differentials for the traded and non-traded sectors.

The study will analyse the relative demand for labour in Malaysia during the period 1983-1999 using aggregate and micro data.

1.4. Scope and Limitations of the Research

This study covers the changes in wage inequality in Malaysia from 1983 to 1999. The 1980s were chosen because of the structural changes in the Malaysian economy that occurred during this period. In addition, before the 1980s, the changes in technology in Malaysia that did take place were very slow. Moreover; data limitations mean that they could not be reliably measured. Indeed, we do not begin with 1980 because of different terminologies and incomplete data in the first few years of the decade. This study could also not go beyond the year 1999 again because of changes in definitions used in the main data sources which cannot be reconciled.

A second limitation is that the study only measures the technological change using the data for Total Factor Productivity (TFP). Due to data limitations, we are not able to measure the direct effects of technological change, for example, using computer data as some previous studies have done (Berman and Machin, 2000). As a developing country, during the 1980s, economic data in Malaysia were collected by various institutions and bodies: information about IT is collected by the Ministry of Science, Technology and Environment and was more advanced and used different definitions from those applied in the surveys conducted by the Department of Statistics (DOS), the main source of data used in the present study. Different sources therefore made it impossible to bring the data together for suitable analysis. It was not until 1996 that the DOS took over all data management and compiled all the data from different ministries. Thus, this limits the sort of analysis that cannot be carried out for Malaysia during the 1980s and 1990s.

1.5. Organisation of the Thesis.

This thesis is organized into eight chapters. Chapters one to four deal with the background to the study, evidence from previous work and the theoretical framework. The remaining chapters present the empirical research, which covers the estimation techniques, results, discussion and conclusion. A summary of the chapters is presented below.

Chapter 2 describes Malaysia's economic background. First, we discuss structural change in Malaysia and policy adjustments during the period of study. Second, this chapter gives background information on employment and wage structures in Malaysia. Third, it covers trade policy and technology policy in Malaysia at this time. Also the chapter emphasises the importance of the manufacturing sector for economic growth in the country.

The theoretical foundations about the causes of changes in wage differentials are presented in Chapter 3. The trade hypothesis is theoretically explained using the Heckscher-Ohlin-Samuelson (HOS) model. This model is able to capture the effects of trade and the indirect impact of technological change associated with the sector bias of technological change. The direct impact technological change is explained using a standard demand and supply for skills framework.

The literature on the empirical studies related to wage differentials using three different methodologies, which provides evidence for a variety of developed and developing countries, are presented in Chapter 4. This chapter also details the empirical models that previous studies have tested and that will be used in the thesis.

In Chapter 5, the relative demand for employment and wages are measured using the decomposition and cost function approaches. These approaches measure the affects of changes in the pattern of trade and technological change in relative labour demand using aggregate manufacturing data. This chapter focuses on three types of production workers in Malaysian manufacturing; skilled, semiskilled and unskilled.

Chapter 6 presents a descriptive analysis of the Household Income Survey (HIS) data. The importance of this chapter is that it reveals an overview of the data that will be used in the next chapter. This chapter also presents the pattern of employment and wages during the sample period 1984 -1997.

Using a micro level data set, Chapter 7 measures the relative demand for different skill groups using the decomposition approach. Applying a supply and demand framework, as proposed by Katz and Murphy (1992), this chapter determines the direct effect of changes in the pattern of trade using both equal allocation and production allocation approach, a distinction based on the assumptions made about the way imports impact upon demand. This chapter also explores the changes in wage differentials using Mincer's standard earnings model (Mincer, 1997). At two stage estimation approach is adopted following a number of previous studies and considers the way trade and technological change impact upon industry skill premiums and skill differentials. Finally, this chapter deals with trade effects by comparing traded and non traded sectors in Malaysia during the period 1984-1997.

A summary of the main findings and the policy implications and recommendations that follow from the empirical analysis are presented in Chapter 8. As we shall see, the Malaysian government has pursued various policies and national plans in order to achieve economic growth and the goal of becoming an industrialised country by 2020. The results of our analysis indicate that the Malaysian economy has undergone major changes since 1980 and that these are reflected in the changes that are found in the labour market. In particular, we find that technological change has favoured the employment of semi-killed over skilled and unskilled labour. The principal issue therefore is whether this is indicative of the limited potential currently faced by Malaysia in terms of its economic development.

CHAPTER 2

TRADE, TECHNOLOGICAL CHANGE AND WAGES IN MALAYSIA

2.1 Introduction

This chapter provides an overview of the Malaysian economy, with a particular focus on trade, technological change, wages and employment during the period under study. The two critical questions addressed in the chapter are as follows: how did the Malaysian economy change during the period, and how did the trade expansion and the technological changes that also took place affect employment, skills formation and wages? At this stage we will only focus on general trends; a more detailed analysis will be presented in Chapters 5, 6 and 7.

The chapter is organized as follows: the first section presents Malaysia's mid and long-term plans that were introduced in order for the country to become a developed nation by 2020. It explains in detail, the strategies and policy agendas that were in place at the time. Section 2.3 presents an overview of economic performance and labour market trends in Malaysia. It focuses on changes in the manufacturing sector. The discussion is concluded in Section 2.4.

2.2 The Policy Context

Located in South East Asia and bordered by Thailand in the north and Singapore and Indonesia in the south, Malaysia belongs to a group of successfully integrated developing countries. It has a land mass of approximately 330,000 square kilometres. As a developing country, it aims to achieve the status of a developed nation by 2020. To encourage the development of its economy, Malaysia has mapped out a series of medium to long-term plans.

As described in Table 2.1, column (2), the long term aspects were set out in the First Outline Perspective Plan (OPP1) covering the period 1970-1990. Under this long-term plan, the Government established a number of shorter-term Malaysia Plans (Malaysia Plan 1-5). The aims of these are also set out in Table 2.1. The Second Outline Perspective Plan (OPP2) was introduced to cover the period from 1990 to 2000 and was implemented through Malaysia Plans 6 and 7. Finally, the Third Outline Perspective Plan (OPP3) was designed to be implemented from 2001 to 2020. To date it has been introduced through Malaysia Plans 8 and 9.

Generally, as shown in Table 2.1, during OPP1 the emphasis was on improving social and economic development primarily through encouraging the participation of the *Bumiputera* (literally, 'sons of the soil') in a wider range of economic activities. In the early stage of OPP1, the economy of Malaysia was dominated by the primary sector and depended crucially on commodities such as rubber and tin. During the First and Second Malaysia Plans, the New Economic Policy (NEP) was adopted with the aim of channelling a greater share of future economic growth into Malay hands. As a result, the Malaysian Industrial Development Authority (MIDA) and *Majlis Amanah Rakyat* (MARA) were established to encourage Malay-controlled businesses. Several other bodies were also started under the plan, including the *Perbadanan Nasional* (PERNAS, or the National Trading Corporation) the State Economic Development Corporation and the Urban Development Authority (UDA). PERNAS was established to purchase businesses and participate in joint ventures with private companies, as well as to develop nascent industries to be held in trust until Malays held sufficient capital to take them over. By the end of the plan's tenure, PERNAS owned 100% of eight companies involved in insurance, trading, construction, properties, engineering, securities and mining. These included, for example, the National Oil Co. (PETRONAS) established in 1974 with the overall aim of acquiring a majority control of the country's petroleum.

Table 2.1: Malaysia Plans 1966-2006

Year	Malaysia Plan		Aims	Policy Implementation	Achievement
(1)	(2)		(3)	(4)	(5)
1965-1970	First Malaysia Plan	OPP1	• Promote integration of the people of Malaysia. • Stimulate new lines of economic activity in both the agriculture and industrial sectors. • Develop and expand the social and physical infrastructure of the economy.	• Open new land for development to keep pace with the formation of new farm families, namely FELDA.	
1971-1975	Second Malaysia Plan		• Ensure more equitable distribution of wealth via the New Economic Policy. • Improve social and economic development. • Focus on the private sector as the engine of growth.	• Introduce New Economic Policy (NEP).	• 1974-Established National Oil Company (PETRONAS). • 1975–PERNAS to encourage Malay people in business.
1976-1980	Third Malaysia Plan		• Reduce poverty and increase the share of Malay and other indigenous people in employment in mining, manufacturing and construction and raise their ownership in productive wealth. • Encourage and support private investments, both domestic and foreign. • Promote further utilization of the country's abundant human and natural resources.		

Table 2.1: Malaysia Plans, 1966-2006 (continued)

Year	Malaysia Plan	Aims	Policy Implementation	Achievement
(1)	(2)	(3)	(4)	(5)
1981-1985	Fourth Malaysia Plan OPP1	• Develop rural areas. • Focus on heavy industries • Encourage collaboration between public and private sector.	• 1981- National Agriculture Policy. • 1985- Malaysia Industrial Master Plan. • Look East Policy	• Automotive industries. Creation of first Malaysian car: the Proton). • Perwaja Steel • DRB HICOM • Penang Bridge
1986-1990	Fifth Malaysia Plan	• Revitalize the agriculture sector. • Emphasize research and development. • Develop human capital. • Increase the role of the private sector. • Promote an industrial economic basis. • Promote foreign investment and export.	• 1986- Privatize electricity company, airline, telecommunications and maritime. • 1990- The Action Plan Development (APITD) of 1990	• 1990 - Investment in IT of RM 1.3 billion – Numbers of personal computers (PCs) 160,000 units

Table 2.1: Malaysia Plans, 1966-2006 (continued)

Year	Malaysia Plan	Aims	Policy Implementation	Achievement
(1)	(2)	(3)	(4)	(5)
1991-1995	Sixth Malaysia Plan OPP2	• Sustain growth momentum of the economy, emphasis on balanced development. • Promote IT development • Set up Vision 2020	• Launch of the OPP2, establishment of the National Development Policy (which replaced NEP). • Human Resource Act of 1992 • 1992- Malaysian Technology Development Corporation (MTDC) • 1993- Malaysia Industry-Government High Technology (MIGHT)	• Kulim High Tech Park. • 1995 - Investment in IT RM 3.8 billion - Number of PCs 310,000.
1996-2000	Seventh Malaysia Plan	• Focus on raising the standards of science and technology (IT). • Enhance potential output growth. • Achieve further structural transformation and balanced development. • Accelerate productivity and efficiency. • Promote a more viable Bumiputra commercial and industrial community by encouraging their participation in strategic industries.	• 1996- Second Industrial Plan (IMP2) • 1997- Multimedia Super Corridor (MSC). • 1998 - 2000. Policy shift from an input-driven strategy to a productivity- driven strategy after economic crisis	• Small and Medium Enterprise (SMEs) parks in all states.

Table 2.1: Malaysia Plans, 1966-2006 (continued)

Year	Malaysia Plan	Aims	Policy Implementation	Achievement
(1)	(2)	(3)	(4)	(5)
2001-2005	Eighth Malaysia Plan OPP3	• Pursuit of sound economic management, ensuring prudent fiscal and monetary policies. • Strengthen and streamline distribution strategies and programmes to ensure balanced participation among and within ethnic and income groups. • Expand usage of IT. • Strengthen the human resource base. • Enhance productivity growth via R&D, science and technology.	• Launch of OPP3, which is underpinned by the National Vision Policy. • Developed Knowledge Based Index (KDI) to monitor the progress of economy towards becoming more knowledge-based.	• Human resource achievement • Development in the higher value added manufacturing sub- sectors, such as petrochemical, maritime, aerospace and heavy machinery industries.
2006-2010	Ninth Malaysia Plan	• Emphasis on human resource development, with a focus on the education system. • Develop new growth sources, especially in service sectors, such as tourism, health and education. • Enhance productivity and efficiency in all sectors. • Improve the delivery system. • Focus on agriculture, especially on downstream activities.	• Focusing on 3 sectors: Manufacturing, Services and Agriculture. • Textbook loan scheme • Facilitate access to higher education. RM 7.9 billion disbursed to scheme.	• The number of students enrolled in science and technical related programmes at first degree and diploma levels increased from 229,014 in 2000 to 291,546 in 2005

The Second Malaysia Plan, focused on agriculture, particularly on diversifying the crops grown, and reducing rural poverty in Malaysia. According to the Malaysian Government, the incidence of poverty fell from 49.3 percent of the households in 1970 to 5.1 percent in 2002. Nearly 90 percent was in rural areas where the incidence of poverty was 44.3 percent compared with 4.2 percent in urban areas. By 2002, the incidence of poverty had fallen to 5.1 percent of households though again the incidence of poverty is much higher in rural areas (11.4 percent of the rural households) than in urban areas (2.0 percent of urban households) (Malaysia, Malaysia Plan various years). As a result, the Farmer's Organization Authority was established in 1973 with the goal of coordinating agricultural cooperatives, farmers' associations, and government agricultural agencies (Malaysia, Second Malaysia Plan 1971). In 1974, the Green Book programme aimed to make Malaysia self-sufficient in food production by encouraging farmers to double rice crops. It also encouraged the growing of vegetables such as long beans and chillies so that farmers could harvest twice in one year and effectively double their output (Malaysia, Fourth Malaysia Plan 1981). The government also fostered growth in small-scale agriculture to create jobs and reduce rural poverty. Government agencies such as The Federal Land Development Authority (FELDA) vastly increased the scope and size of their development programmes. The Rubber Industries Smallholder Development Agency (RISDA) was given the task of diversifying smallholder estates; RISDA set itself the ambitious goal of developing 150,000 acres (610 km^2) during the Second Malaysia Plan. As a result, the Malaysian economy relied heavily on rubber and it produced more than half of the world's rubber supply. However, the world recession of the mid 1970s depressed rubber prices, and RISDA was quick to react by stopping the development of new land. The main aim then was to diversify into palm oil through the planting of oil palms. By the end of the Second Malaysia Plan, only 40,000 acres (160 km^2) had been developed, with palm oil estates constituting only half this acreage.

The government's land development and resettlement policies under the Second Malaysia Plan did not have the hoped for effect on rural poverty. Approximately 535,000 agricultural families (around 50 percent of families) in Malaysia were reported as living below the poverty level[1] in 1970 yet less than 10 percent were resettled (Malaysia, Fourth Malaysia Plan 1981). Even then, weaknesses in the system meant, according to the Government's assessment of the Second Malaysian Plan, that many of these were not the most deserving families (Malaysia, Review of Second Malaysia Plan, 1976). There were also claims that the programme had attached too much significance to the problematic process of resettling and developing new areas, rather than concentrating on assisting production on existing land and farms. Such issues were made more difficult by the terms of the Malaysian constitution. This left the question of land development in the hands of individual states, and central government was obliged to negotiate with the various state Governments. In addition to all these difficulties, the constitution reserved portions of land for native Malays, to the detriment of non-Malay rural families. Such a situation meant that many state governments were not anxious to resettle destitute rural non-Malays on their territory (Malaysia, Third Malaysia Plan 1976).

As far as education is concerned, some important initiatives were taken during the Second Malaysia Plan. In 1970, Malay, the national language, became the major medium of instruction from primary to tertiary level, replacing English. British standardised examinations were replaced with local ones, and new Malay-language textbooks were introduced. By the end of the Plan, most formerly English-based schools had converted the first four years of instruction entirely into the new Malay-medium curriculum (Malaysia, Third Malaysia Plan 1976). In 1973, the Curriculum Development Centre was established. Its goal was to coordinate projects to reform the curriculum that had previously been handled by various government departments. It also began revamping the curriculum for science and mathematics, and instituted a new programme to review the various social science curricula (Malaysia, Third Malaysia Plan 1976). Also, the Second Malaysia Plan aimed at alleviating the problem of unemployment, especially youth unemployment which accounted for more than two-thirds of total unemployment. To this end, the government increased the availability of vocational and technical training. By the end of the Plan (1975) seven technical and vocational institutions had been built.

[1] This is based on the so-called Poverty Line Income, defined as a level of income sufficient to purchase a minimum basket of food to maintain household members in good nutritional health and other basic needs.

The Third Malaysia Plan (1976-1980) continued to focus on restructuring employment policies amongst ethnic groups. In terms of overall economic growth, an outward-oriented export promotion strategy was implemented. At the end of this period, Malaysia had embarked on a big push towards industrialization. However the economy was plagued with bottlenecks and other development challenges due to the worldwide recession (Nor'Aznin *et al.* 2003).

The Fourth Malaysia Plan (1981–85) proposed a level of development spending, in current terms, of RM 42.8 (£7.13) billion and called for an acceleration of the NEP goal of *Bumiputra* economic participation. Economic planning also stressed a "Look East" policy, with Malaysia attempting to emulate the economic successes of Japan and the Republic of Korea by importing technology from these countries. Major achievements in industrial and infrastructural development projects included a RM900 (£150) million bridge between Pulau Pinang and the mainland and a RM 600 (£100) million automobile-manufacturing plant. Both these opened in 1985.

The Malaysian economy has now been in a transitional stage for more than 20 years in an effort to industrialize; outward-oriented industrialization approaches were the major thrust. As far as trade was concerned, Malaysia implemented two major policies: export-oriented and import substitution strategies. After the recession of 1986, the export-oriented industrialization strategy gave fresh impetus to industrial growth. Import Substitution 2 (IS2) was implemented during the Fourth Malaysia Plan, concentrating on heavy industries such as the steel, cement and automobiles[2]. Promotion of heavy industry through, for example, tariffs and quotas was intended to generate links with the domestic economy and rectify trade imbalances. Tariffs and quotas were the main instruments of promotion under IS2. The policy placed greater emphasis on protection levels rather than on increased import duties. In general, Malaysia has experienced four major phases of industrialization, with import substitution or export orientation dominating each phase. Table 2.2 presents the four phases of industrialization in Malaysia between 1958 and 2000.

[2] Companies promoted in the automobile assembly were Proton and Perodua.

Table 2.2: Industrial Strategies and Trade Orientation, 1958-2000

Phases	Trade Orientation	Period of Dominance	Policy Instruments
Phase 1	IS 1	1958-1970	Pioneer Industries Ordinance, 1958
Phase 2	EO 1	1970-1980	Investment Incentive Act, 1968. Free Trade Zone Act, 1971
Phase 3	IS 2	1980-1985	Heavy Industries Corporation of Malaysia (HICOM) 1980.
Phase 4	EO 2	1985-2000	Industrial Master Plan (IMP) 1986 Promotion of Investment Act, 1986. Action Plan for Industrial Technology Development (APITD) 1990 IMP 2, 1996.

Source: World Bank (2000)

By the end of the OPP1 stage, during the early 1990s, the industrial policy that was the focus of the Fifth Malaysia Plan was associated with a very different industrial structure. The economy was no longer as dependent on primary production because it had an established manufacturing sector. During this plan, industrialization and globalization became ever more emphasized. The 'Chinese Connection' (business links with China, Taiwan, Korea, Singapore and Hong Kong) was implemented to provide incentives and motivate the general business climate between Malaysia and other fast-growing East Asian countries. The presence of a significant Chinese business community is considered a central factor underlining the long-standing importance of Singapore as a major source of investment for Malaysia. This is in addition to the recent new wave of foreign direct investment (FDI) inflow from Taiwan, Korea and Hong Kong to Malaysia. Among East Asian countries, the Malaysian government has been promoting the concept of growth triangles as a vehicle for speedy internationalisation of the economy. There is the Singapore-Johor-Riau (SIJORI) effort, which has been in place since 1989, and the most recent, the Northern Growth Triangle that links the northern most states of Malaysia with Northern Sumatra and Southern Thailand. These triangles (SIJORI and Northern Growth Triangle) are important from the point of view of attracting FDI because they bring together the comparative advantages of three countries in a complementary, rather than a competitive, manner. The Malaysian state of Johor has an abundance of land and skilled and semiskilled labour, as well as a good physical infrastructure; Singapore has high quality human capital, sophisticated financial marketing and service industries and an excellent supporting infrastructure; the Riau

Islands (particularly Batam) of Indonesia have low-cost land and low skilled labour. The creation of a wider manufacturing base with different factor endowments in each area of the triangle provides an incentive for investment.

The Fifth Malaysia Plan (1986–90) moved away from the goals of the NEP, aiming instead at promoting foreign investment, particularly in export industries. Industrial strategies moved once again from a dominant import-substitution strategy to place greater emphasis on export orientation. The external development and the Industrial Master Plan (IMP) introduced in 1986 helped expand manufactured exports considerably from the mid-1980s. The policy of promoting export-oriented industrial expansion concentrated mainly on incentives and infrastructure development. The government also introduced substantial tariff reforms in the domestic market, especially involving light industries (IMP, 1994: 36-38). According to Doraisamy and Rasiah (2001) the incentives offered to export-oriented businesses were excessive and caused a massive capital inflow which began to overheat the economy. There has been a boom in the amount of FDI coming into the country, particularly since the mid-1980s. Between 1987 and 1991, foreign capital inflows increased almost tenfold. Since the mid-1980s, FDI flows to Malaysia have been increasing at a faster rate rather than those to other ASEAN countries. This expansion has occurred in the context of a significant decline in the relative magnitudes of FDI flows from developed to developing countries, compared to flows among the developed countries. Foreign firms accounted for over 45 percent of total manufacturing value added and over three-quarters of total manufactured exports by the mid–1990s (Athukorala and Menon, 1999).

The Sixth and Seventh Malaysia Plans, which cover the long term plan in OPP2, outline *'Vision 2020'* for Malaysia to become a developed nation. Vision 2020 was announced by the former Prime Minister of Malaysia, Mahathir Mohamad, during the tabling of the Sixth Malaysia Plan in 1991. He outlined nine challenges that Malaysia must achieve by 2020:

Malaysia should not be developed only in the economic sense. It must be a nation that is fully developed along all the dimensions: economically, politically, socially, spiritually, psychologically and culturally. We must be fully developed in terms of national unity and social cohesion, in terms of our economy, in terms of social justice, political stability, system of government, quality of life, social and spiritual values, national pride and confidence. There can be no fully developed Malaysia until we have finally overcome the nine central strategic challenges that have confronted us from the moment of our birth as an independent nation. Challenge 1: To form a nation that stands as one. Challenge 2: To produce a Malaysian community that has freedom, strength, and full self confidence. Challenge 3: To develop a mature democratic community. Challenge 4: To form a community that has high moral ethics and religious strength. Challenge 5: To cultivate a community that is matured and tolerant. Challenge 6: To form a progressive science community. Challenge 7: To cultivate a community rich in values and loving culture. Challenge 8: To ensure the formation of a community with a fair economy. Challenge 9: To cultivate a prosperous community (Mahathir, Malaysian Business Council; 1991).

The aim of OPP2 was to sustain the growth momentum achieved under OPP1 and to achieve a more balanced economy, including encouraging the use of information technology (IT). The Sixth Malaysia Plan called for an average annual growth rate of 7.5 percent, a figure needed to achieve the level of economic development to which the Government aspired. However, during the Seventh Malaysia Plan economic growth fell short of the mark with an average annual growth rate of 4.7 percent. During these plans the government increased the role of IT in enhancing productivity and competitiveness. Although the development of IT started in 1985, when the Malaysian Government established the National Committee on Data Processing (NCDP) to promote the IT environment in Malaysian society, the achievement was not as great as anticipated. This was because the recession of 1985 had a major impact, and policy and expenditure decisions turned to solving standard of living and social economic problems. Also, in 1987 the National Consultative Committee on Information Technology (NCCIT) was introduced to encourage private sector investment in IT. In addition, the government started to introduce IT into the school syllabus to encourage knowledge across Malaysian society. The implementation of this plan began in 1989, when the Ministry of Education formulated a "Computers in Education" programme. The Sixth Malaysia Plan (1991-1995) incorporated the first national IT programme and, in 1995, the Multimedia Super Corridor (MSC) was created and became the centrepiece of the national IT strategy in the Seventh Malaysia Plan (1996-2000). The MSC is a 15 by 40 kilometre area located in Cyberjaya in Kuala Lumpur. As previously noted, investment in IT grew rapidly from RM 1.3 (£0.21) billion in 1990 to RM 3.8 (£0.63) billion in 1995, and the number of personal computers (PCs) increased from 160,000 units in 1990 to 310,000 units in 1995.

The contribution of manufacturing was important to industrialisation in the 1990s, during the Sixth Malaysia Plan. Most of the training for industries to increase the level of IT in production, such as computer aided design (CAD) and computer aided manufacturing (CAM), was conducted by government agencies such as the Standard and Industrial Research Institute of Malaysia (SIRIM) and the Malaysian Institute of Microelectronic Systems (MIMOS) (Malaysia, Economic Report 2000). In the transportation sector, IT was used to improve efficiency in business operations. The Electric Data Interchange (EDI) for example, was installed to facilitate electronic submission of documentation, enable tracking of consignment status and standardise the use of trade documents and processes to predict the movement of goods at the ports. The use of IT in the government sector focused on enhancing productivity and efficiency, as well as improving the quality of services.

The government also provided institutional support to transform the manufacturing sector with higher value-added and high technology operations; for example, the introduction of the Action Plan Development (APITD) of 1990, the Human Resource Act of 1992, and the Second Industrial Plan (IMP2) of 1996 promoted structural change within this sector. On the other hand, the introduction of institutions such as the Malaysian Technology Development Corporation (MTDC) in 1992, Malaysian Industry Government High Technology (MIGHT) in 1993 and the Multimedia Super Corridor (MSC) in 1997 promoted technology development both in the manufacturing sector and Malaysian society generally. Based on a survey conducted by DOS in 1994, the use of IT in the manufacturing sector was mainly applied in the administration profession; the majority of IT applications were used in the areas of accounts and finance, payroll, word processing, personnel records and inventories.

In 1997, Mahathir, the former Prime Minister, opened the Multimedia Asia Conference and Exhibition Centre to highlight the importance of IT in transforming Malaysia into a fully developed nation by the year 2020. The MSC was created to move Malaysia into the information age under the Seventh Malaysia Plan which implemented the *Leapfrog* programme to achieve the *Vision 2020* target. Under the Seventh Malaysia Plan (1996-2000) the country allocated in current terms, of RM2.3 (£0.38 million) to IT programmes, including establishing infrastructure training and network installations. The government further earmarked RM400 (£66 million) to expand the capacity of a network operated by the Malaysian Institute of Microelectronic Systems (MIMOS), later called the Joint Advanced Research Networking [JARING]). In 1995, JARING became the first provider of a nationwide Internet Service (ISP). As a consequence, in 1997, the government received further applications for ISP licenses from five fixed-line telecommunications operators: Binariang, Mutiara Telecommunications, Cellular Communication, Time Telekom and Prismanet. Although the contribution of the IT industry in terms of gross domestic product (GDP) was relatively small, by 1996 Malaysia had become the world's largest exporter of hard disc drives for personal computers. In 1997, IT-related spending reached RM7.22 (£1.2 million); the use of IT grew rapidly throughout this period and private and public sectors were both beneficiaries.

In OPP3, which covered the Eighth and Ninth Malaysia Plans, the highest priority was to change the domestic and economic landscape to one that was outward-looking and competitive at an international level. This was to be achieved by promoting the concept of globalisation, and extending the use of IT in education, government departments and rural areas. The plans also emphasized the development of human resources, focusing on education and training, in order to encourage research and development (R&D). The government also fostered the growth of high-value industries, such as petrochemicals and the maritime and aerospace businesses. As a result, manufacturing remains the main contributor to the country's exports; 76.7 percent of total exports in 2005 were contributed by manufactured goods[3].

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[3]Malaysia, Economic Report 2006/2007.

2.3 Economic Overview and Trends in the Labour Market in Malaysia

We have noted above that the economic development of Malaysia was to be achieved through various plans which sought to move the economy from one dependent upon primary production to one with a strong manufacturing base which had an international outlook. In this section we will present data on the changes that have taken place. Given that the focus of this thesis is on wages and employment, the emphasis of the chapter will be on the labour market (Section 2.3.2). However, before this, Section 2.3.1 will provide information on the overall performance of the economy.

2.3.1 General Background on Economic Performance

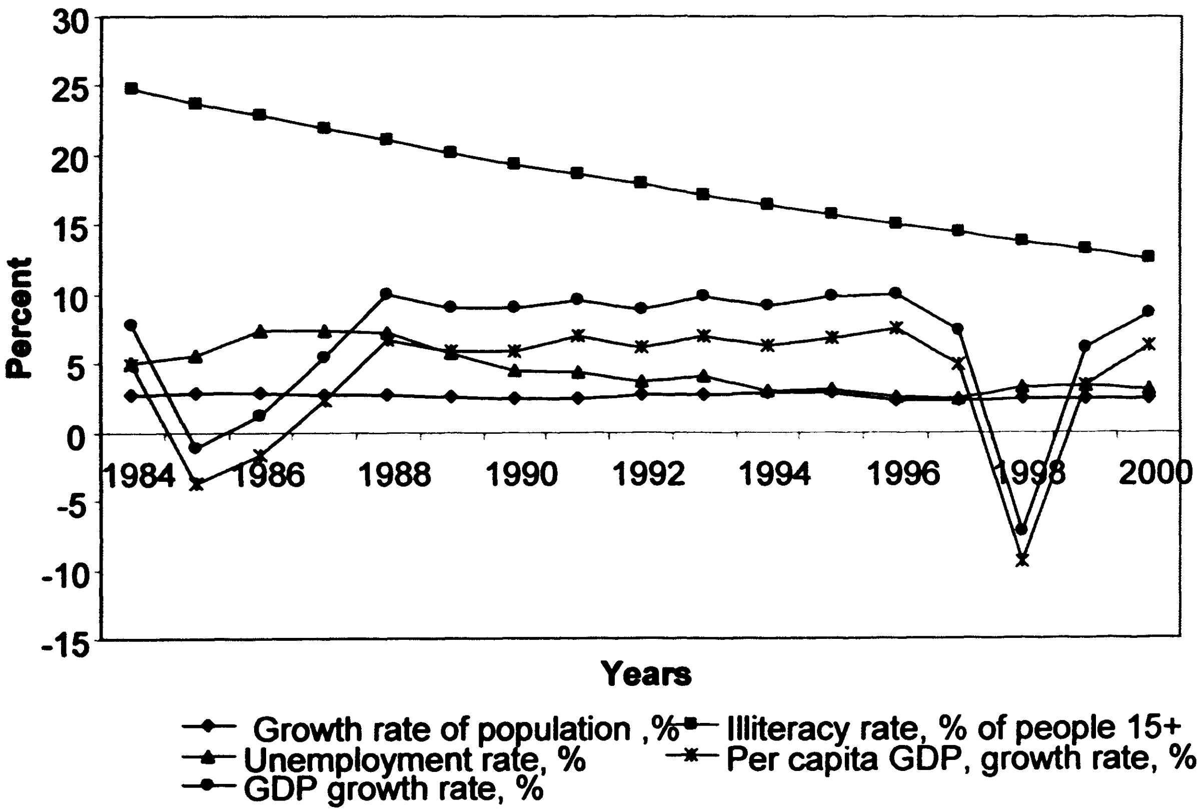
The general picture of the Malaysian economy in the last 16 years is presented in Table 2.3. It shows that during the period 1984-2000 the population increased 49 percent from 15.2 million to 23.2 million. However, as shown in Figure 2.1, the growth rate decreased slightly, from 2.7 percent in 1984 to 2.5 percent in 2000. The Malaysian economy was buoyant in 1984, with a GDP growth rate of 7.76 percent and a per capita income growth of 4.95 percent. In 1985, economic growth stalled and there was a decline of 1.13 percent due to the economic recession. Heavy industry performed particularly badly during the 1985-1987 recession period. According to Khor (1987), all Malaysia's heavy industries faced massive losses: for example, Perwaja Steel continued to register losses of close to RM3 million (£500,000) into the 1990s. Two years after the economic recession, the economy was growing at rates averaging over 8 percent, with growth peaking at 10.00 percent in 1990. The country's per capita income rose sharply to 7.5 percent in 1996. However, because of the Asian financial crisis of 1997, GDP growth fell to 7.32 and then went into sharp decline falling by -7.37 percent in 1998. During this period, most of the major companies that the government had privatized and reserved for *Bumiputra* leadership, including Proton (the national car company) Malaysian Airlines (the national airline company) Renong (an engineering group) and the Malaysian Resources media group had to be renationalized to prevent their collapse. A vigorous recovery programme mounted by the government showed positive results. During the second quarter of 1999, the Malaysian economy began to recover. The GDP and per capita income growth rates increased to 5.8 percent and 3.3 percent respectively.

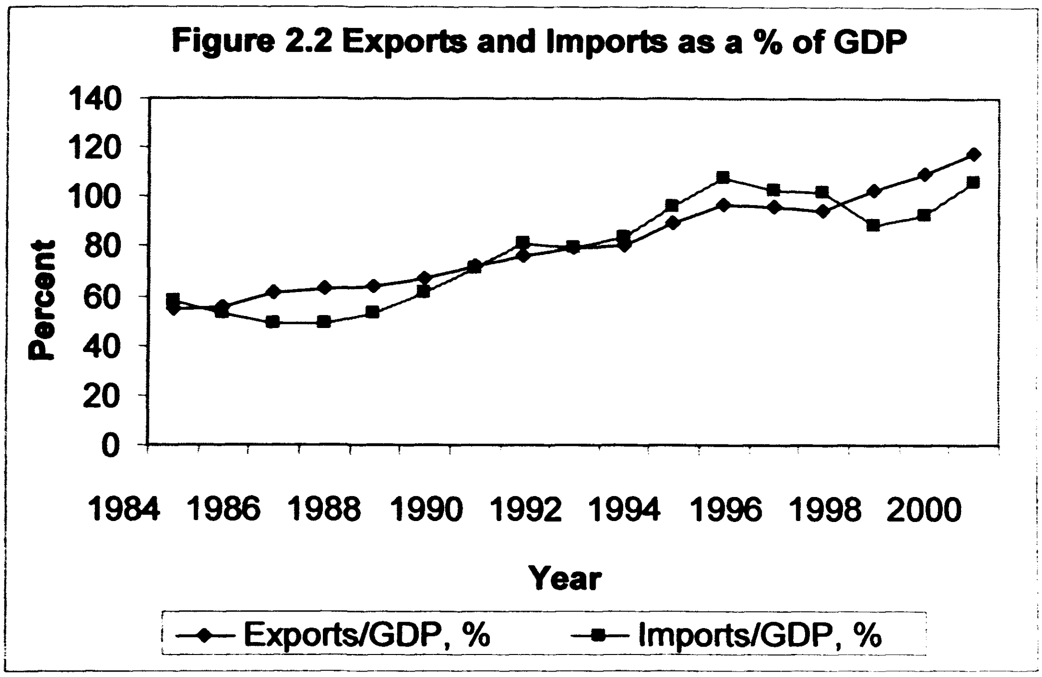
Table 2.3: Basic Economic Indicators for Malaysia

	1984	1990	1995	2000
Population, millions	15.45	18.10	20.69	23.28
Labour force, millions	5.86	7.00	7.89	9.62
Employment, millions	5.57	6.69	7.65	9.32
Per capita GDP, 1987 ringgit	4,979	5,854	8,054	9,021
Per capita GDP, current US$	2,197	2,432	4,294	3,874

Source: World Bank 1984-2000.

Figure 2.1 Basic Economic Indicators for Malaysia





Source: World Bank 1984-2000.

An open trade policy and its attractiveness to foreign direct investment (FDI) were major contributions to the impressive growth in Malaysia. As shown in Figure 2.2, the export and import share of GDP increased from 54.9 percent and 57.7 percent respectively in 1984 to 117.2 percent and 106.2 percent respectively in 2000. According to the World Trade Organization (WTO) Secretariat Report on Malaysia (1997) the country reduced its import tariffs by almost one half since 1993. The implementation of tariffs and quotas, which restricted the import of steel, automobiles and cement, began to have a strong effect, partly as a result of the industrial plan.

During the period 1992-1996, investment in Malaysia averaged 40 percent of GDP, with a considerable share coming from abroad. This was especially the case in manufacturing, where more than half of all firm's equity is now foreign-owned (WTO report, 1997). In the late 1980s and early 1990s, Foreign Direct Investment (FDI) in fixed assets in manufacturing industries rose sharply (see Table 2.4); the electrical /electronic, beverage and tobacco, leather and machinery sectors continues to be strongly dominated by foreign capital, which accounts for more then 60 percent of assets. Foreign capital also owned more than 50 percent of fixed assets in rubber products.

Table 2.4: Foreign Ownership of Fixed Assets in Malaysian Manufacturing, 1985-1998 (%)

Industry	1985	1990	1993	1998
Food	25	30	33	27
Beverages and tobacco	67	62	58	69
Textiles	48	61	64	76
Leather	54	59	57	61
Wood	9	19	36	27
Furniture and Fixtures	19	45	45	25
Paper, Printing and Publishing	20	14	13	10
Chemicals	16	24	25	46
Petroleum and Coal	37	44	50	34
Rubber	42	55	51	50
Plastics	13	27	46	38
Non-metal minerals	32	33	39	34
Basic metals	32	17	33	30
Fabricated metals	23	30	56	36
Machinery	35	53	65	66
Electrical/ Electronics	73	89	91	83
Transport equipment	15	25	35	29
Other manufacturing	53	69	81	56

Source: Rasiah (1995: 111); MIDA, unpublished data.

As in many developing countries, in the 1950s and 1960s industrialization through import substitution was a key emphasis of Malaysian development strategy (Alavi, 1996). Even though Malaysia was becoming more export orientated during the 1990s, imports of intermediate goods to be used in the production of goods for export increased the import share of GDP. This situation led to an increase in imports during the period 1991-1997 and the imports to GDP ratio slightly exceeded that for exports.

Although increased imports were an integral part of Malaysian economic restructuring, the fact that imports, as a percentage of GDP were increasing more than exports (as a percentage of GDP) showed that the Malaysian economy was too dependent on imports and that the level of foreign trade access to the country was very high. Consequently, in 1998 the Malaysian government started to restrict foreign access in order to reduce competition and increase the efficiency of the domestic market. For example it refused to grant new licences to private providers of telecommunications services, and prohibited the establishment of new banks and the expansion of foreign bank branches. As far as trade was concerned, as a member of the Association of South East Asian Nations (ASEAN) and of the Asia Pacific Economic Cooperation (APEC) Malaysia substantially reduced tariffs on imports from its ASEAN Free Trade Area (AFTA) partners. According to the WTO (1997) AFTA was also committed to reducing tariffs to a maximum of 5 percent by 2003 on imports of practically all manufactures, including automotive products. Import licensing affected some 17 percent of all tariff lines, principally in the agriculture and automobile sector. Imports of coffee beans and some agriculture goods were restricted and imported motor vehicles were subject to quotas and high tariffs.

To promote stable economic growth, Malaysia also placed great emphasis on increasing exports. Export promotions were encouraged by exemptions or drawbacks on import duties and other indirect taxes, as well as internal incentives and government-sponsored trade information initiatives. Such promotion measures are partly designed to offset disincentives arising from other policies, like import tariffs levied on inputs used in goods for export. As a result, during the period 1998-2000, export-led growth was accompanied by a constant unemployment rate of approximately 3 percent. The unemployment rate in 2000 was 3.06 percent and exports on GDP were 117.2. The increase in exports during this period was perhaps due to the 'Endaka Effect'[4]. This effect offered a critical mass for attracting a whole range of firms and making them part of the value added chain. As a consequence, the export of components and equipment began to increase.

It is interesting to note that between 1984 and 2000 the Malaysian economy was transformed from a protected low income supplier of raw materials to a middle income emerging multi-sector market economy driven by manufactured exports (particularly electronics and semiconductors) which constituted about 90% of total exports. From the late 1980s, much of growth came from the expansion of manufacturing. With reference to Table 2.5, between 1984 and 1997, the manufacturing sector grew at an average annual rate of 29 per-

[4] The Endaka effect originates from the Plaza Accord of 1985. This Accord was a plan aimed at currency control enacted during EO2 to push up the value of the currencies of North-East Asian countries and devalue against the United States dollar to promote FDI in South-East Asia.

cent, almost 50 percent above the rate of expansion achieved in the previous thirteen years. The share of manufacturing in GDP increased to 30 percent in 2002, while the share of agriculture in GDP declined from over 20 percent in 1984 to less than 9 percent by the turn of the century.

Table 2.5: Industry Shares of GDP

Sector	1984	1989	1992	1995	1997	1999	2001	2002
Agriculture	20.13	17.91	14.62	10.27	9.16	9.10	8.50	8.41
Mining	10.52	10.24	8.63	8.32	7.27	7.93	7.24	7.22
Manufacturing	20.28	23.25	25.15	27.11	29.89	29.39	30.07	30.05
Electricity, gas & water	1.54	2.75	2.67	3.53	3.09	3.66	4.00	3.99
Construction	5.17	3.25	3.80	4.45	4.84	3.58	3.37	3.32
Trade, hotels, etc.	12.31	12.40	14.46	15.19	14.99	15.19	15.15	14.93
Transport & communications	6.00	6.53	6.52	7.38	7.51	7.94	8.58	8.46
Finance	5.42	7.89	9.55	10.37	12.22	12.91	14.16	14.31
Public admin. & other	18.63	15.77	14.62	13.38	11.04	10.30	8.93	9.31

Source: World Bank (2002).

The contribution of the manufacturing sector has been very significant to export growth in Malaysia; by the mid-1990s, machinery manufacture was leading the growth in exports, accounting for 55.14 percent of the total. As shown in Table 2.6, machinery manufacture's share of exports increased dramatically from 18.9 percent in 1984 to 62.32 percent of total exports in 1999. Exports of telecommunications and electrical goods had also doubled by the end of the 1990s. Malaysia had become the sixth largest exporter of manufactured goods in the developing world, after the four newly industrialized countries in East Asia (South Korea, Taiwan, Hong Kong and Singapore) and China (MATRADE, 2007). At first, Malaysia's market niche in manufactured exports consisted mainly of simple assembly operations in electronic and electrical goods, and standard light manufacturing such as clothing, footwear and rubber goods. From the mid-1990s, the country's export competition began to diversify into mature technology-based final products such as radios, TVs, cameras and computers. Most of these 'products' consisted of simple assembly operations, although some electronics firms entered into higher value-added fabrication and design activities. However, as shown in Table 2.6, exports of agricultural goods, crude materials, and mineral fuels show significant declines during the period of study, as a percentage of total exports this group of industries saw their share of total exports decline from around 70 per cent to less than twenty during this fifteen year period. In contrast, the export of electrical machinery and computers increased from less than 15 per cent to over 50 percent. Interestingly, Table 2.7 shows that imports of machinery and telecommunications and electrical goods also grew during the 1984-1999 period.

Table 2.6: Malaysia's External Trade by Major Commodity Group

EXPORTS (total exports in US$ millions, commodity group shares of total exports in %)

	1984	1992	1995	1996	1997	1998	1999
Total merchandise exports	16,490	40,768	73,778	78,315	78,729	73,254	84,512
Agricultural products	19.09	10.44	9.48	8.69	8.62	9.95	7.96
Crude materials excluding fuels	21.01	10.63	6.42	5.39	4.52	3.22	3.08
Mineral fuels	29.92	12.95	6.99	8.06	8.13	6.17	6.80
Machinery manufactures	18.95	43.81	55.13	55.27	56.12	59.21	62.32
Road vehicles	0.16	0.66	0.63	0.66	0.66	0.72	0.55
Other transport equipment	1.37	3.04	2.20	1.70	1.59	2.12	1.04
Other manufactures	9.71	19.69	17.64	18.37	17.83	17.08	15.77
Miscellaneous manufactures	0.71	3.52	2.70	2.81	2.38	2.32	2.27
Not classified	0.22	0.45	1.32	1.10	1.24	0.93	0.88

Source: World Bank (2000).

Table 2.7: Malaysia's External Trade by Major Commodity Group

IMPORTS (total imports in US$ millions, commodity group shares of total imports in %)

	1984	1992	1995	1996	1997	1998	1999
Total merchandise imports	14,049	39,788	77,046	77,905	78,434	57,759	64,939
Agricultural products	10.81	6.11	4.54	5.02	5.12	5.37	5.11
Crude materials excluding fuels	3.52	2.59	2.40	2.53	2.50	2.52	2.51
Mineral fuels	10.12	4.24	2.31	2.71	2.98	3.17	3.11
Machinery manufactures	45.95	54.96	59.84	59.90	59.98	62.94	61.72
Road vehicles	5.31	2.95	3.55	3.92	3.76	1.24	2.05
Other transport equipment	2.95	5.61	4.60	3.09	4.27	5.21	2.65
Other manufactures	20.66	21.87	18.97	18.40	18.42	16.34	16.99
Miscellaneous manufactures	2.31	2.17	1.87	1.90	2.03	2.02	2.20
Not classified	0.94	2.29	4.94	4.78	4.12	2.61	3.21

Source: World Bank (2000).

2.3.2 Trends in the Labour Market

The previous sections have presented the development strategies and the achievement of economic growth in Malaysia during the period of study. Generally, in the last decade Malaysia has achieved successful economic growth and full employment. Employment grew rapidly from 5.57 million in 1984 to 9.32 million in 2000 (see Table 2.3). The unemployment rate fell rapidly from 5.05 percent of the labour force in 1984 to 3.06 percent in 2000. Although the Malaysian economic situation showed a good performance during what was a transitional period, the Malaysia economy actually faced a tight situation in the labour market. There were shortages of labour, especially during and after the recession period. This section will discuss the circumstances in the Malaysian labour market during the period when the development strategies were employed.

In general, the Malaysian labour market was transformed from having a primary sector base to being industrially based during the 1980s and 1990s. Table 2.8 shows employment by sector during the period 1984-2000. Government policy towards the labour market was one linked to the transition of the economy; consequently, the structure of the labour market changed. The total job share of the agriculture, forestry and fishing sectors declined from 30 percent to 18 percent during the period. This decline was arrested in the more difficult years of the 1980s as far as the non-cash crop sector was concerned, but continued at much the same rate in the rubber, palm oil and coconut sub-sectors. On the other hand, the share of the manufacturing sector increased from 15 percent in 1984 to 23 percent in 2000. The services sector continued to contribute the largest share of employment, remaining fairly stable at 50 percent during the period. As can be seen from Table 2.8, employment growth was especially notable in the social and community sector. Here, employment increased from 1,106 million workers in 1984 to 1,935 million in 2000. Employment in wholesale and retail trade, and the hotel and restaurant industry also increased dramatically from 956 million to 1,790 million. The expansion of these industries arose from the creation of more job opportunities due to the entry of new large retailers. Similarly, as a result of the telecommunication companies undertaking large capital investment to upgrade their services (such as, the general pocket radio services (GPRS)) the trade-related and telecommunication sectors also expanded to meet increasing demand. In the construction sector, employment accounted for 8 percent of total employment in 1984 and 9 percent in 2000. This was made possible by a sustained demand for affordable housing, together with the ongoing implementation of civil works projects, which provided jobs for 7.98 million workers in 2000.

Table 2.8 Malaysia: Employment by Sector (1984-2000)

Year	1984		1989		1992		1995		1997		2000	
	(000)	%	(000)	%	(000)	%	(000)	%	(000)	%	(000)	%
Sector												
Agriculture, Forestry and Fishing	1695	30	1833	29	1536	22	1527	20	1481	17	1712	18
Mining	46.5	1	33.1	1	36.3	1	32.5	0	38.5	0	27.3	0
Manufacturing	858.4	15	1171	18	1640	23	1781	23	2003	23	2126	23
Construction	428	8	376.9	6	506.7	7	611	8	793	9	798.9	9
Services	2538.8	46	2977	47	3329	47	3694	48	4254	50	4658	50
Electricity, Gas and Water	32.9		40.6		45.9		48		50.9		48.1	
Transport, Storage and Communications	242.8		277.6		326.2		359		423.3		422.7	
Wholesale and Retail Trade, Hotels, and Restaurants	956.6		1144		1255		1371		1578		1790	
Finance, Insurance Real Estate & Businesses Services	200.5		253.2		299.8		364		447.2		462	
Services, Social and Community	1106		1262		1403		1552		1755		1935	
Total Employment	5566		6391		7048		7645		8569		9322	

Source: Department of Statistics (DOS) 1984-2000.

Changes in employment patterns and rapid job growth in the manufacturing sector contributed to a tightening of the labour market in Malaysia (World Bank, 1995; Sixth Malaysia Plan, 1996; Seventh Malaysia Plan, 2001). As Table 2.3 indicates, the period was one of a very strong performance in the Malaysian labour market in terms of employment growth. As a result of these employment opportunities the unemployment rate contracted to 2.4 percent in 1997 but increased to 3.43 in 1999 (see Table 2.3). During the period the labour force participation rate decreased slightly from 65.6 percent in 1997 to 64.2 percent in 1999. According to Lin 1988, the causes of the tightness in the labour market occurred in Malaysia due to a mismatch between demand and supply and through the low quality of labour. As far as wages are concerned, we can consider the direct evidence of the skill composition and wages shares of Malaysia's labour force from 1985-1999, as presented in Table 2.9. Using the standard classification of the work force reported by the Malaysian Department of Statistics (DOS) Malaysia's labour force is divided into: working proprietors and active business partners, unpaid family workers, professional, non-professional, technical & supervisory, clerical and related occupation, drivers, other general workers, skilled directly employed (that is, they are not employed through a contractor but employed directly by the company – the latter are part-time workers), semi-skilled directly employed, unskilled directly employed, skilled through contractors, unskilled through contractors and paid employees (part time). As can be seen in Table 2.9, the aggregate manufacturing labour force became less skill- intensive between 1983 and 1999. The ratio of skilled directly employed fell from 0.25 in 1985 to 0.23 in 1999. Similarly, the wage share of skilled directly employed fell from 0.22 to 0.21. On the other hand, the ratio of semi-skilled workers increased from 0.10 in 1985 to 0.18 in 1999. In line with the share of skilled workers, the ratio of unskilled workers also decreased during the period 1985-1999. This indicates that the trend in the labour market during this period was favourable to semi-skilled workers.

The information in Table 2.9 indicates that the share of the wages bill grew most during the period 1990-1997, amongst professional, technical, supervisory and semiskilled directly employed groups. However, the share of non-professional, clerical and related occupation, skilled directly employed, unskilled directly employed, skilled through contractors, semi-skilled through contractors and unskilled through contractors fell during the period 1990-1997. It is interesting to note that the share of wages bill for unskilled directly employed increased during the period 1986-1989. The share fell slightly from 1990 to 1997, but was still considerably higher compared to 1984. However in 1999, the share of the wages bill for unskilled workers fell and was below the share of 1984.

This situation shows that the rapid growth of exports under Export Orientation 2 starting from 1985 had not seen a corresponding rise in wage ratio trends for all occupational groups. It only increased the wage bill for certain groups of non-production and production workers. For non-production workers, those workers in professional, technical and supervisory occupations were most likely to have had an increase in their share of the wages bill. However, amongst production workers, only the semi-skilled directly employed group showed an increase in the share of the wage bill during the period 1985-1999. Although the same measure for skilled workers decreased from 1985 to 1999, the share of skilled workers continued to be greater than the share of other occupation groups.

Table 2.9: Skill Composition and Wage Shares of the Labour Force

	1985		1990		1999	
	Employment	**Wages**	**Employment**	**Wages**	**Employment**	**Wages**
Working proprietors & active business partners	0.5	-	0.3	-	0.7	-
Unpaid family workers	0.1	-	0.1	-	0.1	-
Professional	2.1	11.9	2.0	12.2	3.2	15.1
Non professional	2.4	8.4	1.7	6.7	2.7	7.7
Technical & supervisory employment	8.9	15.3	8.5	15.4	10.4	17.6
Clerical and related occupational	8.7	10.1	6.6	8.1	6.5	6.8
Drivers	1.7	1.5	1.2	1.3	1.1	1
Other general workers	3.8	2.9	2.7	2.0	2.0	1.4
Skilled directly employed	25.5	22.2	23.3	21.1	23.9	21.3
Semi-skilled directly employed	10.3	6.6	13.5	9.0	18.3	11.8
Unskilled directly employed	25.3	13.5	30.7	16.6	24.9	13.2
Skilled through contractor	3.3	3.4	2.6	3.1	1.4	1.6
Semi-skilled through contractors	2.1	1.6	2.0	1.8	1.7	1.2
Unskilled through contractors	3.7	2.1	3.6	2.0	2.2	1.1
Paid employees (part time)	1.4	0.4	1.3	0.5	0.7	0.2

Sources: DOS 1985-1999.

In order to improve the shortages of labour and the tightened labour market in the country, the Malaysian government implemented various development programmes. As mentioned earlier, under a land and development restructuring programme a new land area created by the First and Second Malaysia Plans allowed new job opportunities, especially for those in rural areas. Besides emphasising rural development, the policies also promoted the growth of the manufacturing sector through export- orientation during the Third, Fourth and Fifth Malaysia Plans. In the early 1980s, Malaysia faced labour market shortages due to a mismatch between demand and supply. This shortage had been a normal situation in the agricultural sector since the late 1970s. In order to overcome this problem, in July 1982 the government officially approved the use of foreign workers from ASEAN countries and from Bangladesh (Ragayah *et al.* 2005). The government also implemented the '*Operasi Isi Penuh*' (Full Employment Operation) to raise the public sector workforce from 39,800 in 1970 to 804,000 in 1983. There were two categories of foreign labour in Malaysia: expatriates and foreign workers. The term expatriate workers referred to those educated, experienced workers who were involved in professional, technical, administrative and managerial jobs. Foreign workers, on the other hand, were employed particularly in low category jobs; the so-called 3D jobs (dirty, dangerous, and degrading) (Ragayah *et al.* 2005). Foreign workers were found not only in the agriculture sector, but also in manufacturing and construction, as well as working as domestic helpers.

After the economic recession of 1997 and consequent rising unemployment rates, some began to question the impact of foreign workers on the employment opportunities of local workers. However, given the fact that locals are often not interested in 3D jobs, Malaysia's dependence on foreign workers will continue, particularly as the government is trying to rejuvenate the agriculture sector as one of its engines of growth in the Ninth Malaysia Plan. The existence of foreign workers in Malaysia does not help to reduce the tightness of the labour market because foreign workers are suspected of being a factor in encouraging low productivity and wages. As Ragayah (2002) argues, foreign workers will discourage employers both from undertaking more capital and technology intensive methods of production and providing skill training to their workers. Furthermore, the general perspective that assumes foreign workers cost less is questionable. According to the Annual Survey Manufacturing (1997) employers incur various costs such as preparing paperwork before getting the required approval from the relevant authorities and paying high levies to the government and agencies before they can hire foreign workers. In certain cases, employers face losing their workers because the foreign workers decide they wish to terminate their contracts and return to their country of origin, or work as illegal workers in other sectors. The domestic help sector is the main area where illegal workers have the opportunity to work. They usually make an agreement to be domestic helpers before moving to another sector. Although there is no exact measure of the number of foreign workers in Malaysia, in 1994 the estimated number of legal foreign workers was 750,000 and the number of illegal workers estimated at 500,000. In 1996, according to Government (Human Resources Department) estimates, the number of legal foreign workers increased to an estimated 900,000 and the number of illegal foreign workers increased to 1 million (Ariff, 1998).

Difficulties in the labour market were also the result of Malaysian employers competing for the same workers as employers in neighbouring countries like Singapore. Singaporean companies offer higher salaries (on average, double) compared to companies in Malaysia. Workers, particularly in the Johor Baharu area, travel to Singapore to get better salaries. In 1997, Singapore employed about 200,000 Malaysians of whom 50,000 commuted daily to Singapore (about half an hour's drive from Johor Baharu). These figures represent about 13 percent of the work force in Singapore (Rohayu *et al.* 2001). Starting from January 2001, the Malaysian government encouraged professionally qualified and skilled Malaysians working abroad to return to work in Malaysia. The programme included various incentives such as tax exemptions on all goods brought into Malaysia by migrant workers will be exempted from tax, including cars, on their return to Malaysia. They are also gave favourable treatment migrants' spouses and children who are not Malaysian Citizens to enable them to gain permanent resident status within 6 months of their arrival in Malaysia. Foreign-born spouses who have professional qualifications are also allowed to apply for employment visas to enable them to work.

Malaysia's skill development strategy has, until recently, focused primarily on increasing the supply capacity of public education and training institutions to meet the skill needs of industry (World Bank, 1995). In order to expand the supply of skilled workers, the Malaysian government increased the share allocated to industrial training from 4.9 percent in the Sixth Malaysia Plan to 9.3 percent under the Seventh Malaysia Plan and to 16.6 percent during the Eighth Malaysia Plan. Four Advanced Technology Training Centres were set up under the Manpower Department to boost the number of skilled workers in labour market in 2000. However, for several reasons this programme of industrial training was not successful. First, about 27 percent of eligible firms failed to register and contribute to the Human Resource Development Fund (HRDF) while more than one-third of the registered firms (mainly small and medium scale enterprises (SMEs)) did not claim any reimbursements because they found limited resources for training. Firms also found that sometimes the training was too general for and was insufficient in terms of skill levels. Secondly, in a situation of shortages and a tight labour market, labour turnover is high. Most employers lose their workers to other companies after training due to poaching. In 1998, 83,865 employees were retrenched compared to the 18,863 retrenched in 1997 (Labour Market Report, June 2001).

Under the Seventh Malaysia Plan, the government also reformed Malaysian Universities by amending the University College Act of 1971 and the Private Higher Education Act in 1996. One of the dramatic changes implemented was the duration of study. The number of years required for a degree was reduced from four to three for most courses in order to hasten the supply of graduates and educated workers. This programme had a big impact during the recession years. In view of the high incidence of youth unemployment and the general lack of skills amongst younger workers, the high levels of retrenchment required the provision of new skills training programmes for younger workers. As a result, retraining schemes were introduced in 1998. This programme aimed at improving skill levels and minimizing unemployment during the recession period. From 1998 to 2004, the labour market in Malaysia also faced a mismatch between the number of graduates being produced and the types of prospective employees needed by employers, especially in the private sector. Graduates from the Arts and Humanities, Economics and Islamic Studies recorded the highest incidence of unemployment, while those from critical areas such as Medicine and Engineering were less likely to be unemployed. Furthermore, the fact that many of the former group had poor communication skills, particularly in English (the language used in the private sector) also reduced their employment prospects.

In terms of the demand side, the government attempted to create jobs through export-orientation. After the first economic recession in 1985, the government actively encouraged FDI by turning to the private sector as the engine of growth. It passed the Industrial Co-ordination Act, 1975 (ICA) and replaced the Investment Incentive Act of 1968 with the Promotion of Investments Act, 1986 (PIA). As a result, Japan's share of foreign-owned fixed manufacturing assets in Malaysia in 1993 was 33.6 percent, followed by Singapore's 14.8 percent, the USA's 10.0 percent, Taiwan's 6.9 percent, the United Kingdom's 6.3 percent and Hong Kong's 5.0 percent (Athukorala and Menon, 1999). The resultant rapid investment in Malaysia created new job opportunities and a healthy demand for labour. It also raised household incomes, lowered the unemployment rate and promoted economic growth. As shown in Table 2.3, this situation brought down the unemployment rate in Malaysia from 7.43 in 1986 to 2.45 percent in 1997 and increased GDP growth from 1.15 percent in 1986 to 7.32 percent in 1997. However, the soaring salary levels of skilled and professional workers, as presented in Table 2.9, have been hypothesized as the cause of the tightening of the labour market during the 1990s.

According to Rasiah (2001), employment elasticity in the manufacturing sector improved significantly during the Export-Orientation 1 (EO1) phase between 1970 and 1980. Table 2.10 shows employment and value added in manufacturing between 1971 and 1997. It shows that employment in export-oriented industries increased from 72.1 percent of total employment in 1971 to 75.8 percent in 1979, before falling slightly to 74.4 percent in 1985. The recovery process led to the employment share in this sector reaching a peak of 85.7 percent in 1990, but it fell again to 78.1 percent in 1997. The share of value added in export-oriented industries also increased, compared to the share of their domestic- oriented counterparts. The latter underwent considerable structural change during the sample period. In 1985 the value added share in domestic-oriented industries was 43.1 percent; this fell to 35.9 percent in 1997.

Table 2.10 Manufacturing Employment and Value Added by Export-Oriented and Domestic-Oriented Industries 1971-1997.

	1971	1979	1985	1990	1997
Employment in					
Export-Oriented	72.1	75.8	74.4	85.7	78.1
Domestic-Oriented	27.9	24.2	25.6	14.3	21.9
Value Added in					
Export-Oriented	64.2	72.7	56.9	56.0	64.1
Domestic-Oriented	35.8	27.3	43.1	44.0	35.9

Source: Raziah (2002): Industrial Surveys, 1971,1979,1985,1990 and 1997.

Two conclusions can be drawn from the trend in the share of the wage bill and employment in Malaysia during the period 1985-1999. First, in the case of production workers (semi-skilled workers) the share of the wage bill rose because the demand for these workers increased. The reason for this was that the need for production workers was mainly at medium levels of production. As Malaysia increased its imports, the requirement for skilled workers decreased. The existence of SMEs encouraged demand for semi-skilled labour as the aims and structure of production require the use of medium levels of production. The exhaustion of labour reserves did not lead to high wage increases amongst skilled workers, when compared to the increases amongst semi-skilled workers. As regards non-production workers, the increases in wage bill for the professional and technical and supervisory groups were caused by labour shortages and a tightening of the labour market. Second, the sharp fall in unemployment levels in the 1990s, following continued expansion in export-oriented industries, forced firms to operate labour saving strategies and to employ more foreign labour. Expatriate foreign labour increased the wages of professional, technical and supervisory groups whereas foreign workers kept the labour market operating at a low productivity level and increased the wages of semi-skilled workers. As noted earlier, employers do not want to invest and be involved in training to increase the skill levels for foreign workers, because they are normally employed for short periods.

2.4 Conclusion

This chapter has discussed the background to this study. Malaysia aims to reach the status of a developed nation by the year 2020. To reach this objective, it has engaged in long-range plans to maintain economic stability and growth, particularly in government expenditure and fiscal policy. In the 1980s, Malaysia transformed the basis of its economy from agriculture to manufacturing. The manufacturing sector is the key factor in the nation's continuing growth and prosperity. This sector is expected to be driven strongly by export-orientated policies and reinforced by the modest pick-up in external demand during the 1990s. As far as trade trends are concerned, Export Orientation 2 (EO2) provides the incentives for production for the global market, with labour-intensive stages of assembly and processing being reallocated to Malaysia. A substantial expansion in infrastructure and import substitution industries expanded the export competitiveness of the Malaysian economy during the period.

The manufacturing sector has shown remarkable growth during the 1980s and 1990s, and the sector is now the second largest after the services sector in terms of the value of output produced. Overall, the Malaysian labour market has been affected by a shortage of labour especially amongst skilled workers. This is typical of developing countries. As mentioned earlier, the Malaysian government started to put emphasis on the development of human capital during the Sixth, Seventh and Eight Malaysia Plans. Most of the retraining schemes and programmes did, however not achieve their objectives due to problems at management level. As a result, the Malaysian Government has encouraged foreign workers into the labour force. The existence of foreign workers, however, has brought another problem to the labour market especially in terms of illegal immigrants. As far as relative wages are concerned, the excess supply of foreign workers resulted in a decrease in the wages of unskilled workers relative to skilled and semiskilled workers in labour market. This is because there is no minimum wage in Malaysia and the determination of wages is dependent on market power (demand and supply).

As the country's mission is to be a developed nation by 2020, Malaysia needs to encourage the development of technology. One of the problems in Malaysian is that manufacturing is operating at low and medium levels. In the mid-1980s and early 1990s, the Malaysian government prompted Malaysian society to embrace IT and encouraged investors through its trade policies. The introduction of institutions such as the Malaysian Technology Development Corporation (MTDC) in 1992, Malaysian Industry Government High Technology (MIGHT) in 1993 and the Multimedia Super Corridor (MSC) in 1997 promoted technology development both in the manufacturing sector and Malaysian society generally. In what follows we will examine how the policies adopted by the Malaysian Government impacted upon employment and wages. The particular focus is whether trade-oriented and technology-oriented policies had an impact on the labour market. Second, we will seek to establish the nature of the observed effects.

CHAPTER 3

WAGE INEQUALITY: THE THEORY OF TRADE AND SBTC

3.1 Introduction

The previous chapter discussed the background to trade and technology policies in Malaysia, emphasising those affecting the country's employment and wage structures that are the focus of the present study. We now turn to the theoretical issues relevant to the study. This chapter aims to provide a framework for assessing changes in relative demand and in relative wages. In particular, the framework will focus on two broad hypotheses, namely those based on trade and on technological change.

The focus of the trade hypothesis of changing wage inequality is that changes in the demand for labour arise from changes in the pattern of trade, especially those resulting from trade liberalisation and globalisation. For example, an industry may release workers due to falling prices because of increased trade competition that resulted from the removal of trade protection. Removal of trade protection will lead to a fall in the demand for the type of labour used intensively in the production of that product, causing wages to fall.

The second hypothesis focuses on technological change and suggests that the changes in wage inequality arise from changes in technical progress which impact upon the demand for different types of human capital. Technical progress occurs in two ways; either it is induced by trade or it is due to technology transfer. The latter is strictly exogenous whereas the former is endogenous. Both can be explained within the Heckscher-Ohlin-Samuelson (HOS) model and are typically skill-biased technological change (SBTC). Specifically, both approaches argue that technical progress favours certain skill groups. As a consequence, then, there will be an increase in the relative demand for these particular groups of workers and thus in their relative wages.

This chapter is structured as follows: in Section 3.2, we discuss the basic theoretical framework for the two hypotheses based on the HOS model. Sub-Section 3.2.1 then presents the skill biased technological change hypothesis. Sub-Section 3.2.2 will then consider the effects of changes in the pattern of trade on relative demand. Section 3.3 will conclude the discussion.

3.2 Theoretical Framework

In recent years, the determinants of wage inequality and changes in the levels of inequality have attracted considerable attention from researchers. The basic theoretical framework we adopt here is based on the factor proportions model that was originally developed by two Swedish economists, Eli Heckscher and his student Bertil Ohlin in the 1920s. Further elaborations of the model were provided by Paul Samuelson in the 1930s; and as a result the model is often referred to as the Heckscher-Ohlin-Samuelson (or HOS) model. This model considers the effects of trade and technological change on the relative labour demand and wages of skilled and unskilled workers. The model emphasises the distinction between the *sectoral* dimension of such shifts that are between industries or sectors and the *factoral* dimension that are between different types of skill (Wood, 1994).

The HOS model incorporates a number of realistic characteristics of production that are left out of the simple Ricardian model of international trade. In the latter, only one factor of production, labour, is needed to produce goods and services. The HOS model begins by expanding the number of factors of production from one to two. The model considers two countries (one developed and one developing country; in this study we have used the UK and Malaysia), two factors (skilled and unskilled labour) and two products or sectors (which vary in terms of skill intensity) we have used a high technology sector (H) and a low technology sector (L). The developing country is more abundant in unskilled workers, whilst the developed country is more abundant in skilled workers. Let us apply this to our case, Malaysia (the developing country) trades with the UK (the developed country). This trade causes Malaysia to specialize in the production of the unskilled-intensive good, in which it has a comparative advantage because of the relatively large supply of unskilled labour, and to reduce the production of the skill-intensive good. In developing countries, there is a rise in the relative price of the unskilled intensive good, and the relative demand for unskilled workers. There is also a narrowing of the wage gap between skilled and unskilled workers. In the developed country (the UK) there is an opposite effect as regards the wage gap.

To determine the relative contributions of trade and technology to shifts in labour demand, we follow Lawrence and Slaughter (1993) and consider a general production function for industry i at time t.

$$Q_{it} = A_{it} F^{i}\left(S_{it}, U_{it}, K_{it}\right) \qquad \text{(Equation 3.1)}$$

where Q_{it} is the output of sector i (H or L) at time t. A_{it} is the Hicks-neutral technology parameter for industry i at time t. The factors of production employed at time t are denoted as S_{it}, U_{it} and K_{it} which represent skilled labour, unskilled labour and capital respectively. In order to explain how the trade and the technology work in the HOS model we drop the time subscript t and the factor K. We exclude K for ease of exposition and because in the thesis we focus on labour demand[6]. The model assumes that both types of labour are mobile between sectors within each country, but are internationally immobile. This model also assumes that restoring zero profits in both sectors is achieved by setting price equal to marginal cost in both sectors. The relative labour demand for sector i can then be written as

[6]A number of authors believe that, in the context of developing countries, changes in income inequality can only be understood if a three-way categorization of labour is used (Wood,1994). In the empirical analysis therefore we use skilled, semiskilled and unskilled The general propositions we develop in this chapter can, however, be applied to more than two types of labour in a straightforward way.

$$W_{ji} = P_i \times A_i \times F_j^i(\cdot) \qquad \text{(Equation 3.2)}$$

where, W_{ji} represents factor j's marginal revenue product in industry i. P_i is the exogenously determined price of output in sector i. Because of relative factor prices, the aggregate relative labour demand will change whenever factors flow across industries. If for example, there is a shift in factors of production to the high technology industry this will increase aggregate relative demand in that industry. Equation 3.2 shows that aggregate relative demand shifts respond to inter-industry profitability, in which the impact of trade (product prices) and technology are captured by shifts in P_i and A_i respectively.

Using two factor inputs skilled (S) and unskilled labour (U) to produce two outputs, high technology (H) and low technology (L) goods the general Equation 3.1 can be written separately for high technology (Q_H) (Equation 3.3), and low technology (Q_L) output (Equation 3.4) as follows,

$$Q_H = A_H\left[(\theta_{UH}U_H)^{\rho} + (\theta_{SH}S_H)^{\rho}\right]^{1/\rho} \qquad \text{(Equation 3.3)}$$

$$Q_L = A_L\left[(\theta_{UL}U_L)^{\rho} + (\theta_{SL}S_L)^{\rho}\right]^{1/\rho} \qquad \text{(Equation 3.4)}$$

In both equations, the parameter ρ refers to the elasticity of substitution between S and U within each industry. Bear in mind that one of the assumptions of the HOS model is that it assumes perfect inter-industry factor mobility within each country. With exogenous product prices, each country has one equilibrium wage for skilled and unskilled labour, W_S and W_U respectively. In both countries, each industry chooses its employment of skilled and unskilled labour to maximise profits. Consider the first order conditions of profit maximisation of the production function of Equation 3.1, the optimal relative labour demand can be written as,

$$\left(\frac{S}{U}\right)_i = \left(\frac{\theta_{Si}}{\theta_{Ui}}\right)^{1/(1-\rho)-1} \left(\frac{W_S}{W_U}\right)^{-1/(1-\rho)} \qquad \text{(Equation 3.5)}$$

In this model, we define technical change in industry i to be skill-biased (un-skill-biased) if it raises (lowers) $\left(\frac{S}{U}\right)_i$ at given $\left(\frac{W_S}{W_U}\right)$. θ_{Si} and θ_{Ui} represent skill biased and unskilled biased technological change parameters respectively. In other words, skill biased technical change exists if the output elasticity of skilled labour increases at a faster rate than that of unskilled labour and vice versa for unskilled biased technological change.

Combining Equations 3.2, 3.3, 3.4 and 3.5 gives the effects of technological change on relative wages (W_S / W_U) setting parameter $1/(1-\rho)$ to σ. This can be written as Equation 3.6 below.

$$\left(\frac{W_S}{W_U}\right) = \left[\frac{\left(\frac{P_H A_H}{P_L A_L}\right)^{(\sigma-1)} (\theta_{SH})^{\sigma-1} - (\theta_{SL})^{\sigma-1}}{(\theta_{UL})^{\sigma-1} - \left(\frac{P_H A_H}{P_L A_L}\right)^{(\sigma-1)} (\theta_{UH})^{\sigma-1}}\right]^{\frac{1}{\sigma-1}} \qquad \text{(Equation 3.6)}$$

where (W_S / W_U) is the relative wage for skilled and unskilled workers. As can be seen factor prices (W_S / W_U) are entirely determined by product prices and technology.

Using this model, we first analyse how technological progress operating through a shift in A_i affects relative demand (sub-Section 3.2.1). Then we analyse the pattern of international trade change by looking at changes in P_i in sub-Section 3.2.2.

3.2.1 Skill-Biased Technological Changes and Relative Wages

Equation 3.6, satisfies the zero profit condition in both sectors and highlights the implications of the model. Consider first changes in technology that are exogenous and result, say, from technology transfer such changes in an industry will raise profitability attracting new firms into the industry and will shift labour demand in favour of a particular skill group. Let us take as an example the situation when technical progress occurs in the low technology intensive industry operating through A_L. As can be seen, this situation will lead to an increase in unskilled wages relative to skilled wages. Similarly, if technical progress occurs in the high technology industry, skilled wages must rise to restore the zero profit condition. We can extend this to the situation in which there are three categories of skill (skilled, semiskilled and unskilled).

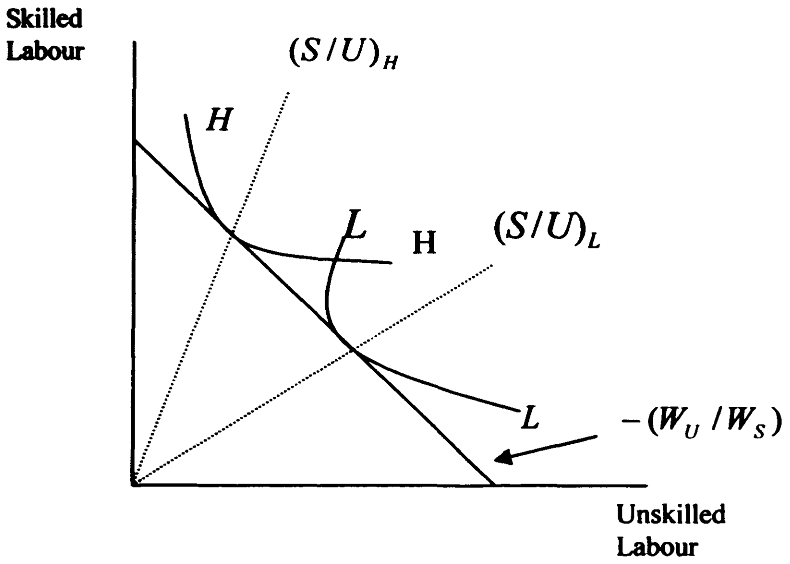
Now we discuss the direction of technological change when this is endogenously determined and results from changes in product prices resulting from changes in the pattern of trade. The model assumes that trade will affect wage premia and the direction of the technical change. Trade induces technical change through decreases in the cost of trade, for example through the relaxation of trade barriers which increase the price of importing technology from abroad. However, as trade is already marked as a vehicle through which new technologies enter developing countries, innovations from abroad are assumed to reduce the relative demand for skilled workers in the developing country and is an application of the standard Stolper-Samuelson theorem (Leamer, 1994; Haskel and Slaughter, 1999). In terms of relative wages, Equation 3.6 shows that a rise in $\left[\frac{P_H}{P_L}\right]$ raises $\left(\frac{W_S}{W_U}\right)$ and similarly a fall in $\left[\frac{P_H}{P_L}\right]$ brings a decrease in $\left(\frac{W_S}{W_U}\right)$. An increase in the relative price of a product raises the relative wage of the factor employed relatively intensively in the production of that product. This process, following Lawrence and Slaughter (1993), can be illustrated in Figure 3.1. Panel A shows the condition at initial equilibrium and Panel B presents the condition at the new equilibrium. At the initial equilibrium, the production isoquants for high technology *(H)* and low technology *(L)* given their relative price are drawn as HH and LL respectively. As mentioned above, the production of H uses skilled workers relatively intensively compared to unskilled workers. This situation is shown in Panel A, where the isoquant HH lies above and to the left of LL. If both goods are produced, both isoquants must be at a tangent to the line $-(W_U / W_S)$. The isocost line $-(W_U / W_S)$ indicates the ratio of factor prices. These tangency points indicate the ratios of skilled to unskilled labour $(S/U)_H$ and $(S/U)_L$, used to produce high technology and low technology respectively.

Now, assuming that international trade begins and the protection of trade is then reduced with familiar consequences. In the case of Malaysia (the developing country), the export of low technology intensive goods and the production of fewer high technology intensive import substitutes brings a drop in the domestic price of high technology intensive goods relative to that of low technology intensive goods. The expansion of production of low technology intensive goods increases the demand for unskilled workers, and hence raises their wages. In other words, this situation shows that the wages for unskilled workers rise relative to those of skilled workers. This situation also shows a narrowing in income inequality because it reduces the wage differentials between higher-paid skilled workers and lower-paid unskilled workers (Wood 1994). In contrast, in the developed county (e.g. the UK) the reduction of trade protection expands the output of high technology intensive goods while reducing the production of low technology intensive goods. This situation brings a rise in the price of high technology intensive goods relative to the price of low technology intensive goods, which widens income inequality.

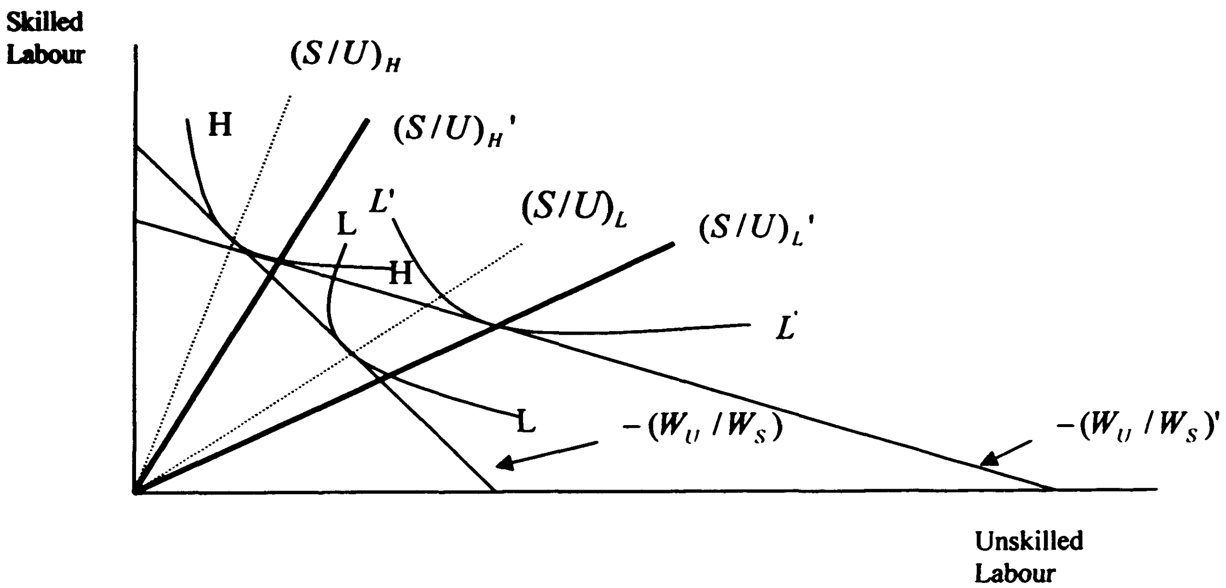
These discussions are illustrated in Panel B of Figure 3.2. In the case of the developing country, the price of L rises. The rise in the price of goods L increases the wages of unskilled workers relative to skilled workers. The production of low technology intensive goods then expands. However, the production of high technology intensive goods falls. The increase in the production of low technology intensive goods increases the demand for both types of labour. Since low technology intensive goods are relatively intensive in unskilled labour, the overall economy's relative demand shifts to unskilled labour and away from skilled labour. The low technology intensive goods industry will use more unskilled labour and less skilled labour relative to the changes in demand in the high technology intensive goods industry. Wages must therefore change. The wages for unskilled labour increase and the wages for skilled labour fall. At the new equilibrium condition, as shown as in Panel B, the new relative wage ratio shifts to $-(W_U / W_S)'$. The new relative wage ratio, and the new ratios of skilled to unskilled labour employed to produced high technology intensive goods and low technology intensive goods shift to $(S/U)_H'$ and $(S/U)_L'$ respectively.

Figure 3.1: The HOS Process in a Small Open Economy

Panel A: Initial Equilibrium



Panel B. New Equilibrium



3.2.2 Changes in the Pattern of Trade and Relative Demand

Now we consider the effects of changes in the pattern of international trade on the relative demand for labour. This discussion examines the effects of changes in relative prices between developed countries and developing countries. The above discussion on trade concentrated on the sector biased technological change induced by the changes in the pattern of trade. The discussion here is slightly different from that presented above in that we now we consider the effects of changes in trade itself. This analysis assumes prices are endogenous and will respond to changes in trade. Following Acemoglu (2001), consider the two goods interpretation of the model above as presented in Equation 3.7 and Equation 3.8. Before trading, the UK and Malaysia relative price of high technology-intensive goods, P_{SUK} / P_{UUK} and P_{SM} / P_{UM} respectively, are given by

$$P_{UK} = \left(\frac{P_{SUK}}{P_{UUK}} \right) = \left[\frac{A_{SUK} S}{A_{UUK} U} \right]^{\rho - 1} \qquad \text{(Equation 3.7)}$$

and

$$P_{M} = \left(\frac{P_{SM}}{P_{UM}} \right) = \left[\frac{A_{SM} S}{A_{UM} U} \right]^{\rho - 1} \qquad \text{(Equation 3.8)}$$

In the case of the developed county, the model assumes that $S_M / U_M < S_{UK} / U_{UK}$. Following the reduction of trade barriers world prices would fall in the UK and rise in Malaysia. The condition post trading in the UK can be written as,

$$P_W = \left[\frac{A_S (S_{UK} + S_M)}{A_U (S_{UK} + S_M)} \right]^{\rho - 1} < P_{UK} \qquad \text{(Equation 3.9)}$$

The price condition in Malaysia can be written as,

$$P_W = \left[\frac{A_S (S_{UK} + S_M)}{A_U (S_{UK} + S_M)} \right]^{\rho - 1} > P_M \qquad \text{(Equation 3.10)}$$

Equation 3.9 shows that $P_W < P_{UK}$ and implies that after trading with Malaysia, the demand for skilled workers in the UK will increase and push wages up. On the other hand, the skill premium in the developing country (Malaysia) is reduced after trading with the developed country (UK). The demand for unskilled workers is shown in Figure 3.2 below and is an approach that is called the mandated wage methodology. To demonstrate the mandated wage methodology, we follow Wood (1997) using Leamer's approach[7] to show the effects of trade on relative wages in the HOS model. Again, consider two goods, high technology goods (H) and low technology goods (L) that are produced by two factors, skilled (S) and unskilled (U) respectively, and two countries, the UK and Malaysia. Figure 3.2 shows the effect of trade on relative labour demand. The horizontal axis is the unskilled-skilled ratio and the vertical axis is the real wages of unskilled and skilled workers. The UK will be a net exporter of high technology intensive goods. Malaysia with more unskilled workers will export low technology intensive goods.

The Mandated Wage methodology argues that trade liberalization in developing countries will generally compress the wage gap between skilled and unskilled workers. The comparative advantage in developing countries generally lies in their stocks of unskilled labour, whilst protectionism actually distorts prices in favour of skilled workers. Protectionism raises the demand for skilled versus unskilled labour. Thus, moving from protectionism to trade liberalisation should shift the composition of output and employment towards sectors intensive in unskilled labour. This raises the relative demand for unskilled labour versus skilled labour and increases the wages of unskilled workers relative to the wages of skilled workers. It is called the mandated wage methodology because changes in wages are observed in order to explain the changes in the pattern of trade to satisfy the zero profit condition.

The line *dd* refers to the demand curve for unskilled labour in a country where high barriers prevent trade. At this stage, no trade occurs and prices are determined by the intersection of the demand curve and the supply curves. As shown in Figure 3.2, the

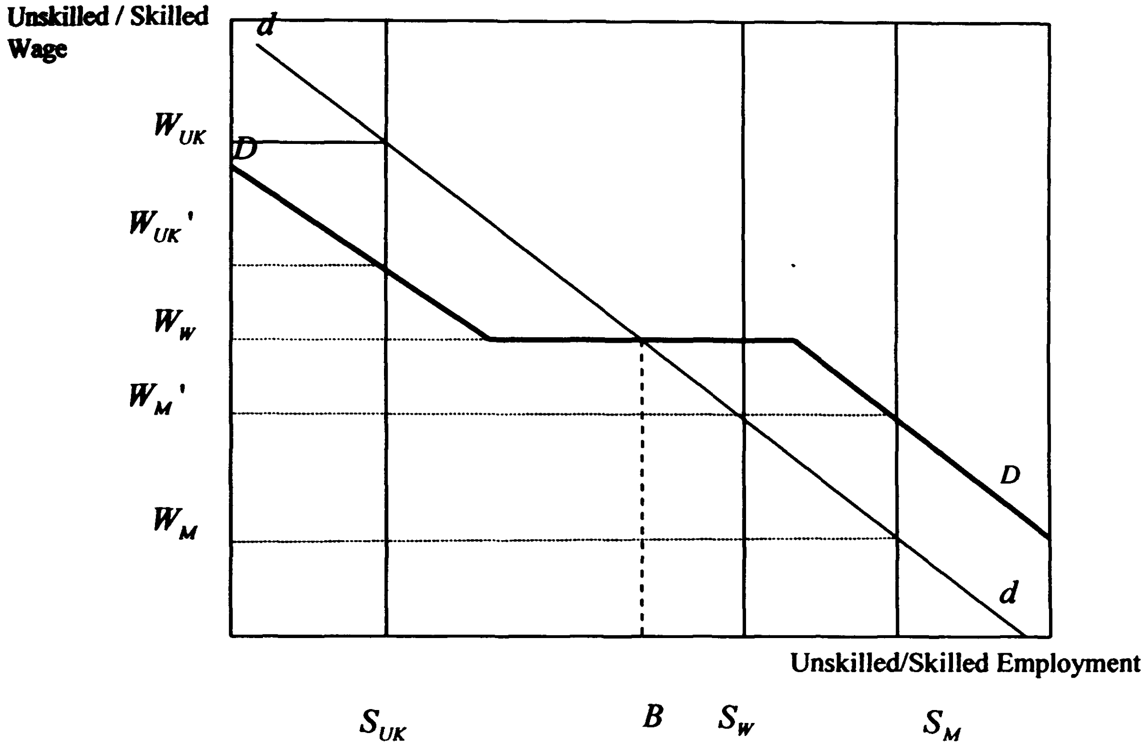
[7] This approach has been introduced by Leamer (1998).

relative wage equilibrium for the UK would be at the high level W_{UK}. In a country with many unskilled workers, as this case is Malaysia, the relative wages of unskilled labour would be at the low level W_M. The demand curve in a country completely open to trade is the line DD, which has two downward sloping segments separated by a flat segment in the middle at point B. This point indicates that from B to the left is the developed country (the UK) exporting high technology intensive goods or skill intensive goods. From point B to the right is the developing country (Malaysia) exporting low technology intensive goods or unskilled intensive goods. At this point, a no-trade point occurs, as the pre-trade and post-trade product prices are identical. The flat segment covers the range of factor endowments in which a trading country would produce both traded goods. Relative prices are set by the relative world price at the level W_W.

Now, we take the case of the UK in order to explain the effects of trade on relative wages and demand. We hold the assumption that the economy is a small open economy. For the UK, trading with Malaysia reduces the wages of unskilled workers from W_{UK} to W_{UK}'. The economy that is fully specialized in high technology intensive goods will experience a fall in the relative price of low technology intensive goods, because no low technology intensive goods are produced. This situation is shown by the downward sloping demand curve DD, where changes in domestic labour supply affect relative wages.

For the developing country, Malaysia, the supply curve is at S_M and this country specializes in low technology intensive goods. The effects of trade will increase relative wages for unskilled workers, as shown in Figure 3.2 below, with a relative increase from W_M to W_M', which is higher than W_M, but below the world price W_W.

Figure 3.2: The Effects of Trade on Relative Wages



The model concludes that trading with a developed country reduces the relative demand for skilled workers and increases the relative demand for unskilled workers. However, the use of only two factors (skilled and unskilled) does not fit well with what is actually happening in developing countries. Wood (1994), for example, has argued that there is a need to also consider semiskilled workers. In Malaysia skills can be categorised as unskilled workers (those with primary and no schooling levels of education), semiskilled workers (those having secondary education levels) and skilled workers (those having tertiary education levels). It is important to make a clear distinction between unskilled and semiskilled, especially in the context of trade between developed and developing countries. As Wood (1994) states, semiskilled groups are typically described as unskilled workers, but these workers are mainly involved in the manufacturing and services sectors and have some level of skill. Thus, it is important to distinguish the pattern of these groups, especially in developing countries. According to Wood (1994), there are three situations that will be distinguished.

The first is the case where the share of unskilled workers in the economy is large. In this case, the demand for semiskilled and skilled labour in manufacturing would fall. This situation would lead to a decrease in wage inequality for all labour, because the wages of skilled workers would fall relative to those of semiskilled workers, and the wages of semiskilled workers would fall relative to those of unskilled workers. Increases in the relative demand and wages for semiskilled cannot account for increases in employment and wages for all workers.

The second case is when the share of unskilled workers in the economy is moderate. The demand for semiskilled workers would increase relative to skilled and unskilled workers. Wage inequalities are not easily determined because the wages of semiskilled workers would rise relative to both skilled and unskilled workers. The wages of semiskilled workers are relatively high compared to skilled workers. As a result, the wage differential between semiskilled and skilled is narrowed. On the other hand, wages for semiskilled are also relatively high compared to unskilled workers. This widens the wage differentials between semiskilled and unskilled workers.

The third case that might occur is where the share of unskilled workers is small. However the case where the share of unskilled workers is small does not occur in developing countries. As highlighted in Chapter 2, the number of unskilled workers in Malaysia is considered moderate which means that the demand for semiskilled workers would increase relative to skilled and unskilled workers in Malaysia and that changes in the pattern of international trade may induce sector biased of technical change in favour of semiskilled workers.

3.3 Conclusion

In this chapter, we have presented the theoretical framework that can be used to examine the hypotheses that trade and SBTC can explain changes in wage inequality in Malaysia. These hypotheses are shown to operate in a HOS model and affect relative wages via changes in skill compositions. The model has significant advantages in that it incorporates how SBTC can work as both an exogenous or as an endogenous factor. In addition, it also permits an analysis of how changes in relative demand are affected by trade independent of technological change.

The model presented in the Chapter considered trade between two countries both using two factors to produce two different goods. As Malaysia is a developing country, we have considered the theory from a developing country's perspective in order to explain both hypotheses. The model assumes that the removal of trade barriers will increase the relative demand and wages for the more abundant factor in both countries. Since Malaysia is relatively abundant in less skilled workers, the demand for, and wages of, less skilled workers is high relative to skilled workers in the country. In terms of skill composition, this model assumes that trade with developed countries tends to increase the share of less skilled labour relative to the share of skilled workers. This model also explains the effects of SBTC on the relative demand for labour, which assumes that increases in technological change will increase the relative demand for those groups favoured by the changing technology. As documented in Chapter 2, the relative employment of semiskilled groups increased during the period 1985 to 1999, which suggest that SBTC or trade in Malaysia has favoured such workers. We have also noted, however, that in the context of a developing country a three-way categorisation of labour is necessary. The reason for this is that trade and technology, it is argued, favour semi-skilled labour at the expense of both skilled and unskilled labour.

Although the HOS model provides a sound theoretical basis in the present context, this model has several limitations. First, the model is based on a very restrictive set of assumptions including those of full employment, constant returns to scale and perfect factor mobility and zero transport costs. In addition, tastes and preferences are assumed to be identical in the trading countries. If this is not the case it is not possible to predict the pattern of trade that would result from trade. Indeed, one possibility is demand reversal and predictions that are the opposite of the standard HOS model.

Further, the assumption of identical technologies ignores an important aspect of trade between developing and developed countries. In fact, the technical capability to produce an identical range of goods may be very different between the two trading countries. Similarly, bargaining power is held constant whereas the majority of international trade is conducted by developed countries who are able to exercise considerable power over their trading partners in developing countries. Finally, the HOS model is not useful in explaining individual preference in the context of globalization. The model predicts that the impact of skill on preferences should vary in a systematic way across countries. In skill-abundant countries for example, highly skilled workers should favour to trade. On the other hand, in countries with an abundance of low skilled workers, these workers should favour to trade. However, Scheve and Slaughter (2001) found that high skilled workers are in favour everywhere, because, generally, educated people are more capable than unskilled workers.

CHAPTER 4

LITERATURE REVIEW AND THE ECONOMETRIC FRAMEWORK

4.1 Introduction

The previous chapter discussed the theory that underpins the empirical analysis of the causes of changes in the relative demand for labour. This chapter reviews previous empirical work related to these changes and presents the empirical model that we use to measure them. The issue of wage inequality came to the forefront, and generated much analysis, when differences in wages between skill groups declined in the 1970s and rose sharply in the 1980s, especially in the US. The interesting issue that has attracted so much analysis is the underlying causes of these changes. A plethora of studies have been undertaken to measure how changes in labour demand can contribute to changes in wage differentials for a whole myriad of countries. For example, Arbache *et al.* (2004), Manasse (2004), Berman and Machin (2000) and Robbins and Gindling (1999) have investigated the changes in wage inequality in developing countries and Katz and Murphy (1992), Haskel and Slaughter (2001; 2002) have conducted an analysis of wages in developed countries.

The structure of this chapter is as follows. In the next section, we present a brief overview of wage inequality. We then present the empirical methodologies USED to measure how changes in the labour market impact upon wage inequality and the empirical literature related to our hypotheses in Section 4.3. Section 4.4 then concludes the discussion.

4.2 Wage Differentials

The discussion of wage differentials can be approached on several different levels; the analysis can be conducted by education, occupation, industries, countries, age and experience. In Brazil, for example, wage differentials are due primarily to high income inequality across industries (Gatica *et al.*,1995). In Taiwan, wage differentials reflect the rapid increase in the share of educated workers in the labour market (Lin and Orazem, 2003). The widening in wage inequality in South Korea was due to the expansion of high incomes in certain occupational groups as a result of heavy industrialization (Leipziger *et al.*1992). Wage inequality has also risen significantly in the US, and a large body of literature documents a substantial rise in wage differentials in many contexts of study; for example, in the US, Katz and Murphy (1992), Bound and Johnson (1992), Murphy and Welch (1992) and Juhn Murphy and Pierce (1993) looked at the changes in relative wages due to supply and demand factors. Katz and Murphy (1992) and Robbins and Gindling (1999) employed a supply and demand framework to construct a time series of returns to schooling and relative demand shifts. Changes in wage differentials have also been examined by looking at changes in the sex composition of the workforce. Blau and Khan (1996) examined wage differentials from a gender perspective and how gender affects wage differences across countries. Lucifora (1999) analysed the changes in wage differentials by industry and occupation in Italy.

Much of the extensive analysis has suggested that there are two principal causes of changes in wage differentials: changes in the pattern of trade and skill biased technological change (SBTC). These two hypotheses have attracted much research. Studies related to the trade hypothesis for example, include Wood (1995), Sachs and Shatz (1994), Haskel and Slaughter (2002), Card and Di Nardo (2002). These studies concluded that changes in patterns of trade have contributed to the increase in the dispersion of wages and employment in developed countries. In developing countries, Edwards (1993), Robbins (1996), Robbins *et al.* (1999), and Arbache (2004) support this argument and believe that wage inequality is largely explained by factors such as changes in the pattern of trade rather than from those relating to exogenous changes in human capital. Galiani and Sanguineeti (2003) find that the rise in inequality in Argentina was due to trade liberalization and not because of changes in the returns to college graduates.

With regard to SBTC, Machin (2001), Berman *et al.* (1998) and Gorg and Strobl (2002) have argued that the declining demand for less skilled workers reflects the fact that technological innovation has been biased toward skilled labour which had a strong impact on the structure of labour demand and thus changes in relative wages. In developing countries, Berman and Machin (2000) investigated the role of SBTC in increasing the demand for skilled workers in manufacturing industries. They reported that SBTC innovation migrated rapidly from developed to middle-income countries, but found no evidence that this happened for low-income countries. Katz and Murphy (1992) have shown that changes in wage differentials can be explained by shifts in the supply and demand for skills (see also Autor, *et al.* (1998)). In particular, the rising demand for skilled workers in parallel with the computer revolution, combined with the slowdown in the relative supply of educated workers, has caused wage differentials to increase significantly.

An interesting extension to the general conclusion that changes in wage inequality arise from the rising demand for skilled workers relative to the unskilled is Acemoglu (2003). Using the supply and demand framework standard in the literature, Acemoglu explores the cross-country inequality in European and the USA. The stylized fact he seeks to explain is that wage inequality increase sharply in the US and the UK but not in most European countries. He considers traditional and alternative explanations in order to explain these differences. Traditional explanations are that the relative supply of skilled workers rose faster in Europe than in the US and the UK and that the wage-setting institutions, acted to maintain the position of unskilled workers in Europe. The alternative explanation Acemoglu considers is that institutional wage compression has led to firms in Europe

Two studies which question the validity of the standard supply and demand models used in the literature are those of Glyn (2001) and Atkinson (2002). Glyn focuses on the position of the least qualified workers in OECD countries. After documenting the relative decline in their position in the labour market he considers whether these can be attributed to shifts in relative demand and supply. As with Acemoglu, Glyn notes that the there is considerable variation in the extent to which the relative position of lower skilled workers has declined across the OECD. This, he suggests, casts doubt on the usefulness of global explanations for changes in inequality. In addition, he argues that changes in relative employment rates are only loosely correlated with changes in relative wages, and therefore rejects the standard supply and demand based explanation. Glyn proposes a number of alternative explanations such as whether the employment of less skilled workers is less sensitive to changes in relative wages, the impact of institutional factors, such as the impact of trade unions, and the differential rate at which new technology and import competition have impacted upon labour markets in different countries. Glyn does not come to any strong conclusion regarding these alternatives.

Atkinson (2002) rejects the basic model used in much of the literature on the grounds that a simple dichotomy between skilled and unskilled workers is too simplistic and that it is impossible to translate into empirical equivalents. He argues that understanding changes in inequality require that one moves away the idea that one group of workers loses out at the expense of another. Rather, he suggests, one needs to consider a productivity continuum across which workers are spread and associated with which is an earnings distribution. The focus of the analysis should then be on the complete earnings distribution. Atkinson finds that this distribution has tilted something which cannot be explained in the standard model. Explanations for this tilt must, he argues, be found in alternative theories of wage determination beyond a simple supply and demand model. Atkinson focuses on the role of trade unions, and social custom and reputation.

4.3 Different Approaches to Measuring Changes in Wage Differentials

To examine the causes of changes in wage inequality, researchers have adopted a variety of different approaches. Since the aim of this study is to look at the effects of trade and technology on wage inequality, the first approach we consider is one that measures wage inequality using a standard Mincerian wage equation, (Mincer,1974). This model has been further developed to include the effects of technological change and trade. Examples of this approach are Tsou (2002) and Lin and Orazem (2003). We discuss the Mincer equation approach in Section 4.3.1. The second approach, which is presented in Section 4.3.2, is a decomposition approach. This approach was proposed by Katz and Murphy (1992) and was further developed by Blau and Khan (1996), Machin (1998; 2001), Berman, Bound and Griliches (1994) and Berman and Machin (1998). The third methodology used is based on an analysis of cost functions that allows us to measure the impact of trade. This approach is adopted in the work of Lawrence and Slaughter (1993) and Haskel and Slaughter (2001; 2002). We discuss this approach in Section 4.3.3 below.

4.3.1 Earnings Equations

One of the most important issues in labour economics is the determination of people's earnings. The traditional model of wage determination asserts that both education and experience increase a worker's skill level and therefore increase his/her wages. This basic relationship was first popularized by Mincer (1974) and is know as the human capital earnings function. Standard human capital earnings functions have subsequently been estimated for many countries and over different time periods (see Psacharopoulos *et al.*, 2002). More recently, studies in growth economics use the human capital earnings function to analyze the relationship between growth and average schooling levels across countries (Bils and Klenow, 2000).

In this study, we investigate the causes of increasing earnings inequalities in Malaysia. One staring point therefore would be to employ human capital earnings functions to discover how rates of return human capital (skill levels) have changed and how these contribute to changes in earnings inequality. In addition, as shown below, this analysis can be extended to consider how changes in technology and in trade patterns contribute to changes in earnings inequality.

As mentioned above, the basic Mincer equation relates individual wages to variations in education and training. Changes in the rate of return to education and/or training can be used to measure changes in the relative demand for different groups of workers with different levels of human capital. In the present context Chung (2003) has investigated the returns to education in Malaysia for 1997. However, to examine the impact of technology a number of researchers have introduced modifications to the basic earnings equation by considering technological change and trade variables in a two stage regression analysis. This approach which we shall be using and which we consider now.

Based on the work of Tsou (2002), a two-stage model is needed to trace the effects of trade and technological change on wage inequality in this case in Taiwan during 1982-1997. In the first stage, he estimated a standard wage equation as:

$$\ln W_k = \beta_0 + \beta_1 ED1_k + \beta_2 ED2_k + \beta_3 ED3_k + \beta_4 ED4_k + \beta_5 EXPER_k + \beta_6 EXPER_k^2$$
$$+ \beta_7 AGE_k + \beta_8 MALE_k + \beta_9 MAR_k + \beta_{10} SIZE_k + \varepsilon_k$$

(Equation 4.1)

where

$\ln W_k$ = Natural logarithm of the hourly wage for salaried worker k.

$ED1_k - ED4_k$ = Dummy indicator for highest education level.

$ED1_k$ - 9 years

$ED2_k$ - 12 years

$ED3_k$ - 13-15 years

$ED4_k$ - $\geq$ 16 years

$EXPER_k$ = Represents the worker's total years of potential work experience

$EXPER_k^2$ = Squared $EXPER_k$.

AGE_k = Worker's Age.

$MALE_k$ =Dummy variable equal to 1 if worker is male.

MAR_k = Dummy variable equal to 1 if worker is married.

$SIZE_k$ = Dummy variable that is equal to 1 if firms have >100 employees, otherwise 0.

ε_k = Error term.

Tsou used this regression to obtain estimates of the inter-industry wage differentials between college graduates and senior high school graduates $(W_{sc} = \beta_4 - \beta_2)$ and the wage differentials between college graduates and junior high school graduates $(W_{hc} = \beta_4 - \beta_1)$. Not unexpectedly, estimates of the log-wage differentials between workers with college and senior high-school degrees are found to be smaller than those over junior graduates.

However, he also notes that there was a slight decline in both wage inequality and educational differentials in Taiwan over the period from 1982 to 1997. During this period, the log-wage differentials between the ninetieth and tenth percentile workers slightly narrowed for men while widening for women.

In the second stage, he used the estimated inter-industry wage differentials as the dependent variables to further examine the impact of technology and trade flow on wage differentials. The regression model can be written as:

$$W_{it} = \gamma_0 + \gamma_1 TC_{it} + \gamma_2 TF_{it} + \gamma_3 YEAR_{it} + \varepsilon_{it} \qquad \text{(Equation 4.2)}$$

Where

W_{it} = The log wage differential between education levels in industry i at time t.

TC_{it} = Industry rate of technological change.

TF_{it} = Trade flow variable

$YEAR_t$ = Dummy variable for Year

The technological change variable is measured by total factor productivity growth and the share of R & D to sales. Trade is measured by export and import to income ratios. The data are drawn from the Taiwan Manpower Utilization Survey (TMUS) from 1982-1997. Overall the results suggested that there is a positive correlation between wage differentials and the two measures of technological change indicating a widening of wage differentials between college and high-school workers in industries characterized by higher rates of technological change. It is interesting to note that they also found that the effects from international trade in manufactured goods were confirmed as an important source of relative labour demand shifts.

Arbache *et al.* (2004) investigated the contribution of changes in the pattern trade from a rather different angle. They examined the effects of trade on wages and the return to skills and the level of education between the traded and the non-traded sectors and pre and post a period of trade liberalization in Brazil (pre and post 1990) using the Mincerian earnings equation. The authors adopt a number of different approaches including the use of industry affiliation as a measure of whether someone is employed in the traded or non-traded sectors, a pre and post 1990 comparison of the coefficient estimates from the earnings functions and the use of a measure of openness. Arbache *et al.*(2004) classified traded and non-traded industries as presented in Table 4.1 below:

Table 4.1 Definition of Traded and Non-Traded Industries

Traded Industries	Non-Traded Industries
Agriculture	Industrial Services
Mineral extraction	Construction
Non-Metallic goods	Commerce
Metallurgic goods	Transport
Electrical and Electronics	Communications
Vehicle and Parts	Financial Institutions
Wood and Furniture	Family Services
Paper and Publishing	Company Services
Rubber	Public Administration
Chemicals	Rental
Petroleum Refining	Other Non –traded Services
Pharmaceutical and Perfumes	
Plastics	
Textiles	
Clothes	
Footwear	
Food	
Other Manufacturing	

Using a series of nationally representative cross-section household surveys from Pesquisa Nacional por Amostra de Domicilios (PNAD) during the period 1981-1999, Arbache *et al.* (2004) found that wages in the traded sector were lowered substantially by an increased degree of openness following liberalization. Trade also had differential effects across education groups and within sectors. Across the whole economy, the marginal returns to education were lower post-liberalization than the pre-liberalization period, except for college-educated workers, for whom the marginal return increased. Within the traded sector, increasing openness was associated with lower wages, but the downward impact of openness on wages was significant at the highest two education levels.

Pavcnik, *et al.* (2004) examined the impact of trade liberalization during the period 1988-1994 on the industry wage structure in Brazil. They argue that industry affiliation potentially provides an important channel through which trade liberalization affects workers' earnings and wage inequality between skilled and unskilled workers. To investigate the effects empirically, they employed an industry indicator in a two-stage regression along similar line to that used by Tsou (2002) reported earlier. In the first stage, the regression equation is:

$$\ln(W_{kit}) = H_{kit}\beta_{kit} + I_{kit} * Wp_{it} + \varepsilon_{kit} \qquad \text{(Equation 4.3)}$$

where;

$\ln(W_{kit})$ = Natural logarithm of hourly wages for workers k in industry i at time t.

H_{kit} = vector of worker characteristics (age, age squared, gender, marital status, head of the household indicator, education indicator, literacy, location indicator, occupational indicator, job type indicators.

I_{kit} = Industry indicator.

Wp_{it} = Industry wage premium

ε_{kit} = Error term.

In the first stage of their analysis, they estimated the model for each year and in the second stage, they pooled the industry wage premiums Wp_i over time and regressed them on a vector of trade-related industry characteristics T_{it}, a vector of industry fixed effects, and time indicators D_{it} [8]. The equation can be written as:

$$\Delta Wp_{it} = \Delta T_{it}B_T + D_{it}B_D + u_{it} \qquad \text{(Equation 4.4)}$$

They also estimated the second-stage regression in first-differences. Since the dependent variable in the second stage equation is derived from the first equation, they estimated Equation 4.4 with weighted least squares (WLS) using the inverse of the variance of the

[8] In fact they express the estimated wage premiums as deviations from the employment-weighted average wage premium.

wage premium estimates from the first stage as weights. They combined the information from the Brazilian labour force survey *Pesquisa Mensal de Emprego (PME)* with industry level data on tariffs, import penetration, and exports from 1987 to 1998. The data set covers the 6 largest metropolitan areas in Brazil[9]. The two main conclusions from their empirical analysis are: firstly, that they found that there is no association between changes in industry wage premiums and changes in trade policy. Secondly, trade liberalization in Brazil did not significantly contribute to increased wage inequality between skilled and unskilled workers.

Attanasio *et al.* (2003) using the some type of approach similarly found limited evidence of the effects of trade on wage inequalities in Colombia after trade reforms. They consider the effects of trade using four sets of variables; returns to education, industry wage premiums, returns to occupation and informality of the sector. They used information from the Colombian National Household Survey (NHS) over two decades: the 1980s and 1990s. This data consisted of information about workers' earnings, characteristics and industry affiliation. They linked this data with two digit industry level tariff and trade exposure information. Applying Equation 4.3 in the first stage and 4.4 in the second stage, they reached two main conclusions. Firstly, they report both an increasing return to college education and that the demand for labour shifted towards the informal sector that typically pays lower wages. They suggest that the increase in the skill premium was primarily driven by skilled biased technological change. Secondly, as far as trade was concerned, they again found limited evidence that the trade reforms were responsible for the changes in the wage distribution on the grounds that the increased returns to education, changes in industry premiums and informality alone could not fully explain the increase in wage inequality.

A slightly different approach is proposed by Pavcnik *et al.* (2003), and Cragg and Epelbaum (1996), using modified Mincerian earnings equations they by allow the industry dummies, occupation dummies and wage experience profile to shift across time and across education groups. The changing of returns to skills can then be measured as:

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[9] Sao Paulo, Rio de Janeiro, Porto Alegre, Belo Horizonte, Ricife and Salvador.

$$W_k = \sum_{t=1987}^{1993} Y_{kt} \left\{ D_{It}^{'} \alpha_{kt} + D_{Ok}^{'} + \sum_{e=1}^{3} ed_{ek} \left\{ \beta_{et}^{0} + \beta_{et}^{1} \exp_k + \beta_{et}^{2} \exp_k^2 \right\} \right\} \qquad \text{(Equation 4.5)}$$

where W_k denotes the wage for individual k, Y_{kt} represent the time dummies indicating the year in the survey, D_{It} is a vector of 22 industry dummies, D_{Ok} is a vector of 17 occupation dummies, $\exp_k$ is the age experience profile, ed_{ek} are education dummies corresponding to primary, secondary, or post–secondary schooling. Pavcnik *et al.* (2003) found that the industry-specific effects explain little of the rise in wage dispersion in Mexico. Occupation specific effects can explain almost half of the growing wage dispersion. They further measured the effects of trade by repeating the same exercises for wage and employment changes into traded and non-traded sectors and found that employment growth for unskilled workers was much lower in traded industries than in the non-traded industries; thus, the traded sector is becoming more skill intensive than the non-traded sector. This finding is consistent with other findings using plant level data (Bernard, 2001). They also found that the competition from imports has an important role in the fall in the relative demand for unskilled workers in the traded sector.

Although earnings functions are now a standard part of labour economics, the do rely on a number of significant underlying assumptions (James, *et al.*2005). In the first place, there is what James *et al.* (2005) call the synthetic cohort assumption, namely that cross section estimates are equivalent to the life cycle of individuals. If the premiums associated with education are changing over time, then cohort-specific rates of return to education will not be captured by cross-section estimates. Changes in wage patterns over time may not therefore be captured by a series of cross section estimates.

Second, standard earnings functions do not allow for differences in ability or for differences in the quality of schooling. If these are fixed over time then this would not be a problem in the present context. However, if these variables are changing over time and, if they are correlated with level of education, then cross section estimates of rates of return to education will provide biased estimates of the changing pattern of skill premiums. Finally, the model does not allow for differences in the costs of acquiring education nor for heterogeneity in rates of return across individuals.

This would suggest that caution should be used in interpreting variations in rates of return to education over time. This is more likely to be the case for a country such as Malaysia where the economy and labour market have seen rapid and significant change in a relatively short period.

4.3.2 Decomposition Approach

The decomposition approach measures the changes in employment and wage bill shares between, for example, skilled workers and unskilled workers. The approach allows the effects of trade and technological change to be measured, specifically by estimating between industries and within industry changes. This approach has been pioneered by Katz and Murphy (1992). Using a supply and demand framework, Katz and Murphy (1992) examined relative demand and supply shifts in the U.S between 1963 and 1987.

Using data from the March Annual Demographic Supplement (CPS) for survey years 1964 to 1988 the overall (industry-occupation cells) change in relative demand can be written as:

$$\Delta X_k^d = \sum_j \left(\frac{E_{jk}}{E_k}\right)\left(\frac{\Delta E_j}{E_j}\right) = \frac{\sum_j \alpha_{jk} \Delta E_j}{E_k} \qquad \text{(Equation 4.6)}$$

where ΔX_k^d is the change in demand for group k. j indexes sector (industry) and k indexes demographic groups. For the overall relative demand j indexes 150 industry-occupation cells. E_j represents the total labour input in sector j, ΔE_j is the change between years in total labour input in sector j. E_k is the base year employment of group k. $\alpha_{jk} = \frac{E_{jk}}{E_j}$ is group k's share of total employment in sector j in the base period. They used an efficiency unit measure of E_k and E_j rather than actual employment and the average share of total employment in sector j of groups k over the 1967-1987 sample period as their base period for α_{jk} and the average share of group k in total employment over the 1967-1987 period as their measure of E_k.

Katz and Murphy decomposed this index into between and within components. The between industry demand shift index for group k, ΔX_k^b is given in Equation 4.6 when j refers to 50 industries. Between-industry demand shifts are considered as trade effects because they do not only measure demand shifts at fixed relative wages but also include the demand shifts brought about by changes in relative wages. The within-industry demand shift index for group k, ΔX_k^w, is calculated as the difference between the overall demand shift index and the between-industry demand shift index (i.e. $\Delta X_k^w = \Delta X_k^d - \Delta X_k^b$). The within-industry demand shift measures the shifts in employment among occupations within-industries and might not capture the full effect of within-industry changes in relative demand. This is the skill biased technological change effect.

Using the above decomposition, Katz and Murphy found that wage inequality in the U.S labour market in the 1980s could be explained by the rapid growth in the relative demand for more skilled workers, and the changes this has had on wage structure over the last 25 years. They also found that female workers appeared to be the driving force behind observed changes in the wage structure. Between-industry shifts in employment increased the demand for male college graduates by over 30 percent relative to males with twelve or fewer years of schooling; when compared to females, they concluded that the demand for males with 12 to 15 years of schooling are more pronounced in production and manufacturing industries. This study also concluded that the shift in relative demand was mostly due to the accelerated within-industry shift, which supports the hypothesis of skill biased technological change (SBTC).

Katz and Murphy also estimated the labour supply equivalents of trade in order to measure the overall impact of trade on wages. The implicit labour supply in trade is the labour input required to produce traded output domestically. The implicit supply of labour of demographic group k contained in net trade in year t as a fraction of total domestic labour supply of k is given by:

$$L_t^k = \sum_i e_i^k E_i^t \left(\frac{I_{it}}{Y_{it}} \right)$$

where L_t^k is the implicit labour supply of demographic group k embodied in trade in year t. i indexes the manufacturing industry, k indexes demographic groups and t indexes year. Formally, we let I_{it} be net import in industry i in year t, Y_{it} be domestic output of industry i in year t, and E_{it} be the share of total employment in industry i in year t. e_i^k is the average proportion of employment in industry i made up of workers in group k over the 1967-1997 period. Using data on imports, exports and output from NBER Immigration, Trade and Labour Market Data Files, which cover four digit SIC manufacturing industries for each year from 1967-1985, Katz and Murphy further measured the effects of trade on relative demand for demographic groups k in year t as:

$$T_t^k = -\left(\frac{1}{E^k} \right) \sum_i \left[e_i^k E_{it} \left(\frac{I_{it}}{Y_{it}} \right) \right] + \sum_i E_{it} \left(\frac{I_{it}}{Y_{it}} \right) \qquad \text{(Equation 4.7)}$$

where E^k is the average share of total employment of group k during the 1967-1987 period. The first term in Equation 4.7 is the implicit labour supply of group k embodied in trade, normalised by base year employment of group $k(E^k)$ with the sign reversed to convert the supply shift measure. The second term adjusts the demand shift measure so that trade affects only relative demand for labour.

Since many activities of non-production workers, e.g., marketing, sales and accounting, may be complementary with production workers overseas, Katz and Murphy analysed these issues using two methods. The first method is called was equal allocation, treating net imports in a manner analogous to domestic production for domestic consumption. The second method, namely production allocation, assumes that exports are allocated to all workers in the same manner as domestic production for domestic consumption and imports are allocated to production workers only. The first term directly employs Equation 4.7 and the second method can be written as:

$$-\left(\frac{1}{E^k}\right)\sum_i\left\{\left[e_i^k E_{it}\left(\frac{X_{it}}{Y_{it}}\right)\right]-\left[p_i^k E_{it}\left(\frac{M_{it}}{Y_{it}}\right)\right]\right\} \qquad \text{(Equation 4.8)}$$

where X measures exports, M measures imports and p_i^k is group k's average share of production worker employment in industry i over the period 1967-1987 period.

The Katz and Murphy analysis found that trade reduced the demand for high-school educated men and increased the demand for female workers who were intensively employed in competing import industries. They found that the effects of trade on changes in relative labour demand showed a moderate trend until substantial trade deficits developed in the 1980s. The adverse effects of trade on relative labour demand were concentrated on high school dropouts. Female dropouts, who have traditionally been employed intensively as production workers in import competing industries such as apparel and textiles, were the group most affected by trade. In fact, demand changes from trade were domestic sources of between-sector demand shifts. They also found that the effects of trade on relative labour demand were substantially larger when imports were assumed to disproportionately affect production workers. During the 1980s, the effects of trade were relatively small compared to increases in the relative supplies of more educated workers.

Chamarbagwala (2006) investigated wage inequality in India using a similar approach to Katz and Murphy (1992). Using individual level data from the Employment and Unemployment Schedule of the National Sample Survey Organization (NSSO) during the period 1983-2000, he examined data for individuals aged 15 years and above and based on two samples. The first is a wage sample to measure hourly wages of workers by demographic group and the second is a count sample to measure the amount of labour supplied by these demographic groups. Chamarbagwala divided the data into 100 distinct labour groups, defined by two gender groups (male and female), five education groups (less than primary, primary, middle, high school, and college), and 10 age groups.

To measure overall relative demand, Chamarbagwala applied Equation 4.6 with j indexes 48 industry-occupation cells; 18 industries and 3 occupation groups. He decomposed the overall relative demand into between-industries and within-industries. The between-industries shift is the index given in Equation 4.6 when j indexes the 18 industries. Chamarbagwala found that overall demand shifted away from men and women with a low level of education and favoured men and women with a higher educational level. This increase in skilled labour was mostly due to a skill upgrading within-industries for all demographic groups. This result indicates that it is primarily skill biased technological change that explains the changes in relative demand in skilled workers in India.

Chamarbagwala tested the trade hypothesis by utilising the Katz and Murphy methodology to measure the impact of changes in trade patterns on wages. Using Equation 4.8, Chamarbagwala indexes i for 16 manufacturing industries. k indexes 10 demographic groups and t indexes four years. He used data on imports, exports and output by industry for the years 1983, 1993, 1998, and 1999 from the Trade & Production Database provided by the World Bank and found that relative wage and demand shifts in India during the period 1983-2000 not support the hypothesis that changes in the pattern of trade affected wage inequality.

Blau and Khan (1996) also measured the changing pattern of demand by skill for number of countries relative to what was happening in the United States using the decomposition approach in a manner similar to Katz and Murphy (1992). They employed Equation 4.6 and used six industries and three occupation groups. The analysis of Blau and Khan concentrated on measuring overall relative demand and supply and did not pay much attention to decomposing this overall relative demand into between-industries and within industries. Based on a series of micro data sets they found that the distribution of wage inequality between the middle and bottom ten percent is considerably larger in the United States than in the other countries studied. However, the inequality between the top ten percent of income groups and middle is only slightly larger in the U.S relative to other industrial counties. These results indicate that the gap between the middle and bottom ten percent of the U.S wage distributions would decrease. The gap between the top and middle ten percent of the wage distributions however would be increased. They also show that the wage distribution in other countries would still be more compressed at the bottom ten percent than at the top relative to the wage distribution in the U.S. They also have taken the demand and supply framework across counties to examine the effects of market forces on the distribution of wages particularly for the high relative wages of low-skilled workers in other countries. They concluded that their analysis suggests that high skill workers are considerably scarce relative to low skill workers in other countries compared with the United States. They also found that, male wage inequality in the United States is much greater than in the other nine industrialised countries.

A slightly different method to the decomposition approach outlined above is proposed by Berman *et al.* (1994). These studies measure relative demand using the decomposition as shown below:

$$\Delta P_S = \sum_i \Delta C_i \overline{P}_{Si} + \sum_i \Delta P_{Si} \overline{C}_i \qquad \text{(Equation 4.9)}$$

where $i = 1, \ldots,$ N industries. $P_i = E_{Si} / E_i$ is the proportion of skilled labour in industry i, $C_i = E_i / E$ is the share of employment in industry i. Similar to the Katz and Murphy (1992) methodology, relative demand can be decomposed into between-industry and within-industry effects. The first term in the equation $(\sum_i \Delta C_i \overline{P}_{Si})$ is the between-industries component attributable to shifts in employment share between-industry with different proportions of skilled workers. The second term $(\sum_i \Delta P_{Si} \overline{C}_i)$ reports the proportion of skilled workers within-industry component which represents the change in the aggregate proportion attributable to changes in the proportion of skilled workers within each industry. A bar over the term denotes a mean over time.

Berman *et al.*(1994) exploited Equation 4.9 to measure the changes in demand for skilled labour within U.S manufacturing during the 1980s. Using the Annual Survey of Manufacturers (ASM), Current Population Survey and the Census of Manufacturing, they concluded that the within-industry component dominated the between-industry component in each period. This result indicates that changes in relative demand in U.S manufacturing during the 1980s support the SBTC hypothesis. Berman, Bound and Machin (1998) support this finding and found strong evidence of SBTC in a number of developed countries. Berman *et al.* (1994) further decomposed the between-industry and within-industry terms into sectors to further investigate the trade effects. They classified the sector terms as imports, exports and defence procurements; the source of import and export data was the NBER Trade-Immigration-Labor Market data set. The further decomposition between-industry term in Equation 4.9 can be written as:

$$\sum_i \Delta C_i \bar{P}_{Si} = \sum_i \Delta C_i^X \left(\bar{P}_{Si} - \bar{P}_S^V\right) + \sum_i \Delta C_i^M \left(\bar{P}_{Si} - \bar{P}_S^V\right) + \sum_i \Delta C_i^D \left(\bar{P}_{Si} - \bar{P}_S^V\right) + \sum_i \Delta C_i^V \left(\bar{P}_{Si} - \bar{P}_S^V\right) \quad \text{(Equation 4.10)}$$

where X, M, D and V denote exports, imports, defence and consumption sectors respectively in industry i. The within-industry terms in Equation 4.9 can also be decomposed into sectors as:

$$\sum_i \Delta P_{Si} \bar{C}_i = \sum_i \left(\Delta P_{Si} - \Delta P_S^V\right) \bar{C}_i^X + \sum_i (\Delta P_{Si} - \Delta P_S^V) \bar{S}_i^M + \sum_i \left(\Delta P_{Si} - \Delta P_S^V\right) \bar{C}_i^D + \sum_i \left(\Delta P_{Si} - \Delta P_S^V\right) \bar{C} S_i^V + \Delta P_S^V \quad \text{(Equation 4.11)}$$

The results show that the domestic consumption sector accounts for almost all of the within-industry skill upgrading and, indeed, for most of the overall skill upgrading. The role of trade in shifting employment away from unskilled labour intensive industries is quite small. To measure other factors that might explain the within-industry changes, they extended their analysis by using the cost function approach. This approach will be detailed and explained in the next sub-section.

Similar findings to Berman *et al.*(1994) are found by Machin and Van Reenen (1998) who examine changes in the skill structure of wage bills and employment in the United States and six other OECD countries using decomposition as presented in Equation 4.9. They used various sets of data; the first is data on value added and investment from an industry-level panel data set compiled by OECD. R&D data is from the Business Enterprise R&D (ANBERD) database and international trade information is from the Bilateral Trade Database. They also found that the within-industry effects, which represents technological change, is dominant rather than the between-industries effects in explaining the changes in the skill structure of wage bills and employment in the United Stated and with six other OECD countries. As with Berman *et al.* (1994), they further explored the changes in skill upgrading using the cost function approach.

A further study adopting the decomposition approach is that of Desjonqueres, Machin and Van Reenen (1999) using two measures of skill, the first based on the distinction between non-production and production workers, and the second based on the comparisons of low and highly educated workers. They use data for Australia, Austria, Denmark, Italy, Finland, Ireland, Japan, Norway, Spain, Sweden, UK and the US from a variety of sources, with the non-production/production comparisons based on data from the United Nations Industrial Statistics Database (UNISD) and the education comparisons from micro-data sources in the relevant countries, for example, in the UK they are based on Labour Force Survey data and, in the US, the Current Population Survey data. As with previous studies they found that increase in skill upgrading is within-industry rather than between- industry. To address the possibility that the decomposition was too aggregated, they followed another route by examining skill upgrading within-industry employment shares in disaggregated, non-manufacturing, non-traded sectors. They found that trade alone cannot explain the extent of skill upgrading. They also extended their analysis using the cost function approach. Their argument was that rising international competition from developing countries is the crucial factor affecting the relative demand shifts against the less skilled workers. We discuss this finding in the next sub-section.

Similarly, changes in labour market inequalities in Mexico cannot be explained by changes in the pattern of trade. Hanson and Harrison (1995), using the decomposition approach, applied Equation 4.9 to investigate the effects of trade and technology in labour market inequalities in Mexico, considered whether trade reform has shifted employment towards industries that are relatively intensive in the use of skilled labour. They performed the decomposition using both the Secretariat of Trade and Industrial Promotion (SECOFI) and Industrials Census data sets. They define skilled workers as white collar and unskilled as blue collar workers. They found that, for the SECOFI sample, 80 percent of the changes in the white collar wage share were due to within-industry wage changes. Similarly, using the Industrial Census data, they found that 93 percent of the change was due to within-industry changes. These results clearly indicate that most of the movement in skilled and unskilled wages and employment is within-industries and not between-industries. This suggests that trade policy and changes in the pattern of trade do not play a major role in explaining the observed changes in wage inequality.

Berman and Machin (2000) investigated the role of skill-biased technological change in increasing demand for skills in manufacturing industries in a number of countries. They ranked countries by income level; high income countries[10], middle income countries[11] and low income countries[12]. Using the decomposition in Equation 4.9 by groups of countries, they find that for all high income countries except Belgium, the increased wage bill share of non-production workers is due to within-industry changes. 16 out of 18 middle income

[10] Japan, U.K., Austria, Finland, Belgium, Denmark, Luxembourg, West Germany, Norway, Sweden, Australia and U.S.
[11] Guatemala, Turkey, Peru, Colombia, Korea, Malaysia, Czech Rep., Chile, Poland, Malta, Portugal, Hungary, Uruguay, Cyprus, Ireland, Spain and Venezuela.
[12] Ethiopia, Tanzania, India, Bangladesh, Pakistan, Egypt and Philippines.

countries experienced increased wage bill changes for non-production workers and the two countries that experienced a decrease in the changes in non-production workers included Malaysia (Cyprus was the other). They found that within-industry effects contributed 86 percent to the decrease in changes of the share of non-production workers. They also found that the 1970s showed much less evidence of skill-upgrading for the middle income group; and that the within-industry shifts were much weaker in the low income group. In the 1970s, only the Philippines experienced substantial within-industry skill upgrading; however in the 1980s, Ethiopia, Tanzania, Pakistan and Egypt showed substantial within-industry shifts towards non-production workers. Since within-industry effects measure the changes in technological change, they further estimated the indicator of the technological change using the cost function approach. We discuss this further in the next sub-section. Similarly Machin (2001) examined changes in the relative demand for labour using UK labour force survey data and a US current population survey from 1980-2000. He found that both wage and employment shifts towards the relative skilled group occurred within-industries rather than between-industries.

Manasse *et al.* (2004) conducted an analysis using firm-level data to examine changes in relative employment and wage premia for skilled workers in Italian manufacturing during the nineties. Unlike the standard decomposition approach (Berman *et al.*, 1984; Machin 2001), this analysis focused on between and within-industries decompositions carried out separately for employment and wage bills. Manasse *et al.* (2004) decomposed the overall changes in the skilled wage bill share into the respective contributions of the employment share and the wage premium. They further split each of these two components into their respective between-firm and within-firm components. The between-firm effect reflected the movements across firms and the within-firm effects explained the changes within individual firms. In this model, they concluded that the within-firm component reflects factor-specific shocks, such as changes in the relative productivity of skilled workers due to skill biased technical progress. Between-firm components reflect firm and sector specific shocks altering relative market shares or average wage rates. These may originate on either the demand side (for example change in trade pattern) or due to supply side factors.

This approach provides a more informative and intuitive analysis because it provides information about movement in relative wages and can identify the respective contribution of employment and wages to the change in the wage bill share. The decomposition is written as:

$$\Delta\left(\frac{WB_S}{WB}\right)=\Delta\sum_i^I\left(\frac{W_{Si}E_{Si}}{WE}\right)=\sum_{i=1}^I\left[\Delta\left(\frac{W_{Si}}{W}\right)\overline{\left(\frac{E_{Si}}{E}\right)}+\Delta\left(\frac{E_{Si}}{E}\right)\overline{\left(\frac{W_{Si}}{W}\right)}\right]$$

(Wtot) ***(Etot)*** (Equation 4.12)

Where Δ denotes time difference, and the upper bar denotes average over time. *WB* is the wage bill, E_{Si} and W_{Si} denote skilled employment and wages at firm *i* respectively; thus, employment at the firm is $E_i = E_{Si} + E_{SSi} + E_{Ui}$. Total employment is $E=\sum_i E_i$ and the total skilled employment is $E_s = \sum_i E_{Si}$. The average wage at a firm is defined as $W_i = (W_{SSi}E_{Si} + W_{SSi}E_{SSi} + W_{Ui}E_{Ui})/(E_{Si} + E_{SSi} + E_{Ui}) = (WB_i)/(E_i)$. The skilled worker's wage is defined as $W_{Si} = (W_{Si}E_{Si})/(E_{Si}) = (WB_{Si})/(E_{Si})$. Finally, $W = \sum_i W_i E_i / \sum_i E_i = WB/E$.

The first term in the squared brackets $\sum_{i=1}^I\left[\Delta\left(\frac{W_{Si}}{W}\right)\overline{\left(\frac{E_{Si}}{E}\right)}\right]$ in Equation 4.12 represents the sum of changes in wage premia, weighted by average skilled employment shares. The first term is called *Wtot* measuring total wage component. In the context of the wage component, there are two effects that are expected to influence the increases in wage premia. These increases may be due either to individual firms having, on average, paid higher skill premia (within-firm effects or *Wwit*), or to the fact that average wages have grown more rapidly in firms paying relatively higher premia (between-firms effect *Wbet*). The weighted wage component of the changes in the skilled wage bill share can be decomposed as follows:

$$\sum_{i=1}^{I}\Delta\left(\frac{W_{Si}}{W}\right)\overline{\left(\frac{E_{Si}}{E}\right)}=\sum_{i=1}^{I}\left[(\Delta D_{Si})\overline{R_i}+(\Delta R_i)\overline{D_{Si}}\right]\overline{\left(\frac{E_{Si}}{E}\right)} \qquad \text{(Equation 4.13)}$$

Wtot ***Wwit*** ***Wbet***

where $D_{Si} = W_{Si} / W_i$ is the wage differential paid by firm i, and $R_i = W_i / W$ is the average wage paid by firm i to the average wage rate. The first term in squared brackets in Equation 4.13 is the part that can be attributed to the change in each firm's wage differentials D_{Si}, keeping constant the firm's relative wage, R_i. We call this the wage within-firm component (*Wwit*). A positive value of the within-firm component suggests that firms have paid larger premia on average. On the other hand, the between-firms component (*Wbet*) accounts for the variation in each firm's average rate. A positive value of (*Wbet*) shows that wages have risen faster in firms that pay higher wage premia.

The second term $\sum_{i=1}^{I}\left[\Delta\left(\frac{E_{Si}}{E}\right)\overline{\left(\frac{W_{Si}}{W}\right)}\right]$ in Equation 4.12 labelled (*Etot*), measures the total employment component effect. This effect represents the sum of changes in the skilled employment share weighted by the average wage premia. In the employment component, the rise in skilled employment share comes from two separate factors: either individual firms have, on average, become more skill-intensive (within-firms effect-*Ewit*), or employment has shifted towards firms that are relatively intensive in terms of skilled workers (between-firms effect-*Ebet*). The employment component (*Etot*), can thus be written as follows:

$$\sum_{i=1}^{I}\Delta\left(\frac{E_{Si}}{E}\right)\overline{\left(\frac{W_{Si}}{W}\right)}=\sum_{i=1}^{I}\left[(\Delta P_{Si})\overline{C^i}+(\Delta C^i)\overline{P_{Si}}\right]\overline{\left(\frac{W_{Si}}{W}\right)} \qquad \text{(Equation 4.14)}$$

(Etot) ***(Ewit)*** ***(Ebet)***

where $P_{Si} = E_{Si} / E_i$ is the proportion of skilled workers in firm $i's$ employment and $C_i = E_i / E$ is the share of the firm i in total employment.

Manasse *et al.* (2004) conducted the analysis based on the establishment-level survey on pay and labour conditions collected by *Federmeccanica*, the national association of Italian private metal-mechanical firms. They aggregated the establishment-level data up to firm-level, given that wages disaggregated by employment class are only available at firm level. They found that the effects of technological change and trade seemed to largely offset each other. Technological change was found to raise the relative demand for unskilled labour within firms; on the other hand, trade reduced the relative demand for skills: employment shifted towards firms producing unskilled-intensive goods, offsetting the effects of technology upon factor proportion and wage shares.

Although the decomposition methodology has been widely applied in studies of changing wage inequality, it is not without it limitations. In the first place, the approach suffers from the standard index number problem that the results may be sensitive to the base and end dates chosen. Second, both the within and between components are interpreted as reflecting technology and trade respectively. However, trade and technology are not the only factors that could explain changes in wages that are taking place both within and between industry groups. Since data on trade and technology do not figure in the analysis, it could well be that their impact is over-stated in this type of analysis. Finally, Wood (1994) suggests that this type of analysis is limited because it does not allow for the fact that changes in labour technology may themselves be related to changes in the pattern of international trade. In so far as the expansion of trade has seen the growth of less skill intensive products and technology being shifted towards developing countries (due to their lower costs), then this interaction will not be captured by the decomposition approach.

4.3.3 Cost Function Approach

The cost function approach provides another way to measure changes in relative labour demand. This approach allows us to evaluate many factors that might be involved in the determination of wages and relative labour demand and assumes that firms minimize the cost of skilled and unskilled labour subject to constant return to scale production technology.

Haskel and Slaughter (2002) looked at wage inequality using the standard Heckscher-Ohlin model. They argued that the sector bias of skill-biased technical change (SBTC) can help explain changing skill premia within countries in recent decades. Using the cost function model, the following wage equation is estimated:

$$\Delta W_S = a_0 + a_1 \Delta \log\left(\frac{W_S}{W_U}\right)_i + a_2 \Delta \log\left(\frac{K}{Y}\right)_i + \varepsilon_i \qquad \text{(Equation 4.15)}$$

where, ΔW_S is the level change in the non-production-labour share of the total wage bill, $\Delta \log\left(\frac{W_S}{W_U}\right)$ is the ratio of wage bill of skilled to unskilled labour. K denotes capital, Y is real value added output and ε_i is the error term. Changes in the wage share that do not occur because of changes in the skill-wage premium or in the capital output ratio are assumed to result from skill biased technological change and are thus measured by ε_i. The cross sector average of SBTC is measured by a_0 and $a_0 + \varepsilon_i$ measures the SBTC in sector i. A positive value of $a_0 + \varepsilon_i$ indicates that technological change is skill biased in sector i. The larger the value of $a_0 + \varepsilon_i$ in sector i, the more concentrated SBTC is in that sector. The pervasiveness of SBTC is captured by the $i \times 1$ vector $a_0 + \varepsilon_i$. In Equation 4.15, only skilled (S) and unskilled (U) labour is used. The cost shares of these two factors must sum to unity, so a sector can have either SBTC or unbiased technological change (UBTC) but not both. By this construction, a negative value of $a_0 + \varepsilon_i$ implies that the sector i enjoys UBTC and not SBTC.

Haskel and Slaughter then examine the sector bias of SBTC. For each country, they pooled all sectors and regressed SBTC against sector skill intensity, measured as $\left(S/U\right)_i$. The equation can be written as:

$$SBTC_i = \alpha + \beta_{bias}\left(\frac{S}{U}\right)_i + \varepsilon_i \qquad \text{(Equation 4.16)}$$

$SBTC_i$ is a $(k \times 1)$ vector of SBTC and ε_i is an error term, The coefficient β_{bias} is our estimate of sector bias: a positive coefficient indicates that SBTC is concentrated in skill intensive sectors, while a negative coefficient indicates that SBTC is concentrated in unskilled intensive sectors.

Using data from the United Nations on capital stock, output, computer use, employment and wages for both skilled and unskilled workers, they applied weighted least squares with sector employment averaged over the decades as weights. For both data sets, they estimated the Equation 4.15 at the first stage and Equation 4.16 in the second stage regression. They found that in both countries, SBTC was concentrated on unskilled–intensive sectors during the 1970s and skilled-intensive sectors during the 1980s.

The concept of the sector bias of SBTC is discussed in some detail in the papers by Leamer (1998) and Haskel and Slaughter (2001). Following the approach noted by latter, they consider a more general theoretical framework bringing together the impact of trade (captured by changes in product prices) and technology (as measured by skill-biased technological change). The logic of the former is that in the Stolper-Samuelson model, changes in the pattern of trade affect product prices across sectors which then affects cross-sector wage changes. Similarly changes in technology operate across sectors, affecting cross-sector profitability and thus wage changes. Haskel and Slaughter thus consider a multi-sector model in which wages (or more generally factor prices) adjust following either changes in product prices or in technology in order to bring all factors back to normal profits. Haskel and Slaughter, as noted in Chapter 3 called this approach the *Mandated*

Wage Methodology because the changes in wages that follow changes in either technology or in product prices are "mandated" to restore normal profits. Using this methodology, they identified the effects of technological change on relative labour demand as follows:

$$\Delta \log TFP_{it} = \sum_{j \in J} V_{jit} \beta_{jt} + \varepsilon_{it} \qquad \text{(Equation 4.17)}$$

where;

$\Delta \log TFP_{it}$ = The growth in total-factor productivity for sector i at time t.

V_{jit} = The share of factor j in total cost in sector i at time t.

β_{jt} = Parameters to be estimated.

ε_{it} = error term.

A positive β_{jt} indicates that technical change is larger in sectors in which factor j constitutes a larger share of costs. Thus each β_{jt} is factor $j's$ wage change 'mandated' to restore zero profit in all sectors in response to the sector bias of technical change.

For trade effects, they derive the following relationship:

$$\Delta \log P_{it} = \sum_{j \in J} V_{jit} \gamma_{jt} + \varepsilon_{it} \qquad \text{(Equation 4.18)}$$

where:

$\Delta \log P_{it}$ = The changes in prices in industry i at time t.

V_{jit} = The share of factor j in total cost in sector i at time t.

γ_{jt} = Parameters to estimate.

ε_{it} = error term.

Using UK manufacturing data for nearly 135 three-digit SIC manufacturing industries at approximately five-year intervals, they found that the sector bias of 1960s price changes mandated a 20 percent fall in the skilled wage and a 27 percent fall in the unskilled wage to maintain zero profits in all sectors. The results over the entire decade show that the sector bias of price changes significantly explains the rise in inequality during the 1980s but is insignificant in explaining the inequality in 1960s and 1970s. They found that changes in price, and not technology, were the major forces behind the rise in inequality in the 1980s. Changes in the OECD prices and UK tariffs significantly raised 1980s skill premia through their effects on prices, and industry concentration significantly raised 1980s skill premia through its effect on TFP. This result is consistent with the idea that world prices affect UK prices. They also found that levels and changes of industry concentration are positively correlated with higher UK prices but at lower levels of significance. In general, they suggest that the estimation of price changes suggests that UK prices are influenced, as expected, by international trade and domestic forces. In terms of the trade contribution, this study is the first study to use the mandated wage methodology to relate domestic factors with the tariff and import prices. Secondly, it shows how import-price competition induces technical change in a mandated wage methodology.

Using the mandated wage methodology, Milner *et al.* (2007), find that the rise in inequality in Indian manufacturing is due only to technology and not to changes in pattern of trade. They used the mandated wage methodology to explore the roles of trade and technological change behind the rising wage inequality in Indian manufacturing following the 1991 trade policy reforms. They conducted a balanced panel of 158 three-digit manufacturing industries from the Annual Survey of Industries (ASI). Milner *et al.* (2007) defined two periods: the pre-reform period (1984-1991) and the post-reform period (1991-1997). They found that the sector bias of the pre-reform price changes mandated an insignificant fall in the skilled wage to maintain zero profit in all sectors. Similarly, the mandated wage was an insignificant increase of 67 percent for unskilled wages and a statistically significant increase of 29 percent for capital. The mandated change in skill premium for post-reform was a 418 percent fall and a 440 percent increase from price and technological change respectively; these are both statistically significant. This suggests that technology via the sector bias of TFP growth was a major factor in explaining increasing wage inequality in the 1990s.

Lawrence and Slaughter (1993) examined the effects of trade and technological change on shifts in the relative labour demand in the U.S labour market using the HOS model and the cost function approach. To explore the implications of the Stolper-Samuelson theorem on wage inequality, they conducted a series of analyses: first, they looked at the sluggish rise in real compensation and how the accompanying convergence of U.S. and foreign wages reflected slow productivity in the non-traded goods sectors of the U.S. economy. Second, they considered the rise in relative wages of non-production workers. For these purposes, they used the U.S manufacturing sector data set from 1989. Data on price and quantities of inputs and outputs was taken from the Trade Immigrations Database of the National Bureau of Economic Research. They also used data for export and import prices produced by the Bureau of Labor Statistics (BLS). To measure the effects of technological change, they employed data from the Annual Survey of Manufactures (ASM) and the Current Population Survey (CPS) to identify the skill level of workers in the 1980s. The study concluded that there was little evidence that Stolper-Samuelson effects could explain increasing wage inequality in the U.S. relative wages in the 1980s. Similar to other studies in the U.S, they also found pervasive shifts in U.S. manufacturing towards the increased employment of skilled workers. Lawrence and Slaughter then went on to examine whether the effects of technological change occurred more rapidly in goods that were relatively intensive in skilled labour. They concluded that technological change was an important source of wage inequality trends because they found a positive association between total factor productivity growth and skilled labour intensification. They also concluded that TFP had been higher in manufacturing industries which used skilled workers relatively intensively.

Sachs and Shatz (1996) consider whether the expansion of North and South (denoted as developed and developing countries) trade caused a fall in the relative wage of unskilled workers in the North. They used two sets of data to answer this question: The first was a set of data on domestic output prices for 450 four-digit manufacturing sectors based on the 1972 SIC classification from 1978-1989. The second set of data was from 1989-1995, and used the domestic output price for 410 four-digit manufacturing sectors based on the 1987 SIC classification. Both data sets allowed them to construct value-added prices and gross output prices. They find a link between increasing trade with developing countries and increasing U.S. wage inequality. This result is consistent with the trade hypothesis, which is that trade with developing countries has a big impact on skilled employment.

Desjonqueres *et al.* (1999) reassessed the *'price puzzle'* and the trade-based explanation of changing skill structures by examining several different implications of rising international trade for relative wage and employment shifts. They estimate Equation 4.18 to measure skill differentials for both non-production workers and highly educated workers between 1989 and 1995. To estimate equation 4.18, they compiled data from non-OECD countries and 16 manufacturing industries from nine OECD countries. Taking the average annual change in industry prices as the dependent variable, they present the results from a simple regression and found that, in all countries (OECD), except for the U.S, there was actually a negative association between price increases and industry skill intensity. They also show that the evidence that technological progress as proxied by Total Factor Productivity (TFP), has a positive correlation with the skill level of the industry. In the case of non-OECD counties, they applied Equation 4.10 to investigate the effects of trade and technological change. They found that wage differentials for non-production and production workers rise in Chile and Pakistan, fall in Colombia and are constant in Brazil and India. On the other hand, changes in the employment share of non-production workers shows that five of the six countries (except Pakistan) have increases in relative demand. The dominant factor explaining these changes is technological change. Their results indicate that changes in trade pattern are not responsible for the changes in relative demand for non-production workers in OECD and non-OECD countries.

Krueger (1997) also used relative prices to investigate the effects of trade on wages and the link between product price changes and the skill intensity of employment in U.S. industries. Based on data for 4-digit industries between 1989 and 1995, he found consistent evidence that the price increases in the unskilled intensive sector were considerably below those of the skilled intensive sector during the 1989-1995 period. Price changes rose less in the low skill intensive US industries, whose products compete with imports from low wage developing countries. The 1989-1995 period showed relatively little change in skill differentials; however, it is unclear whether these results can be generalised to earlier periods. By calculating the percentage change in U.S. value added prices and effective prices weighted by the share of each sector's trade with developing countries, Krueger measured the changes in relative price. He found that the import-weighted price index fell steadily relative to the export price index by 21.9 percentage points between 1978 and 1989 and by an additional 8.3 percentage points between 1989 and 1995.

To examine the direct impact of SBTC, a number of empirical studies have included an indicator of technology in the basic cost function model. Berman, Bound and Griliches (1994), Machin and Van Reenen (1998) and Machin (2002) are examples of this appraoach. The share of skilled workers' wages in the total wage bill can thus be written as:

$$\Delta W_i = a_0 + a_1 \Delta \log\left(\frac{W_S}{W_U}\right)_i + a_2 \Delta \log\left(\frac{K}{Y}\right)_i + a_3 TFP_i + \varepsilon_i \qquad \text{(Equation 4.19)}$$

The focus in this equation becomes whether the coefficient a_3 on the technology indicator TFP is estimated to be positive.

Berman, Bound and Griliches (1994) employed 143 U.S. manufacturing industries data sets and estimated α_3 using computer investment and expenditure research and development (R& D) as measures in TFP during the period 1979-1987. They found a strong correlation between the share of skilled workers and R & D investment and the increase in computer investment. This result provides direct evidence for the importance of biased technological change.

Machin and Van Reenen (1998) estimated the coefficient α_3 using the ratio of the flow of R&D expenditures to value added as a measure of TFP. They examined the inter-temporal shifts in the skill structure in the seven industrial nations: Denmark, France, Germany, Japan, Sweden the U.K and the U.S and divided this analysis into four time periods (1973-1977, 1977-1981, 1981-1985 and 1985-1989). During these periods, they found that the estimated coefficients on the R&D variable were positive and were almost statistically significant at the 5 percent level. Their analysis leads to the conclusion that there are important skill-technology complementarities across all countries.

Berman and Machin (2000) tested the argument of within-industry effects by examining the indicator of whether technological change in high income countries is able to predict skill-upgrading in developing countries. Using data on computer use in the U.S. in 1984 (CPS) and R&D value added ratios for the OECD, they found that 8[13] out of 12 countries[14] (3 of them statistically significant) in middle income countries in the 1980s had a positive correlation with R& D intensity. Of the 12 countries, 9[15] countries (2 of which had a significant value) showed a positive correlation with the U.S. computer variable. Although this pattern is considered a weak correlation, they concluded that technology has transferred from developed to developing countries and indicated that technological activity in high income countries caused an increase in demand for skills in middle income countries in the 1980s.

Estimating Equation 4.19, Machin (2002) used a computer variable to measure the variable *TFP*. Using the U.S. and the U.K data sets on the capital, output and computer use from the Current Population Survey (CPS) and Labour Force Survey/General Household Survey for the U.S and the U.K respectively, he conducted a series of analyses during the period 1980-2000. It is interesting to note that basic computer use at work was strongly correlated with the 1980s changes and was not correlated with industry relative demand shifts in the 1990s. This is most likely because the diffusion of computers became common in the workplace and no longer adequately measured technological advances, as computers have become a standard work aid, especially in technologically advanced industries.

Cost function estimates are well grounded in economic theory. However, the estimates that are reported suffer from a number of problems. First, they are sensitive to the functional for

[13] The countries that have positive correlation with R&D are Guatemala, Turkey, Colombia, Czechoslovakia, Malta, Portugal, Greece and Ireland

[14] The countries are Guatemala, Turkey, Colombia, S. Korea, Czechoslovakia, Malta, Portugal, Hungary, Cyprus, Greece, Ireland and Spain.

[15] The countries that have a positive correlation with computer use are Guatemala, Turkey, Colombia, S. Korea, Czechoslovakia, Malta, Portugal, Greece and Ireland.

assumed. Second, data on the variables included in the model are often difficult to accurately measure, are aggregate in nature and may not be good proxies of their theoretical equivalents. Finally, as most of the variables move together over time, it is often difficult to separate out their individual effects.

4.4 Conclusion

In this chapter we have identified three approaches that have been considered in recent empirical work on wage inequality; these approaches are earnings functions, decomposition analysis and the cost function approach. A summary table of the findings of the main studies is presented in Table 4.2.

Two factors are the focus of the analysis; trade and technology. The literature we have presented includes some, for example Manasse (2004) and Tsou (2002), who have conducted their studies by looking at the effects from these two factors. On the other hand, Machin (2000) and Haskel and Slaughter (2002) focused solely on technological change. Similarly, Lawrance and Slaughter (1993) and Pavcnik *et al.*(2004) looked only at the effects of trade on the changes in wage inequality.

There is no doubt that we do not have a consistency in the results about which factor is more dominant in explaining the changes in relative demand and wages. However, changes within-industries dominate the between industries result in the decomposition approach, a result which is indicative of the importance of technological change as the source of changes in wages and employment. Sachs and Shatz (1996), however, find support for the trade hypothesis and reported a strong link between the increase in trade in developing countries and U.S. wage inequality.

Studies using earnings function enable us to observe the effects of human capital, including skills and demographic characteristic and then the impact of trade on wages. Most of the empirical work dealing with this approach uses micro data sets and estimate the effects of technological change and trade in a two stage regression model measuring the effects of technological change and trade at the second stage regression. It was apparent that most of the literature using this approach showed that the increase in wage inequality was driven by SBTC. The effect of trade was too small to explain changes in the relative demand for labour.

In the decomposition approach, changes in relative demand and wages can be decomposed into within-industry and between-industry effects. The within-industries component represents changes in technological change and the between-industries component represents the changes in patterns of trade. Some studies, for example, Katz and Murphy (1992) and Berman *et al.* (1994), also investigated the effects of trade separately by further decomposing between-industry terms using trade variables. On the other hand, Manasse *et al.* (2004) measured the direction of within-industries and between-industries in both the employment and wages components. This technique is more useful because it provides detailed information about movement in employment and wages to the overall changes in relative demand and wages.

Three studies that estimated earning equations for Malaysia, Rahmah and Ragayah (2003), Chung (2003) and Milanovic (2006), use the Mincerian earnings equation, but do not consider the impact of trade nor technology. This study aims to investigate the effects of trade and technological change on relative labour demand in Malaysia during the period 1983-1997. Thus, we believe this study can present a picture of the Malaysian labour market during the sample period and provide a major contribution to Malaysian literature on wage differentials. This study aims to use two sets of data: aggregate manufacturing data and micro Household Income Surveys (HIS). We believe that, by analysing both sets of data, we will produce robust results and a better picture of wage differentials in Malaysia.

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality

	Study / Author	Unit of analysis	Time Period	Demand Measure	Annualised Change (Percentage Point)	Result Within (%)	Country Status
Decomposition	Berman, Bound and Machin (1998)	450 US manufacturing Industries	1979-1987	Non-production employment share	0.552	70	Developed
				Non-employment wage bill share	0.774	60	
		360000 US manufacturing Plants	1977-1987	Non-production employment share	0.367	82	
		100 UK manufacturing Industries	1979-1990	Non-production employment share	0.387	82	
				Non-production Wage bill share	0.669	83	
		402 British workplaces	1984-1990	Non-production employment share	0.41	83	

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality (Continued)

Estimation Model	Study / Author	Unit of analysis	Time Period	Demand Measure	Annualised Change (Percentage Point)	Result Within (%)	Country Status
Decomposition	Autor, Katz and Kruger (1998)	140 US industries	1990-1996	College employment share	0.300	87	Developed
				College wage bill share	0.587		
			1980-1990	College employment share	0.469		
				College wage bill share	0.878		
Decomposition	Berman and Machin (2000)	Across-country study, 37 countries	1980-1990	Change in non-production Wage Bill (annual)		76	Developing
		High Income groups; GDP >$10,000			High Income groups (US) 0.51		
		Middle income groups; GDP <$10,000 GDP >2,000			Middle Income group (Malaysia) -0.35	86	
		Low income groups; GDP <2,000.			Low income group (Egypt) 0.44	83	

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality (Continued)

Estimation Model	Study / Author	Unit of analysis	Time Period	Demand Measure	Variable Measure	Coefficient (Standard Error)/ *t statistic	Result Within (%)	Country Status
Mincer's Earning Equation	Tsou (2002)	Micro Level Data	1982-1997	College Senior High School	TFP	0.4149 (3.22)	Trade and Technology explained wage inequality in Taiwan	Developing
					Export	0.0622 (2.70)		
					Import	-0.0370 (-1.40)		
					Net Export	0.0516 (2.79)		
Mincer's Earning Equation	Attanasio, Goldberg Pavcnik (2003)	Colombian National Household Survey	1992	Probability of Employment	Post Trade Reform Year	.005 (0.004)*	Post trade reform is positive and significant. Unemployment does not change significantly in manufacturing sector relative to the non-traded sector over the long period	Developing
					Manufacturing	-0.009 (-0.004)*		
			1998		Post Trade Reform Year	0.026 (0.004)*		
					Manufacturing	-0.006 (-0.004)*		

Table 4.2: Summary of the Findings of Skill Demand and Wage Inequality (Continued)

Estimation Model	Study / Author	Unit of analysis	Time Period	Demand Measure	Variable Measure	Coefficient (Standard Error)/ * t statistic	Result Within (%)	Country Status
Mincer's Earning Equation	Arbache, Dickerson and Green (2004)	Cross Section Household survey	1981-1999	Traded Pre-liberalization	Completed Elementary	0.592 (0.003)	Non-traded sector relatively highly educated both pre- and post-liberalization	Developing
					Completed Primary	1.009 (0.005)		
					Completed Secondary	1.529 (0.005)	Trade effects had differential effects across education groups and within sectors.	
					Completed College Education	2.373 (0.008)		
				Post - liberalization	Completed Elementary	0.408 (0.004)		
					Completed Primary	0.802 (0.005)		
					Completed Secondary	1.249 (0.005)		
					Completed College Education	2.134 (0.010)		

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality (Continued)

Estimation Model	Study / Author	Unit of analysis	Time Period	Demand Measure	Variable Measure	Coefficient (Standard Error)/ *t statistic	Result Within (%)	Country Status
Mincer's Earning Equation	Arbache, Dickerson and Green (2004)	Cross Section Household survey	1981-1999	Non-traded Pre-liberalization	Completed Elementary	0.588 (0.003)	Non Traded sector relatively highly educated both pre- and post-liberalization	Developing
					Completed Primary	0.971 (0.003)		
					Completed Secondary	1.497 (0.003)	Trade effects had differential effects across education groups and within sectors.	
					Completed College Education	2.285 (0.004		
				Post-liberalization	Completed Elementary	0.538 (0.003)		
					Completed Primary	0.848 (0.004)		
					Completed Secondary	1.318 (0.003)		
					Completed College Education	2.173 (0.004)		

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality (Continued)

Estimation Model	Study/author	Unit of analysis	Variable Measure	Time Period	Coefficient (Standard Error)/ *t statistic	Result	Country Status
Cost Function OLS Regression	Haskel and Slaughter (2002)	US; 450 four-digit U.S SIC sector	Sector Bias of SBTC	1970s	-0.03 (-5.56)	SBTC explain the wage inequality in the 1980s and the bias of SBTC is Sector Biased.	Developed
				1980s	0.06 (8.18)		
		UK; 125 three-digit sector		1970s	-0.02 (-1.88)		
				1980s	0.05 (3.34)		
Cost Function OLS Regression	Haskel and Slaughter (1998)	US- 450 four-digit U.S SIC sector	Computer use by Skilled/ Unskilled share	1977	0.08 (2.89)*	In both countries, computerization was higher in more skill intensive sectors. Supports the SBTC hypothesis.	Developed
				1987	0.11 (6.62)*		
		UK- 125 three-digit sector		1986	0.09 (6.29)*		
				1988	0.07 (5.05)*		

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality (Contiuned)

Estimation Model	Study/author	Unit of analysis	Variable Measure	Time Period	Coefficient (Standard Error)/ *t statistic	Result	Country Status
Cost Function Mandated Wage	Haskel and Slaughter (1999)	135 three-digit UK. SIC manufacturing	**TFP**	1960s		Both SBTC and Trade are important to measure the inequality in wages.	Developed
			Skilled Share		1.18 (3.09)*		
			Unskilled Share		0.01 (0.04)*		
			Capital Share		-0.26 (1.14)*		
			Price				
			Skilled Share		-0.20 (0.64)*		
			Unskilled Share		0.27 (2.21)*		
			Capital Share		0.07 (0.38)*		
			TFP	1970s			
			Skilled Share		0.50 (1.04)*		
			Unskilled Share		0.34 (1.64)*		
			Capital Share		0.25 (0.74)*		
			Price				
			Skilled Share		1.40 (2.58)*		
			Unskilled Share		0.36 (1.57)*		
			Capital Share		1.04 (2.76)*		

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality (Continued)

Estimation Model	Study/author	Unit of analysis	Variable Measure	Time Period	Coefficient (Standard Error)/ *t statistic	Result	Country Status
Cost Function Mandated Wage	Haskel and Slaughter (1999)	135 three-digit UK. SIC manufacturing	***TFP** Skilled Share Unskilled Share Capital Share **Price** Skilled Share Unskilled Share Capital Share	1980	*0.06 (0.19)* 0.49 (3.64)* -0.49 (2.30)* 0.92 (3.31)* -0.16 (1.35)* 0.94 (4.84)*	Both SBTC and Trade are important to measure the inequality in wages.	Developed

Table 4.2: Summary of the Findings on Skill Demand and Wage Inequality (Continued)

Estimation Model	Study/author	Unit of analysis	Variable Measure	Time Period	Coefficient (Standard Error)/ *t statistic	Result	Country Status
Cost Function OLS Regression	Machin and Van Reenen (1998)	15 UK Manufacturing Industries	Non-production Wage bill Share Using R & D/ value Added	1973-1989	0.026 (0.009)	Support the Hypothesis of SBTC	Developed
Cost Function OLS Regression	Berman, Bound and Griliches (1998)	143 US manufacturing industry	Non-production wage bill share	1979-1987	0.028 (0.006)	Support the Hypothesis of SBTC	Developed
			Computer investment R&D Sales		0.097 (0.021)		
Cost Function OLS Regression	Machin (2001)	143 US manufacturing industry	Graduate Wage Bill Shares on Computer Usage	1984-1997	0.069 (0.025)	Skill complementary	Developed
				1984-1989	0102 (0.031)		
				1989-1993	0.75 (0.050)		
				1993-1997	0.021 (0.050)		

CHAPTER 5
AN EMPIRICAL ANALYSIS OF THE DEMAND FOR LABOUR: AGGREGATE DATA

5.1 Introduction

This chapter presents an analysis of changes in the relative labour demand between skill groups and the impact of these changes on wages in the Malaysian manufacturing industry during the period of 1983 to 1999. As we have shown, previous studies (Haskel and Slaughter, 2001; Lawrence and Slaughter, 1993; Berman and Machin, 2000) have identified two main determinants of changes in relative labour demand, namely trade and technology. Thus, the first hypothesis we examine is that observed changes in the demand for different skills are due to trade liberalization that has changed the pattern of trade for Malaysia and thus the industrial structure of employment. The second hypothesis is based on the theory of skill-biased technical change (SBTC), which states that, over time, the final demand for goods and services has shifted in favour of high-skilled intensive sectors, causing aggregate demand for labour to shift towards more highly skilled workers. As we have noted earlier, SBTC may, in fact, result from changes in the pattern of trade so the two hypotheses are not independent.

In Chapter 4, we reviewed research that has examined this issue for a number of other countries. Much of this research has stated that the rise in wage inequality has come about as a result of technological changes (Bound and Johnson, 1992; Katz and Murphy, 1992; Juhn, Murphy and Pierce, 1993; Machin and Van Reenan, 1998). On the other hand, Sachs and Shatz, 1996; Wood (1998), Haskel and Slaughter (2001) and Desjonqueres *et al.* (1997) strongly argue that changes in the pattern of trade have also affected wage inequality.

The focus of this chapter is therefore to examine the effects of trade and technology on relative demand and determine the nature, if any, of these effects. In order to achieve this objective, we present five stages of estimation. Stages one to three are based on a decomposition approach developed originally by Katz and Murphy (1992). Stage one uses employment data, stage two applies wage data and stage three examines the changes in relative demand using both employment and wage data. Stages four and five involve estimation using a cost function approach, starting with the translog cost function equation to measure SBTC and the nature of SBTC. This is followed by an analysis using the mandated wage methodology detailed earlier to explore the effects of both trade and technology. The two analyses provides complimentary evidence in that the decomposition approach provides evidence about changing trade patterns and technological change by examining changes in the skill structure of the wage bill and employment. The second type of analysis provide convenient ways of obtaining supply and demand equations, which are consistent with traditional economic theory (and a sound theoretical approach for using price and cost data to estimate a consistent set of factor demand equations).

The chapter is structured as follows: Section 5.2 describes the data to be used. Section 5.3 then reports findings from the first and second stages of the analysis of the impact of technological changes and trade on relative demand. The results of this section are based on a decomposition approach focusing on between and within-industries analysis. As noted earlier, this approach has been employed by many researchers to measure how strongly trade or technology has affected the relative demand for workers. In this section we applied it to Malaysia. In Section 5.4, we consider an extended decomposition approach in which employment and the wage components were evaluated together. In Section 5.5, we report direct evidence on the skill-biased technical change hypothesis, first, using an approach that combined the models of Machin (1998) and Haskel and Slaughter (2002) to determine SBTC. We then use other measures of technological change, following the work of Berman *et al.* (1994) and Machin and Van Reenan (1998) specifically using total factor productivity.

Finally we test the trade and technology hypotheses but also allowing for the possibility that trade and SBTC are determined only by wages. The results of this analysis are presented in Section 5.6. We follow Haskel and Slaughter (1999) for this purpose, and apply the mandated wage methodology to measure the changes in relative demand and wages in response to trade and technological change. Section 5.7 summarises the analyses.

5.2 Data Description

In order to explain the inequality of wages and the impact of trade and SBTC, the data we use are derived from two sources. Firstly, we use data from establishment level information about trade from the Malaysian Trade Department. The second source is information for manufacturing industries collected by the Department of Statistics (DOS), the government statistical body in Malaysia.

The trade data that we use in this study is from the Government of Malaysia Trade Department. It contains information about imports and exports at the five-digit level in commodity groups and reports this information by Standard International Trade Classification (SITC) code. In order to use the information we needed to convert the data to Manufacturing Industrial Code (MIC) codes. For this purpose, we use the information from Input-Output (IO) analysis because this data contained information on both data sets (Input -Output Table Malaysia, 1987, 1991, 2000).

The second source is DOS data. DOS undertakes manufacturing surveys, in which monthly data is collected from the manufacturing sector. The survey provides information on 137 industries at the 5 digit level and 29 industries at the 3 digit level. Because data on wage bill by skill group are not available at the 5-digit level, the analysis presented here is at the 3-digit level. It is also important to explain the construction of the data used. First, for some of the years we are considering, data were not available for some 5-digit industries, as a result these did not figure in the 3-digit information used in the analysis. The excluded data, however, represent a very small part of employment and output. Second, there is variation in terms of coverage within the 5-digit industry groups. Establishments in industries covered by the Industrial Co-ordination Act (1975) are all surveyed. However, these represent only 28 of the 137 industries. For the remaining industries, establishments are included in the survey depending on their employment size though the cut-off point varies by industry. Thus it can be as low as 5 and above employees in some industries but 20 plus in others. Clearly, the latter would introduce bias into the analysis if it meant that significant numbers of small establishments were not included. However, the establishments covered represent a significant percentage of employment (72 percent), output (88 percent) and value added (87 percent). We therefore consider the data to provide a sound basis upon which to analyse the changing pattern of wage inequality in Malaysia.

The data we used covers the period from 1983 to 1999; there was no survey in 1998 due to the Asian financial crisis. The period from 1983 to 1999 was chosen for several reasons. Firstly, during that period, Malaysia underwent an economic transition from agriculture to manufacturing. The transformation of the economy occurred in early 1980 but this study cannot focus on that particular year because of limitations in the data; for example, there is incomplete data for categories of workers in 1980, 1981 and 1982. This study does not focus on the period after 1999 because, starting from the year 2000, the classification of industries for survey purposes is different from the classification used in the 1990s and the two cannot be reconciled. From 1972 until 1999, the classification remains similar. In 2000, DOS changed the classification and expanded the number of industries. In 1999, there were 29 three-digit industry groups; the number increased to 55 three-digit industry groups in 2000. It is also the case that, during the period from 1983 to 1999, the Malaysian economy was extensively exposed to globalisation through the Industrial Substitution 2 (1980-1985) and Export Orientation 2 (1985-2000) policies. This is therefore an appropriate time period to study.

On average, around 7,000 establishments were included in the surveys, with the number increasing from 5,899 in 1983 to 7,301 in 1991, further increasing to 7,865 in 1996, after which the number began to decrease to 6,751 and 6,493 in 1997 and 1999 respectively. Decreases in the numbers of establishments followed the financial crisis in

Malaysia in 1997. Table 5.1 presents the 29 three-digit industry groups that will be used in this study.

To measure the effects of technological change on relative wages, we use total factor productivity (TFP) to show the changes in growth in sector i. We constructed the $\Delta \log TFP_{it}$ by using data on capital, labour and value added that we compiled from the *Annual Survey of Manufacturing Industries* between 1985 and 1999. We started from the year 1985 because complete data of value added for all industries appeared in 1985, and used the year 2000 to measure the *TFP* for 1999. Hence, it is important to note that this study covers the period from 1985-1999. The DEA approach was initiated by Charnes *et al.* (1978), who built on the frontier concept pioneered by Farrell (1957); this approach can be used to measure productivity growth. Following Mahadevan (2002) who used DEA to measure the productivity growth (*TFP*) of Malaysia's manufacturing industries, this section also uses *TFP* to determine technology's effect on wages.

Table 5.1: Three Digit Industry Malaysian Industry Classification

Code	Industries
311	Food
312	Beverage – others (coffee, tea, ice, etc.)
313	Beverage - liquor, malt, wines, soft drinks, alcohol
314	Tobacco
321	Textiles
322	Wearing apparel
323	Leather
324	Footwear
331	Wood
332	Furniture and fixtures
341	Paper
342	Printing, publishing
351	Industrial chemicals
352	Other chemicals
353	Petroleum refineries
354	Miscellaneous products of petroleum and coal
355	Rubber
356	Plastic
361	Pottery, china and earthenware
362	Glass
369	Non-metallic mineral
371	Iron and steel
372	Non-ferrous metal
381	Fabricated metal
382	Machinery
383	Electrical machinery
384	Transport equipment
385	Professional, scientific and measuring controlling equipment
390	Other manufacturing

Source: Department of Statistics Malaysia

The DOS data contains information on employment, wages, capital, value added and output. The employment data is divided into 16 categories of employees, namely working proprietors, active business partners, unpaid family workers, professionals, non-professionals, technical and supervisory, clerical and related occupations, drivers, other general workers, skilled directly employed, semiskilled directly employed, unskilled directly employed, skilled through contractors, semiskilled through contractors, unskilled through contractors and paid part-time employees. As the aim of this study is to explore the changes in relative demand for production workers, we can broadly group the 16 categories of employees under production and non-production employment. The production workers are skilled, semiskilled and unskilled workers. Professional, non-professional, technical and supervisory, clerical and related occupations, drivers, others general workers and part time employees are classed as non-production workers. In the analysis below we only consider production workers, who account for around 75 percent of employment and half the wage bill in manufacturing. Table 5.2 summarises the proportion of production workers in the manufacturing sector between 1983 and 1999.

Table 5.2: Proportions of Production and Non-Production Workers

	Production		**Non-Production**	
	Employment	Wages	Employment	Wages
1983	0.746	0.519	0.253	0.481
1987	0.745	0.488	0.255	0.511
1991	0.780	0.537	0.219	0.462
1994	0.773	0.539	0.226	0.460
1999	0.744	0.502	0.255	0.497

Sources: Department of Statistics Malaysia

It is important to note that, the analysis in this chapter is focused on three skills groups namely, skilled, semiskilled and unskilled. Other studies have just concentrated on the changes in relative demand for skilled workers and unskilled workers, but here we expand the analysis to include semiskilled workers. As Wood (1994) noted the analysis of relative demand in developing countries should consider three groups of workers (skilled, semiskilled and unskilled) and not two (skilled and unskilled). Clearly, the fact that we distinguish three skill levels makes comparison with other studies problematic if the conclusions we report are different to those of studies that adopt a two-way classification. The fact that we do not know whether semi-skilled workers would be included in either or both the unskilled/skilled categories means that we cannot directly relate our results to previous ones. However, we can say that the results presented here are very strong. It is also unlikely that the strong evidence for skill-biased technological change reported in many previous is actually capturing a bias in favour of semiskilled workers, even though some semiskilled are included in the skilled category.[16]

[16] We noted earlier that, in the context of developed countries, Atkinson (2002) suggest that skills lie on a continuum and that division into two or three discrete groups is artificial and prevents an appropriate analysis of wage inequality. However, we would argue that this view is less relevant in the context of a

Table 5.3 presents summary statistics for shares of the different categories of production workers in the wage bill and the employment share from 1983 to 1999. Column 1 of Table 5.3 presents the proportion of skilled workers in employment and column 2 shows the wage bill for skilled workers. Similarly, columns 3 and 4 show the proportion of semiskilled workers in terms of employment share and wages respectively. The next columns, 5 and 6, present the data for unskilled workers. The overall trend shows that unskilled workers have dominated the share of workers in manufacturing over the 1983 to 1999 period, followed by the second largest group skilled workers.

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developing country where more discrete categories based on education levels are evident. Thus, developing countries have significant numbers of working age people with no education or very basic education and these are clearly distinct from those with secondary and tertiary levels of education.

Table 5.3: Share of Skilled, Semiskilled and Unskilled Workers over the Period from 1983 to 1999

	Skilled		Semiskilled		Unskilled	
	Employment	Wage Bill	Employment	Wage Bill	Employment	Wage Bill
	1	2	3	4	5	6
1983	0.400	0.505	0.161	0.151	0.439	0.344
1985	0.410	0.517	0.176	0.167	0.413	0.315
1986	0.400	0.509	0.189	0.176	0.411	0.315
1987	0.394	0.499	0.188	0.176	0.417	0.324
1988	0.372	0.488	0.177	0.160	0.452	0.352
1991	0.331	0.437	0.221	0.215	0.448	0.347
1994	0.326	0.427	0.244	0.234	0.430	0.339
1997	0.351	0.446	0.266	0.256	0.382	0.298
1999	0.349	0.456	0.277	0.259	0.374	0.285

Source: Department of Statistics, Malaysia

The employment share of skilled workers shows that the level of employment dramatically decreased from 40 percent in 1983 to 33 percent in 1994. The share slightly increased in 1997 before falling again in 1999. The overall trend for unskilled workers shows that the share of unskilled workers gradually fell from 1983 from 44 percent to 38 percent in 1997. On the other hand, between 1986 and 1988, the share of unskilled workers increased from 41 percent to 45 percent. In contrast, the share of semiskilled workers rose steadily from 16 percent in 1983 to 27 percent in 1999.

Table 5.3 also displays the trend in wage patterns for the three occupational groups. It reveals, not unexpectedly, that the share of skilled workers' wage bill is higher than that for compared to unskilled and semiskilled workers. This decreased between 1986 and 1994, however, before increasing but at a lower rate than between 1983 and 1985. Generally, the share of the unskilled workers' wage bill rose between 1986 and 1988 before decreasing during the period 1991-1999. Although the share of the wage bill of semiskilled workers is less than the wage bill of skilled and unskilled workers, the semiskilled workers' wage bill shows an increasing trend between 1983 and 1999.

The table also shows that the gap in overall shares in the wage bill between skilled and semiskilled workers became smaller over time, falling from 35 percent in 1983 to 20 percent in 1999. The gap between skilled and unskilled workers increased by 1 percent, from 16 percent in 1983 to 17 percent in 1999. This trend also suggests that the demand for labour in Malaysian manufacturing has moved towards semiskilled workers.

5.3 Shift in Demand: Decomposition Approach Stages One and Two

This section discusses the first two decomposition analyses. In the first, we measure the effects of trade and technology on relative labour demand using employment data. In the second stage, we use wage bill data to measure the effects of trade and technological change. As Machin (1998) notes, changes in relative demand can be examined through either employment or wages and so we consider both.

The main analysis sets out to address the hypothesis that the effects of trade and technology favour particular groups of skills by considering whether the observed changes are between or within-industries. As noted in Chapter 4, changes that are between-industries capture changes in trade whereas those taking place within-industries are attributed to the effects of technological change. A standard way (Katz and Murphy, 1992) of decomposing a change in an aggregate proportion into a term reflecting reallocation of employment between-industries and another reflecting change of proportions within-industries is as follows:

$$\Delta P = \sum_i \Delta C_i \overline{P}_i + \sum_i \Delta P_i \overline{C}_i \qquad \text{(Equation 5.1)}$$

Where, for industries i= 1,2,..,N. $P_i = E_{Si} / E_i$ is the proportion of skilled workers in industries i and $C_i = E_i / E$ is the share of total employment in industry i. A bar over the variable denotes an average over time. The first term on the right hand side of the equation, $\sum_i \Delta C_i \overline{P}_i$, is the change in the aggregate proportion of skilled workers attributable to shifts between-industries with different proportions of skilled workers. The second term $\sum_i \Delta P_i \overline{C}_i$ in the expression is the change in the aggregate proportion of skilled workers attributable to changes in the proportion of skilled workers within-industries. Employment in industry i; $(E_i = E_{Si} + E_{SSi} + E_{Ui})$ is contributed by skilled workers (S), semiskilled workers (SS), and unskilled workers (U), and E represents total employment in manufacturing $E = \sum_i E_i$. The analysis is undertaken for each skill group.

5.3.1 Stage One: Using Employment Data

Table 5.4 reports between-industries and within-industry decompositions of the proportion of workers by skill group by industry in Malaysian manufacturing from 1983 to 1999. Between-industries and within-industry effects are reported in columns (1) and (2) of Table 5.4 respectively. The total of the sums of between-industries and within-industries effects are presented in column (3). Firstly, this discussion elaborates the overall changes in skill proportions. The table shows that changes in labour demand between 1983 and 1999 favoured semiskilled workers. Demand for semiskilled workers increased by 11 percent during 1983 to 1999, whilst demand for both skilled workers and unskilled workers decreased by 5 percent and 6 percent respectively.

Table 5.4: The Aggregate Change in Skill Proportion over the Period 1983-1999 Using Employment Data

		Between-industries (1)			Within-industries (2)			Total (3)		
Code	**Industries**	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled
311	Food	-0.010	-0.009	-0.018	0.002	0.009	-0.011	-0.008	0.000	-0.029
312	Beverage – others (coffee, tea, ice, etc)	-0.002	-0.002	-0.003	0.001	0.001	-0.002	-0.001	-0.001	-0.005
313	Beverage - liquor, malt, wines, soft drinks, alcohol	-0.002	-0.001	-0.004	0.000	0.001	-0.001	-0.002	0.000	-0.005
314	Tobacco	0.000	0.000	0.000	-0.003	0.001	0.002	-0.003	0.001	0.002
321	Textiles	-0.021	-0.006	-0.015	-0.009	0.005	0.004	-0.031	-0.001	-0.011
322	Wearing apparel	-0.010	-0.003	-0.003	-0.001	0.006	-0.005	-0.011	0.003	-0.008
323	Leather	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
324	Footwear	-0.001	0.000	-0.001	0.001	0.000	-0.001	0.000	0.000	-0.002
331	Wood	-0.006	-0.007	-0.018	-0.011	-0.001	0.012	-0.018	-0.008	-0.006
332	Furniture and fixtures	0.006	0.005	0.007	-0.005	0.001	0.004	0.001	0.006	0.012
341	Paper	0.001	0.001	0.001	0.000	0.002	-0.002	0.001	0.003	0.000
342	Printing, publishing	-0.003	-0.002	-0.002	-0.002	0.003	-0.001	-0.005	0.001	-0.003
351	Industrial chemicals	0.000	0.000	0.000	0.000	0.001	-0.002	0.000	0.001	-0.002
352	Other chemicals	-0.002	-0.001	-0.003	0.000	0.003	-0.003	-0.002	0.001	-0.006
353	Petroleum refineries	-0.001	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	0.000
354	Miscellaneous products of petroleum and coal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Calculated from Equation 5.1

Table 5.4: The Aggregate Change in Skill Proportion over the Period 1983-1999 Using Employment Data (continued)

		Between-industries (1)			**Within-industries (2)**			**Total (3)**		
Code	**Industries**	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled
355	Rubber	-0.004	-0.002	-0.006	-0.002	0.009	-0.007	-0.007	0.007	-0.013
356	Plastic	0.009	0.005	0.015	0.001	0.006	-0.008	0.011	0.012	0.007
361	Pottery, china and earthenware	0.000	0.000	0.000	-0.001	0.002	-0.001	0.000	0.002	-0.001
362	Glass	0.001	0.000	0.000	0.000	0.000	-0.001	0.001	0.001	0.000
369	Non-metallic mineral	-0.007	-0.007	-0.010	0.000	0.003	-0.003	-0.007	-0.003	-0.014
371	Iron and steel	-0.002	-0.001	-0.002	0.000	0.002	-0.003	-0.002	0.001	-0.005
372	Non-ferrous metal	-0.001	0.000	0.000	0.001	0.001	-0.002	0.000	0.000	-0.002
381	Fabricated metal	-0.001	0.000	-0.001	-0.001	0.008	-0.007	-0.001	0.008	-0.008
382	Machinery	0.007	0.006	0.006	-0.006	0.005	0.001	0.000	0.011	0.007
383	Electrical machinery	0.064	0.029	0.049	-0.022	0.032	-0.010	0.042	0.060	0.039
384	Transport equipment	-0.004	-0.002	-0.003	-0.009	0.006	0.003	-0.013	0.004	0.000
385	Professional , scientific and measuring controlling equipment	0.001	0.001	0.001	0.001	0.004	-0.006	0.002	0.005	-0.004
390	Other manufacturing	-0.001	-0.001	-0.002	0.001	0.001	-0.003	0.000	0.001	-0.005
Total		**0.011**	**0.002**	**-0.013**	**-0.062**	**0.114**	**-0.051**	**-0.051**	**0.116**	**-0.064**

Note: Calculated from Equation 5.1

Focusing on the Total row in Table 5.4, we find that the main changes in relative demand over the 1983-1999 period are due to within-industry effects. For example, the Total changes in the relative demand of skilled workers decreased by 5 percent, which comprises a 6 percent decrease as a result of within-industries effects (decreasing by 6.2 percent) and only a 1 percent increase as a result of between-industries effects. The changes for unskilled workers are quite similar to the changes for skilled workers with an overall fall of 6.4 percent with that attributable to within-industries effects, at 5.1 percent, with only 1.3 percent being due to between-industries effects.

In contrast to both skilled and unskilled workers, the relative demand for semiskilled workers shows an increase of 11.6 percent over the period. 11.4 percent of this is attributable to within-industry effects, and only 0.2 percent to between-industry effects. These findings are consistent with previous research that has found that the dominant source of changes in skill proportions is within-industry (Machin 1998; Berman 1994) and that it reflects changes in technology that favour, in the case of Malaysia, semiskilled workers. Interestingly, and in contrast to studies for the US, the UK and other countries, the results show that technological change has reduced the demand for skilled and unskilled workers. On the other hand, the changes have significantly increased the requirement for semiskilled workers during the overall period from 1983-1999.

Within the context of Malaysia's economic development, these results reflect specific episodes of change in the structure of the economy. As noted earlier, during the period studied, Malaysia was still in an adjustment stage moving from being agriculture based to one with a strong manufacturing sector. Consequently, the manufacturing sector was operating at low and medium levels of production technology which is reflected in a strong demand for semiskilled workers. Even towards the end of the study period, the process of industrialization, including high levels of foreign direct investment, and technological innovation, had not seen a significant shift towards skill-biased technology. This does, of course, raise important issues about the nature of economic development in Malaysia and whether there is potential for growth in those jobs that have higher skill and income levels.

We now consider how differences across industries have contributed to these overall changes. A comparison across manufacturing industries for skilled workers shows that, despite the overall decline, certain industries, namely furniture and fixtures, the paper industry, the plastics industry and electrical machinery have actually faced an increase in demand for skilled workers, with the need being especially great in the electrical machinery industry. It is also the case that those industries that have experienced an increased labour demand for skilled workers are strongly affected by changes in the pattern of trade. In the electrical machinery industry, for example, the change in labour demand for skilled workers is 4 percent, of which the between-industries component accounts for 6 percent, while the within-industry component resulted in a decrease in the demand for labour by around 2 percent. This result indicates that a change in trade has increased the demand for skilled workers but that changes taking place in technology have decreased the demand for skilled workers. In addition, some industries, such as textiles, wearing apparel and wood, have decreasing relative labour demands due to both trade and technology. For textiles, the between-industries component is stronger than the within-industries component: the between-industries component accounts for 2 percent of the total decrease of 3 percent. This indicates that, in this instance, the changing pattern of trade is working against the employment of skilled workers and dominates the decrease accounted for by changes in technology.

To highlight the complex nature of the changes taking place, the decreasing demand for skilled workers in the wood, tobacco and transport equipment industries are seen to be due to the within-industry component. This result implies that technological change has a positive impact on changes in the demand for skilled workers but that changing technology has shifted the demand for labour to other categories of workers in these particular industries. It is interesting to note that the food and beverage industries also have decreasing labour demand but the major impact is from the between-industries component. Both industries have positive relationships between skilled labour and technological change, but the effect of trade is negative.

As mentioned earlier, the total demand for semiskilled workers increased by 11.6 percent during the 1983-1999 period. Comparison across industries shows that in 14 out of 29 industries technological change accounted for the changes in employment that took place in 7 industries employment change resulted primarily from changes in the pattern of trade whilst in 5 industries very little change was actually observed and 3 industries experienced the same effects for both trade and technology. The electrical machinery industry appears to contribute the most to the changes in relative demand for semiskilled workers, with an increase of 6[17] percent; 3.2 percentage points the result of technological change and 2.9 percent reflecting changes in the pattern of trade. In the fabricated metal industry, the increase in the employment of semiskilled workers of 0.8 percent was fully dominated by the effects of technological change. The changing pattern of employment in the professional scientific and measuring control equipment industry was also strongly affected by technological change. The increase in the employment of semiskilled workers of 0.5 percent was dominated by technological change (within-industry component) at 0.4 percent, with only 0.1 percent of the effect coming from trade (between-industries component). The effects of trade in the particular industries have decreased the demand for semiskilled workers by 0.3 percent, but technological change has caused an increase of 0.6 percent.

However, some industries did face an increase in total demand for semiskilled workers that are due to changes in the pattern of trade. In the furniture and fixtures industry, for example, the relative labour demand for semiskilled workers increased by 0.6 percent and this was dominated by trade related factors which contributed 0.5 percent. Also in the machinery industry, trade increased the demand for semiskilled workers by 0.6 percent whilst technological change resulted in a further increase of 0.5 percent. Industries facing a falling relative labour demand for semiskilled workers, such as the beverages, textiles, wood and non-metallic mineral industries are strongly dominated by between-industries components and thus affected by changes in the pattern of trade that worked against them.

Finally, the changes in relative demand for unskilled workers show that, overall, 18 out of the 29 industry groups had a fall in labour demand. Of these, 5 were predominantly affected by changes in the pattern of trade and 9 faced a decrease in labour demand as a

[17] Due to rounding of the figures.

result of technological changes. In other industries, both effects are equally strong. Interestingly, the transport equipment industry was also affected by both trade and technology, but the effects of these changes offset each other and brought no changes in relative labour demand.

In conclusion, this first analysis indicates that the change in relative demand for different types of labour in Malaysian Manufacturing Industries during the 1983-1999 period favoured semiskilled workers. The effects of technological change on the demand for these particular workers were strong. In contrast, the effects of technological change on skilled and unskilled workers were negative. It is interesting to note that the effect of technological change led to decreasing demand for skilled workers and thus there is no evidence of skill biased technological change for Malaysia but rather favoured semi-skilled employment. This contrasts strongly with what has happened in other countries especially in the U.K. and the U.S. (Katz and Murphy, 1992; Machin, 2000). As mentioned earlier, would seem to reflect the particular stage of economic development Malaysia was going through at the time and the changes in relative demand for very discreet types of labour

Following on from the analysis looking at the trend of aggregate changes in relative demand over the period 1983-1999, we now examine changes in various sub-periods. Our earlier discussion indicated the different types of policies being pushed over this period so it is likely that differences will be evident when we look at sub periods within 1983-1999. Table 5.5 reports between-industries and within-industry decompositions for all of the three skill groups' employment during the 1983-1987, 1987-1991, 1991-1994 and 1994-1999 sub-periods. It can be expected that changes in the economic environment in Malaysia affected relative demand in different ways over time. The total period is divided into four sub periods because these show detailed changes throughout two decades in Malaysia. The chosen span of four years duration per period is the best phasing to consider with changes in economic environment. The effects of the first economic recession of 1985 during the first sub period, for example, may lead to a different outcome than the second economic recession of 1997 during the last sub period.

During the period 1991-1994, specifically in 1991, the government introduced the National Development Policy. This policy was aimed at improving the standard of living and encouraging greater use of information technology (IT) at all levels of society. During the last period of 1994-1999, Malaysia was actively involved in the move towards globalisation and was very active in the Uruguay Round negotiations in 1994, when they were assigned to the export-oriented manufacturing group of countries. Clearly the structural changes associated with the transition from agriculture to manufacturing affected the demand for workers and the skills required. This situation is consistent with economic growth in the country at the time and for the strong performance of a higher demand in highly technologically oriented industries, such as the rapid growth of DRB HICOM in 1996, which brought an opportunity for HICOM to become involved in property and infrastructure development and the assembly of foreign cars from Honda, Mercedes Benz and Hyundai in Malaysia.

Looking at the column Total of Table 5.5, the change in the relative demand for skilled workers decreased in each sub period, except for the period 1994-1999. The relative demand for semiskilled workers on the other hand increased in all the four sub periods. The relative demand for unskilled workers, however, fell across all periods except between 1987 and 1991 when there was an increase in demand for unskilled workers of 3 percent.

Focusing on the first sub period (1983-1987), the relative demand for skilled workers decreased by 0.6 percent. These changes are dominated by a decrease within-industry (technological change) of 0.9 percent. Between-industry effects or that due to trade caused the demand for skilled labour to increase by 0.3 percent. In contrast, these effects were different for semiskilled workers. Changes in the pattern of trade caused the relative demand for semiskilled workers to fall by 0.35 percent but changes due to the effects of technological change increased demand by 3.1 percent, thus giving a total change of relative demand for semiskilled workers to 2.8[18] percent. The relative demand for unskilled workers had a similar pattern to skilled workers. Changes in the nature of trade increased the relative demand for unskilled workers by 0.01 percent but this change was not big enough to influence the total change in the demand for unskilled workers. The effects of technological change decreased the relative demand for unskilled workers. These results show that the effects of technological change were important for all three categories of workers, even if the changes occurred in different directions.

During the period 1987-1991, the effects of trade and technological change on the pattern of relative demand for skilled and semiskilled workers remained similar to that for the period 1983-1997. The results for the changing demand for unskilled workers, however, show that the technological change brought about an increase in relative demand for unskilled workers during the period. It is interesting to note that trade effects were different during the period 1991-1994. Unlike in the previous periods, changes in the nature of trade reduce the relative demand for skilled workers but increased the demand for semiskilled and unskilled workers. During the period, the impact of changes in trade reduces the demand for skilled workers by 0.7 percent whereas technological change contributed to an in employment of increase of 0.3 percent. On the other hand, the effect of trade on the relative demand for semiskilled workers was positive increasing demand by 0.15 percent. These changes, however, were not as strong as the effects of technological change which increased demand by 2.15 percent, and brought the total change of relative demand for semiskilled workers to around 2.3 percent.

It is interesting to note in Table 5.5, the relative demand for skilled workers increased by 2.3 percent in the period 1994-1999. Technological change contributed to 2.2 percent of the increase in relative demand for skilled workers during this period and 0.8 percent was the result of changes in pattern of trade. There is thus limited support for the hypothesis that technological change increased the share of skilled workers but only during the period 1994-1999. The results also show that changes in the demand for labour during this period were very much in favour of semiskilled workers as shown by the total change in relative demand of 3.2 percent. The relative demand for unskilled workers during this period decreased by 5.52 percent, with the within-industries

[18] Due to rounding of the figures.

component dominating the between-industries component. The within-industries component accounts for a decrease of 5.31 percent, a far greater influence compared to 0.21 percent from the between-industries component.

In conclusion, changes in the demand for labour in Malaysia during 1983-1999 were very much in favour of semiskilled workers. In addition, the within-industries component dominants the changes in relative demand, indicating that technological changes were the most significant factor in determining these changes. Table 5.5 also shows that biased technological change played an important role in explaining the increased share of semiskilled workers during all the sub-periods. As we noted earlier, the increased demand for semi-skilled labour is related to the particular stage of economic development Malaysia was at during the 1990s. Specifically, the country had attracted significant levels of inward investment and had experienced a significant growth in its manufacturing sector. However, manufacturing industry was characterised by medium levels of technology and the associated employment of semi-skilled labour. In part, this resulted from the fact that the education system and training provision at that time was not producing significant numbers of skilled workers. As a result, foreign manufacturers located only low and medium technology production processes in Malaysia. Even then, there was still a need to import skilled workers to meet the demand that did exist.

Table 5.5: Between-industries and Within-industry Decompositions Between Years

Sub Period	Between-industries			Within-industries			Total		
	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled
1983-1999	0.0110	0.0022	-0.0132	-0.0624	0.1137	-0.0513	-0.0514	0.1159	-0.0645
1983-1987	0.0031	-0.0035	0.0011	-0.0093	0.0313	-0.0222	-0.0061	0.0280	-0.0221
1987-1991	0.0044	-0.0030	-0.0014	-0.0683	0.0359	0.0325	-0.0640	0.0329	0.0311
1991-1994	-0.0078	0.0015	0.0063	0.0034	0.0215	-0.0248	-0.0045	0.0230	-0.0185
1994-1999	0.0008	0.0012	-0.0021	0.0221	0.0310	-0.0531	0.0230	0.0322	-0.0552

Note: Calculated from Equation 5.1

5.3.2 Stage Two: Using Wage Data.

As indicated earlier, we now move to consider data on the share of the wage bill going to different skill groups. According to Machin (1998) and Berman *et al.*(1998) wage bill share can provide an alternative way of examining changes in the relative demand for workers. This analysis complements the work on employment but takes it a stage further and allows us to explore how wages and employment have changed over time. The results of the wage bill decomposition, following a similar methodology to that in the previous section, are shown in Table 5.6.

Again, changes in the aggregate wage bill share are divided into between and within-industries components. As in our earlier results, Table 5.6 shows strong evidence of semiskilled-biased technological change, as evidenced by the strong within-industries effects. For skilled and unskilled workers, the effects of technological change also dominate changes in the relative demand but in the opposite direction. However, when we compare employment and wage bill results some differences are evident. Looking at the changes in relative wage share of semiskilled workers, the effects of trade, or between-industries effects have a different impact than when we use employment data. Changes in labour demand brought about by changes in the pattern of trade increased the employment of semiskilled workers but has led to a fall in their share of the wage bill. Comparison across industries shows that trade did not have any effect on relative demand in terms of employment of semiskilled workers but seems to decrease the share of the wage bill of workers in tobacco industries during the sample period 1983-1999. In the wearing apparel industry, however, trade decreased the relative demand for employment and increased the relative wages of skilled workers. For the other two groups, trade decreased the relative demand for employment but the share of wage bill remained unchanged for semiskilled and unskilled workers.

Table 5.6: The Change in Aggregate Wage Bill Share of Skill Proportion over the Period 1983-1999

		Between-Industries (1)			Within-Industries (2)			Total (3)		
Code	**Industries**	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled
311	Food	-0.012	-0.007	-0.013	0.001	0.008	-0.009	-0.012	0.001	-0.022
312	Beverage – others (coffee, tea, ice, etc)	-0.002	-0.001	-0.002	0.002	0.000	-0.002	0.000	-0.001	-0.004
313	Beverage - liquor, malt, wines, soft drinks, alcohol	-0.003	-0.001	-0.004	0.000	0.002	-0.001	-0.003	0.000	-0.006
314	Tobacco	-0.003	-0.001	-0.001	-0.001	0.001	0.000	-0.004	0.000	-0.001
321	Textiles	-0.015	-0.003	-0.008	-0.008	0.004	0.005	-0.023	0.000	-0.004
322	Wearing apparel	0.001	0.000	0.000	0.000	0.004	-0.004	0.001	0.004	-0.003
323	Leather	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
324	Footwear	-0.001	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	-0.001
331	Wood	-0.026	-0.018	-0.030	-0.013	0.001	0.013	-0.039	-0.018	-0.017
332	Furniture and fixtures	0.005	0.003	0.004	-0.007	0.001	0.006	-0.002	0.004	0.010
341	Paper	0.002	0.001	0.002	0.000	0.001	-0.001	0.002	0.003	0.000
342	Printing, publishing	-0.007	-0.003	-0.003	-0.003	0.004	-0.001	-0.010	0.002	-0.004
351	Industrial chemicals	0.001	0.000	0.001	0.000	0.002	-0.002	0.002	0.002	-0.002
352	Other chemicals	-0.003	-0.001	-0.002	0.000	0.003	-0.003	-0.002	0.002	-0.005
353	Petroleum refineries	-0.003	0.000	0.000	0.000	0.000	0.000	-0.003	0.000	0.000
354	Miscellaneous products of petroleum and coal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Calculated from Equation 5.1

Table 5.6: The Change in Aggregate Wage Bill Share of Skill Proportion over the Period 1983-1999 (continued)

		Between-industries (1)			**Within-industries (2)**			**Total (3)**		
Code	**Industries**	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled	Skilled	Semiskilled	Unskilled
355	Rubber	-0.006	-0.002	-0.006	-0.002	0.009	-0.007	-0.008	0.006	-0.013
356	Plastic	0.013	0.005	0.012	0.001	0.006	-0.007	0.014	0.011	0.005
361	Pottery, china and earthenware	0.001	0.000	0.000	0.000	0.001	-0.001	0.000	0.002	0.000
362	Glass	0.003	0.001	0.001	0.001	0.000	-0.001	0.004	0.001	0.000
369	Non-metallic mineral	-0.012	-0.008	-0.011	0.000	0.005	-0.004	-0.012	-0.003	-0.015
371	Iron and steel	-0.005	-0.002	-0.003	0.000	0.004	-0.004	-0.005	0.002	-0.007
372	Non-ferrous metal	-0.001	0.000	-0.001	0.001	0.001	-0.002	0.000	0.001	-0.003
381	Fabricated metal	-0.001	0.000	0.000	-0.001	0.008	-0.006	-0.002	0.007	-0.007
382	Machinery	0.011	0.006	0.006	-0.008	0.003	0.005	0.003	0.009	0.011
383	Electrical machinery	0.087	0.033	0.048	-0.014	0.028	-0.014	0.073	0.061	0.034
384	Transport equipment	-0.011	-0.004	-0.005	-0.016	0.010	0.005	-0.027	0.006	0.000
385	Professional , scientific and measuring controlling equipment	0.003	0.001	0.003	0.002	0.004	-0.006	0.005	0.005	-0.002
390	Other manufacturing	0.000	0.000	0.000	0.001	0.001	-0.002	0.001	0.001	-0.002
Total		**0.016**	**-0.001**	**-0.015**	**-0.065**	**0.109**	**-0.044**	**-0.049**	**0.108**	**-0.059**

5.4 A Further Analysis of the Decomposition Approach Using Both Employment and Wage Data to Measure Technology and Trade Effects

The above section presented evidence relating to the changes in relative demand for different skill groups of workers in Malaysian manufacturing, using employment and wage data to measure the effects of trade and technological change. In this section, we develop this analysis further by breaking down the overall changes in the wage bill share into its components: wage premiums and employment components. We then split each of these components into their respective parts: within and between industries. As has been documented by Manasse *et al.*(2004) in the context of the wage component, two effects are expected to influence changes in wage share. These effects may be due to either an individual industry having, on average, higher paid skilled workers (within effects $(Wwit)$ in Equation 5.4). On the other hand, it may be due to the fact that average wages have grown more rapidly in those industries paying relative higher wages across all skill groups (between effects $(Wbet)$ in Equation 5.4. With the employment component, the skilled employment share comes from two separate factors: either an individual industry has, on average, become more or less skill-intensive (the within-industry effect $(Ewit)$ in Equation 5.5), or employment has shifted towards industries that are relatively intensive in terms of skilled workers (the between-industry effect $(Ebet)$ in Equation 5.5).

Thus, this analysis provides us with direct information about how movements in employment and wage premium components affect relative wages. Previous decompositions cannot identify the respective contributions of employment and wage premiums in the share of the relative wage bill. Following Manasse *et al.* (2004) this section provides further information about movements in relative wages shares and employment. In keeping with the previous section, the analysis measures two effects (within and between-industries), representing technology and trade effects respectively, but now using both wages and employment. To discuss this issue, let industries in the sample be indexed by superscript $i = 1,..,I$, and S, SS and U denote skilled, semiskilled and unskilled workers respectively. Using the decomposition approach described earlier, the change in the wage bill going to each group can be classified into between-industry and within-industry components (in this case for skilled workers) as follows:

$$\Delta\left(\frac{WB_S}{WB}\right) = \Delta\sum_i^I\left(\frac{W_{Si}E_{Si}}{WE}\right) \qquad \text{(Equation 5.2)}$$

$$\Delta\sum_i^I\left(\frac{W_{Si}E_{Si}}{WE}\right) = \sum_{i=1}^I\left[\Delta\left(\frac{W_{Si}}{W}\right)\overline{\left(\frac{E_{Si}}{E}\right)} + \Delta\left(\frac{E_{Si}}{E}\right)\overline{\left(\frac{W_{Si}}{W}\right)}\right] \qquad \text{(Equation 5.3)}$$

Wages (Wtot) ***Employment (Etot)***

Where, Δ denotes time difference, and the upper bar denotes average over time. WB is the wage bill, E_{Si} and W_{Si} denote skilled employment and wage in industry i; employment in the industry is $E_i = E_{Si} + E_{SSi} + E_{Ui}$. Total employment is $E = \sum_i^I E_i$ and the total skilled employment is $E_S = \sum_i^I E_{Si}$. The average wage in an industry is defined as $W_i = (W_{Si}E_{Si} + W_{SSi}E_{SSi} + W_{Ui}E_{Ui})/(E_{Si} + E_{SSi} + E_{Ui}) = (WB_i)/(E_i)$. The skilled workers' wage is defined as $W_{Si} = (W_{Si}E_{Si})/(E_{Si}) = (WB_{Si})/(E_{Si})$. Finally, let $W = \sum_i^I W_iE_i / \sum_i^I E_i = WB/E$ which is the average wage overall.

Equation 5.3 shows the wage and employment components of the composition in the first and second terms respectively. Each component can be further broken down into their respective between and within components. Thus the wage component of the changes in the skilled wage bill share weighted by average skilled employment shares can be decomposed into between-industry changes $(Wbet)$ and within-industry changes $(Wwit)$ as follows.

$$\sum_{i=1}^I\Delta\left(\frac{W_{Si}}{W}\right)\overline{\left(\frac{E_{Si}}{E}\right)} = \sum_{i=1}^I\left[(\Delta R_i)\overline{D_{Si}} + (\Delta D_{Si})\overline{R_i}\right]\overline{\left(\frac{E_{Si}}{E}\right)} \qquad \text{(Equation 5.4)}$$

(Wtot) ***(Wbet)*** ***(Wwit)***

Where, $D_{Si} = W_{Si} / W_i$ is the skilled wage differential paid by industry i, and $R_i = W_i / W$ is the average wage paid by industry i relative to the average wage rate.

The employment component $(Etot)$ $\sum_{i=1}^{I}\left[\Delta\left(\frac{E_{Si}}{E}\right)\overline{\left(\frac{W_{Si}}{W}\right)}\right]$ in Equation 5.3 shows the changes in skilled employment shares. This change represents the sum of changes in the skilled employment share weighted by the average wage. The employment component, $(Etot)$, can thus be written as follows:

$$\sum_{i=1}^{I}\Delta\left(\frac{E_{Si}}{E}\right)\overline{\left(\frac{W_{Si}}{W}\right)} = \sum_{i=1}^{I}\left[(\Delta C_i)\overline{P_{Si}} + (\Delta P_{Si})\overline{C_i}\right]\overline{\left(\frac{W_{Si}}{W}\right)} \qquad \text{(Equation 5.5)}$$

(Etot) ***(Ebet)*** ***(Ewit)***

where $P_{Si} = E_{Si} / E_i$ is the proportion of skilled workers in industry $i's$ employment and $C_i = E_i / E$ is the share of industry i in total employment.

In summary, the purpose of this section is to identify in detail the factors that shift labour demand. In Section 5.3, we discussed how changes in labour demand are affected by trade and technology associated with between-industry and within-industry effects. In this section, we explore how the effects of changes in trade patterns and in technology affect relative wages and employment.

Tables 5.7, 5.8 and 5.9 report the decomposition in wage and employment shares for skilled, semiskilled and unskilled workers respectively.

Table 5.7: Decomposition of Skilled Workers during the Period 1983-1999

Industries	Wtot	Wwit	Wbet	Etot	Ewit	Ebet	Overall
Food	-0.0024	-0.0019	-0.0005	-0.0092	0.0028	-0.0119	-0.0116
Beverage – others (coffee, tea, ice, etc)	0.0005	0.0004	0.0001	-0.0010	0.0015	-0.0025	-0.0005
Beverage - liquor, malt, wines, soft drinks, alcohol	0.0013	0.0004	0.0010	-0.0041	-0.0005	-0.0036	-0.0028
Tobacco	0.0020	0.0061	-0.0041	-0.0062	-0.0056	-0.0006	-0.0042
Textiles	0.0071	0.0005	0.0066	-0.0301	-0.0090	-0.0211	-0.0230
Wearing apparel	0.0109	0.0005	0.0104	-0.0098	-0.0008	-0.0090	0.0011
Leather	0.0000	-0.0002	0.0002	0.0002	0.0001	0.0001	0.0002
Footwear	0.0000	-0.0001	0.0001	-0.0001	0.0006	-0.0006	-0.0001
Wood	-0.0123	0.0046	-0.0169	-0.0271	-0.0173	-0.0098	-0.0393
Furniture and fixtures	-0.0025	-0.0004	-0.0021	0.0007	-0.0066	0.0073	-0.0017
Paper	0.0007	0.0000	0.0007	0.0013	0.0000	0.0014	0.0020
Printing, publishing	-0.0021	0.0004	-0.0025	-0.0083	-0.0033	-0.0050	-0.0104
Industrial chemicals	0.0017	-0.0003	0.0020	0.0001	0.0007	-0.0006	0.0017
Other chemicals	0.0009	0.0002	0.0007	-0.0031	0.0003	-0.0034	-0.0022
Petroleum refineries	-0.0001	-0.0002	0.0001	-0.0028	0.0001	-0.0029	-0.0028
Miscellaneous products of petroleum and coal	-0.0002	-0.0001	-0.0001	-0.0003	0.0001	-0.0003	-0.0004
Rubber	-0.0003	0.0010	-0.0013	-0.0081	-0.0030	-0.0051	-0.0084
Plastic	0.0031	-0.0003	0.0034	0.0109	0.0012	0.0096	0.0140
Pottery, china and earthenware	0.0004	0.0001	0.0003	-0.0002	-0.0005	0.0003	0.0002
Glass	0.0009	-0.0004	0.0013	0.0026	0.0009	0.0018	0.0036
Non-metallic mineral	-0.0015	-0.0004	-0.0012	-0.0106	0.0002	-0.0107	-0.0121
Iron and steel	-0.0014	-0.0004	-0.0010	-0.0038	0.0002	-0.0040	-0.0052
Non-ferrous metal	-0.0005	-0.0003	-0.0002	0.0007	0.0016	-0.0009	0.0002
Fabricated metal	-0.0002	-0.0003	0.0001	-0.0019	-0.0012	-0.0008	-0.0022
Machinery	0.0023	0.0029	-0.0006	0.0006	-0.0110	0.0116	0.0029
Electrical machinery	0.0265	0.0107	0.0159	0.0469	-0.0245	0.0714	0.0734
Transport equipment	-0.0054	-0.0009	-0.0045	-0.0215	-0.0145	-0.0070	-0.0270
Professional , scientific and measuring controlling equipment	0.0024	0.0003	0.0021	0.0026	0.0015	0.0011	0.0050
Other manufacturing	0.0003	-0.0005	0.0008	0.0004	0.0014	-0.0010	0.0007
Total	**0.0321**	**0.0213**	**0.0108**	**-0.0812**	**-0.0849**	**0.0037**	**-0.0491**

Note: These results are obtained from Equations 5.3, 5.4 and 5.5. *Wtot*, *Wwit* and *Wbet* represent the changes in total wages, changes in wages within-industry, and changes in wages between-industries. *Etot*, *Ewit* and *Ebet* refer to total employment, within-industry employment and between-industry employment.

5.4.1 Skilled Workers

The results of the decompositions for skilled, workers are presented in Tables 5.7. The 'overall' column of Table 5.7 shows that changes in relative demand for skilled workers as measured by changes in the wage bill, decreased by nearly 5 percent. This result indicates that the demand for labour in Malaysia has shifted towards less skilled workers. This change is the result of changes in employment (*Etot*) and changes in wage bill (*Wtot*) though the results here indicate that it is the employment component that dominates changes in the share of employment of skilled workers which decreased by 8.12 percent whereas the share of the wage bill going to skilled workers actually increased by 3.2 percent. This result suggests that within Malaysian manufacturing, wage shares has moved to more highly paid industries; on the other hand, employment has shifted to less skilled industries. Textiles, wood and transport equipment are among those industries that produce the low skill intensive goods with a decrease in relative demand of 2.3 percent, 3.9 percent and 2.7 percent respectively. Other industries, for example the electrical machinery and plastic industries, however, shifted towards skilled workers and show an increase in relative demand of 7.3 percent and 1.4 percent respectively.

Focusing on the changes that have taken place in relative employment, the overall decrease of 8.12 percent is the result of two offsetting effects: an 8.4 percent fall associated with within-industry and a 0.37 percent increase resulting from between-industry changes. This suggests that industries have reduced the proportion of skilled workers employed (technological change is not skill biased) but that trade meant that employment has shifted toward goods that are more skill-intensive.

Comparison across industries shows that many of the industries in Malaysian manufacturing have raised the proportion of skilled workers they employ due to technological change however, the changes are too small to affect the overall total. Food, beverage and plastic, non-ferrous metal are among the industries in which technological change led to an increase in the proportion of skilled workers employed. In contrast, looking at the industries where this is most evident, the textile, wood and transport equipment industries make the largest contribution to a decreasing in relative employment.

Changes in employment share between industries capture the effects of changes in the pattern of trade. Overall, these effects are small though almost one third of industries in manufacturing shifted towards more skill-intensive goods as a result of changes in trade. Machinery and electrical machinery were among the industries where this was most significant. Textiles and non-metallic minerals, however, are industries in which the employment share of skilled workers fell due to changes in the pattern of trade.

The discussion now turns to the second set of changes in relative demand that is those due to the changes in wage premium. Similar to the changes in relative employment explored above, these changes can also be divided into two components: between (*Wbet*) and within (*Wwit*) effects that represent the effects of trade and technological change respectively. First, we will look at the total changes presented in column *Wtot* of Table 5.7. Overall, the wage premium associated with skilled workers has increased by 3.2 percent. This change was brought about both by changes taking place within-industries (technological change) and those taking place between-industry reflecting changes in the pattern of trade; these effects are 2.1 percent and 1.1 percent respectively.

The results indicate that the overall effect is dominated by what is happening in electrical machinery which saw an increase in wage premiums going to skilled workers of 2.5 percent. Wearing apparel also experienced an increase in the wage differentials associated with skilled workers. In most other industries, changes in the premia were small and in 12 industries there was a fall in the wage premium associated with skilled workers.

It is interesting to note that the effects of technological change on wages are almost entirely focused on the electrical machinery industry. In most other cases, technological change has had only limited effect on the wage premium paid within industries. In contrast, changes in the pattern of trade have led to more significant shifts in wage premiums for generally falling in industries that pay higher wages. Again the one exception is electrical machinery, where wages are increasing generally.

In summary, for skilled workers we find three principal results. Firstly, employment changes contribute more than changes in wage premium to the overall shift in the wage bill and that these have offsetting effects. The results indicate that employment has shifted towards less skilled workers but that wage premia associated with skilled employment have risen. Secondly, the effects of technological change are dominant, but they contribute to a fall in the relative wage bill going to skilled workers, in contradiction to the SBTC hypothesis. Finally, there was a significant difference in the impact of technological change and changes in the pattern of trade across industries.

5.4.2 Semiskilled Workers.

Table 5.8 shows the decomposition of the wage bill for semiskilled workers in manufacturing industries during the 1983-1999 period. Referring to the overall column of Table 5.8, it can be seen that there is an overall increase in the demand for semiskilled workers of 10.8 percent. Clearly, it is changes in the employment of semiskilled workers that plays the dominant role (10.9 percent) in explaining these overall changes. The wage component indicates that wages have changed for semiskilled workers but in favour of skill groups other than semiskilled workers.

Looking at the way relative employment trends have changed, the table shows that the total change in total employment (*Etot*) is an increase of 10.9 percent during the 1983-1999 period. This is due almost entirely to changes that have taken place within industries (10.6 percent) whereas only 0.3 percent is due to between-industry employment changes. This result indicates that there is clear evidence of technological bias in Malaysian manufacturing toward semiskilled workers. Indeed, looking at the column, it can be seen that for all the industries in manufacturing, technical change has led to an increased demand for semiskilled labour, with the exception of the wood industry.

The effects of changes in the patterns of trade on relative employment for semiskilled workers are presented in the (*Ebet*) column of Table 5.8. This shows that for 9 out of 29 industries, changes in trade have increased the demand for semiskilled workers. It is clearly the case, however, that changes in trade do not have a major impact on the changes that have taken place in the employment of semiskilled workers and that trade has, in more cases than not, led to a fall in the demand for semiskilled labour. The one exception here is in the electrical machinery industry which saw a large increase in relative employment which was due both to the way technology was changing and to the fact that trade was moving in favour of goods that require semiskilled labour to produce semiskilled good.

Looking at the changes in the structure of wages, it is clear that, these are very small across all industries. The notable exception is in the wood industry which saw the wages premium for semiskilled workers falling due predominantly to a change in trade away from the employment of semiskilled workers in the industry. In fact, the results indicate that wage premiums overall increased in most industries but this was offset by what was happening in the wood manufacturing industry. The results suggest that wage differentials for semiskilled workers are increasing within industries but that there are being more than offset by the fact that wages are generally falling in industries that employ relatively more semiskilled workers.

Table 5.8: Decomposition of Semiskilled Workers During the Period 1983-1999

Industries	*Wtot*	*Wwit*	*Wbet*	*Etot*	*Ewit*	*Ebet*	*Overall*
Food	0.0004	0.0007	-0.0003	0.0004	0.0073	-0.0070	0.0008
Beverage – others (coffee, tea, ice, etc)	-0.0003	-0.0004	0.0001	-0.0008	0.0006	-0.0014	-0.0011
Beverage - liquor, malt, wines, soft drinks, alcohol	0.0002	0.0000	0.0003	0.0002	0.0016	-0.0014	0.0005
Tobacco	-0.0005	0.0002	-0.0007	0.0004	0.0006	-0.0001	-0.0001
Textiles	0.0010	-0.0001	0.0011	-0.0007	0.0038	-0.0045	0.0003
Wearing apparel	0.0023	-0.0001	0.0023	0.0020	0.0041	-0.0021	0.0043
Leather	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0002
Footwear	0.0001	0.0000	0.0000	0.0000	0.0002	-0.0002	0.0000
Wood	-0.0100	0.0013	-0.0113	-0.0076	-0.0008	-0.0068	-0.0176
Furniture and fixtures	-0.0014	-0.0001	-0.0014	0.0050	0.0008	0.0042	0.0035
Paper	0.0000	-0.0004	0.0005	0.0025	0.0017	0.0009	0.0025
Printing, publishing	0.0001	0.0009	-0.0008	0.0014	0.0032	-0.0018	0.0015
Industrial chemicals	0.0005	0.0000	0.0005	0.0017	0.0019	-0.0002	0.0022
Other chemicals	0.0000	-0.0002	0.0002	0.0016	0.0028	-0.0012	0.0016
Petroleum refineries							
Miscellaneous products of petroleum and coal	0.0000	0.0000	0.0000	-0.0001	0.0001	-0.0002	-0.0001
Rubber	0.0005	0.0009	-0.0004	0.0060	0.0078	-0.0018	0.0065
Plastic	0.0029	0.0014	0.0015	0.0082	0.0045	0.0038	0.0111
Pottery, china and earthenware	-0.0003	-0.0005	0.0003	0.0019	0.0017	0.0003	0.0016
Glass	0.0002	0.0000	0.0003	0.0008	0.0004	0.0003	0.0010
Non-metallic mineral	0.0003	0.0010	-0.0007	-0.0035	0.0034	-0.0069	-0.0032
Iron and steel	0.0010	0.0014	-0.0004	0.0014	0.0029	-0.0015	0.0024
Non-ferrous metal	0.0003	0.0003	-0.0001	0.0005	0.0007	-0.0002	0.0008
Fabricated metal	-0.0007	-0.0008	0.0000	0.0079	0.0083	-0.0004	0.0072
Machinery	-0.0034	-0.0030	-0.0004	0.0120	0.0055	0.0065	0.0086
Electrical Machinery	0.0035	-0.0032	0.0068	0.0577	0.0303	0.0274	0.0612
Transport equipment	0.0014	0.0029	-0.0014	0.0046	0.0070	-0.0024	0.0060
Professional , scientific and measuring controlling equipment	0.0003	-0.0008	0.0011	0.0049	0.0044	0.0005	0.0052
Other manufacturing	0.0004	0.0000	0.0004	0.0006	0.0011	-0.0005	0.0010
Total	**-0.0012**	**0.0014**	**-0.0026**	**0.1092**	**0.1060**	**0.0032**	**0.1080**

Note: The result is obtained from Equations 5.3, 5.4 and 5.5. *Wtot, Wwit* and *Wbet* represent the changes in total wages, changes in wages in within-industry, and changes in wages between-industries. *Etot,Ewit* and *Ebet* refer to total employment, within employment and between employment.

5.4.3 Unskilled Workers

The last skill group that will be discussed is unskilled workers. The decomposition for the unskilled group is presented in Table 5.9. Although the answer to the question of which skill group has been affected most by trade and technology has for the most part already been answered in the discussion of skilled and semiskilled workers, in this sub section we want to know how strong changes in employment and wages for unskilled workers are and what is the cause of these.

Table 5.9 shows that the overall share of the wage bill for unskilled workers fell by 5.2 percent. This was entirely due to a fall in employment share of 5.7 percent. The data also shows that the relative employment decline is due to technological change, as represented by the within-industry component column. A technological change in Malaysia has led to fewer unskilled workers being employed. Changes in the pattern of trade has also moved against the employment of unskilled workers though the effect is less than the impact of technological change.

Changes in relative wages have had only a marginal impact on total changes in the overall share of the wage bill for unskilled workers. However, the total changes in wages reported in the *Wtot* column suggest that relative wages have shifted towards low paid (unskilled wages) industries. Within industry effects contributed to a decrease of 0.4 percent in wage differentials and between-industry effects increased relative wages by 0.8 percent.

The pattern of changes across industries in the demand for unskilled workers suggests some interesting trends. Clearly, there has been a shift away from unskilled employment in many of the traditional industries. Comparison across industries for example, shows that the food industry makes the largest contribution to the overall decrease in the share of the wage bill for unskilled workers, approximately 2 percent of a total decrease of 5 percent. Other industries, for example, wood, rubber and non-metallic minerals, contribute a decrease of around 1 percent. On the other hand, the share of the wage bill for unskilled workers in the machinery and electrical machinery industries actually increased by 1 and 3 percent respectively. Interestingly the impact of technology and trade varies significantly across industries. The fall in the share of the wage bill for unskilled workers in the food industry was due primarily to changes in relative employment with both technology and trade operating against the employment of unskilled workers. This is also true in the rubber industry. In the wood industry, both wages and employment are in decline and this is due to technology moving against unskilled labour.

The major contributor to an increase in the share of unskilled workers is in electrical machinery where employment has increased by 3.1 percent. Looking at the effects of technology and trade on relative wages and employment in this industry we see that the effects of technological change are relatively small compared with the effects of trade. In an employment context, the increase in technological change is associated with a reduction of unskilled workers in the electrical machinery industry. Changes in the pattern of trade, however, increased the proportion of unskilled workers employed.

To a lesser extent, the same patterns are observed in the changes in wages. Technological change seems to reduce the relative wage for unskilled workers, for example, in electrical machinery, but that relative wages have increased in industries that pay low wages. It is interesting to note that trade does not have any effect on relative wages in petroleum refineries and the miscellaneous products of petroleum and coal industries. The effect of technological change on relative wages seems to be very small and most of the changes are due to changes in employment. The effect of technological change on relative employment is dominant in the pottery, china and earthenware industries, having brought a decrease of 0.4 percent to the share of unskilled workers.

Table 5.9: Decomposition of Unskilled Workers

Industries	*Wtot*	*Wwit*	*Wbet*	*Etot*	*Ewit*	*Ebet*	*Overall*
Food	-0.0015	-0.0010	-0.0005	-0.0203	-0.0079	-0.0124	-0.0218
Beverage – others (coffee, tea, ice, etc)	-0.0006	-0.0006	0.0001	-0.0038	-0.0015	-0.0023	-0.0044
Beverage - liquor, malt, wines, soft drinks, alcohol	0.0015	0.0000	0.0015	-0.0075	-0.0015	-0.0061	-0.0060
Tobacco	-0.0006	-0.0003	-0.0003	0.0005	0.0006	-0.0001	-0.0001
Textiles	0.0049	0.0017	0.0032	-0.0084	0.0031	-0.0115	-0.0035
Wearing apparel	0.0036	-0.0010	0.0045	-0.0051	-0.0032	-0.0019	-0.0015
Leather	0.0003	0.0002	0.0001	-0.0001	-0.0001	0.0000	0.0002
Footwear	0.0002	0.0001	0.0002	-0.0012	-0.0007	-0.0005	-0.0010
Wood	-0.0085	0.0031	-0.0117	-0.0035	0.0075	-0.0110	-0.0120
Furniture and fixtures	0.0012	0.0022	-0.0010	0.0076	0.0028	0.0048	0.0088
Paper	0.0004	-0.0001	0.0005	0.0001	-0.0011	0.0010	0.0003
Printing, publishing	-0.0014	-0.0002	-0.0012	-0.0031	-0.0011	-0.0020	-0.0045
Industrial chemicals	0.0004	-0.0006	0.0010	-0.0019	-0.0017	-0.0002	-0.0016
Other chemicals	0.0001	-0.0005	0.0006	-0.0056	-0.0026	-0.0030	-0.0055
Petroleum refineries	0.0001	0.0001	0.0000	-0.0003	0.0000	-0.0004	-0.0002
Miscellaneous products of petroleum and coal	-0.0001	-0.0001	0.0000	-0.0003	-0.0001	-0.0002	-0.0004
Rubber	-0.0021	-0.0010	-0.0011	-0.0104	-0.0056	-0.0048	-0.0125
Plastic	0.0010	-0.0017	0.0026	0.0043	-0.0046	0.0088	0.0052
Pottery, china and earthenware	0.0003	0.0001	0.0002	-0.0007	-0.0009	0.0002	-0.0004
Glass	0.0009	0.0002	0.0007	-0.0004	-0.0010	0.0005	0.0005
Non-metallic mineral	-0.0020	-0.0010	-0.0010	-0.0131	-0.0032	-0.0098	-0.0151
Iron and steel	-0.0020	-0.0013	-0.0007	-0.0052	-0.0030	-0.0023	-0.0072
Non-ferrous metal	-0.0007	-0.0005	-0.0002	-0.0025	-0.0019	-0.0006	-0.0032
Fabricated metal	-0.0005	-0.0006	0.0000	-0.0060	-0.0056	-0.0004	-0.0065
Machinery	0.0035	0.0038	-0.0003	0.0072	0.0011	0.0062	0.0108
Electrical machinery	0.0033	-0.0069	0.0102	0.0310	-0.0078	0.0389	0.0343
Transport equipment	0.0005	0.0023	-0.0019	-0.0004	0.0028	-0.0033	0.0000
Professional, scientific and measuring controlling equipment	0.0015	-0.0007	0.0023	-0.0038	-0.0049	0.0011	-0.0022
Other manufacturing	0.0012	0.0000	0.0012	-0.0035	-0.0020	-0.0016	-0.0024
Total	**0.0046**	**-0.0043**	**0.0089**	**-0.0567**	**-0.0438**	**-0.0130**	**-0.0521**

Note: The result is obtained from Equations 5.3, 5.4 and 5.5. *Wtot*, *Wwit* and *Wbet* represent the changes in total wages, changes of wages within-industries, and changes in wages between-industries. *Etot*,*Ewit* and *Ebet* refer to total employment, within employment and between employment.

5.4.4 Summary of the Decomposition Results

A Summary of the results of changes in share of wage bill for different skill groups by industry is presented in Table 5.10 below. Overall, the demand for skilled and unskilled workers has decreased over time and there has been a shift in favour of semiskilled workers. Table 5.10 suggests a number of implications for the Malaysian labour market. First, comparing the employment component and the wage component, it shows that the changes in the former are dominant in explaining the overall change. This result indicates that employment, or the quantity of labour in the Malaysian labour market, is dominant compared to wage changes. This situation was due to a shortage of labour in the Malaysian labour market, which attracted foreign workers to Malaysia. As noted earlier in Chapter 2, the supply of foreign workers in the Malaysian labour market, especially illegal workers, has come to the top of the agenda in discussions of employment problems. In the present context, the movement away from agriculture towards manufacturing created a labour shortage in favour of workers with higher levels of skills. This would put upward pressure on wages but this was offset by the inflow of significant numbers of foreign workers. Thus, the increased supply of foreign workers made the relative demand for workers more dependent on quantity (employment) and not wages. The limited impact on wages was also due to the fact that trade unions in Malaysia have only a limited impact on wages. Employers do not normally encourage workers to join unions in order to hold down employment costs. Trade unions in Malaysia are not allowed to bargain over wages but rather, they protect the social welfare of workers, for example through health care, social security, child care centres and services for workers. By allowing a trade union, employers are exposed to workers rights, and they would have to provide facilities and social welfare for their workers and cover health insurance costs.

The limited powers granted to unions also reflect political considerations. In the 1960s there was a political disagreement between Malaysia and Indonesia. Indonesia initiated an armed confrontation with Malaysia which led to a state of emergency being declared during the period 1963 to 1966. During this period, the Government introduced the Emergency Essential Regulations, which gave it the power to declare that some sectors of the economy were 'essential sectors'. Workers in these essential sectors were prohibited from taking any industrial action. As a consequence of this emergency period, the government then introduced the Industrial Relations Act (1967) which amended the Employment Act of 1955 and the Trade Union Act of 1959, and limited the power of trade unions in the country. In 1969, there were also major race riots in the country due to the divisions between Malays and non-Malays. This state of emergency was used against the labour movement and employment law becomes more restrictive. Unions were only allowed in certain industries to protect the Malays' rights and to ensure that the Government's Economic Plans succeeded. As a result, trade unions in Malaysia find it difficult to sustain their collective bargaining strength when workers are prevented from becoming members (Navamukundan, 2007). Illegal foreign workers are totally helpless in this situation because they are not identified as being in a formal system. As a result, the effects of wages are not as strong as the effects of employment in determining relative demand.

Second, as far as the relative demand by industry is concerned, Table 5.10 shows that electrical machinery has an increasing share of the wage bill for all skill groups and that this is significantly larger than for other industry group. This result is consistent with the contribution of this industry to Malaysian manufacturing, as noted in the report by the MATRADE (2007). Historically, the United States has long been one of Malaysia's largest trading partners; its exports to the United States reached 21.9 percent in 1999. Trade between the two countries consisted mainly of assembled electrical goods and manufactured electronics. Singapore is traditionally the second-largest export market, with the proportion of goods sent to Singapore reaching 16.5 percent. This market is also dominated by electrical and electronic equipment, machinery, metals, and mineral fuels. Japan is in third place at 11.6 percent, and, once again, exports are dominated by electrical and electronic equipment, machinery and mineral fuels (MATRADE, 2007).

Table 5.10: Summary of the Share of the Wage Bill for Different Skill Groups by Industries

Skill Group	Industries	Wage Component		Employment Component		Total
		Trade	Technological	Trade	Technology	
Skilled	Food	-0.0005	-0.0019	-0.0119	0.0028	**-0.0116**
	Textiles	0.0066	0.0005	-0.0211	-0.0090	**-0.0230**
	Wood	-0.0169	0.0046	-0.0098	-0.0173	**-0.0393**
	Printing, Publishing	-0.0025	0.0004	-0.0050	-0.0033	**-0.0104**
	Plastic	0.0034	-0.0003	0.0096	0.0012	**0.0140**
	Non-Metallic Mineral	-0.0012	-0.0004	-0.0107	0.0002	**-0.0121**
	Electrical Machinery	0.0159	0.0107	0.0714	-0.0245	**0.0734**
	Transport Equipment	-0.0045	-0.0009	-0.0070	-0.0145	**-0.0270**
Semiskilled	Wood	-0.0113	0.0013	-0.0008	-0.0076	**-0.0176**
	Plastic	0.0015	0.0014	0.0038	0.0045	**0.0111**
	Electrical Machinery	0.0068	-0.0032	0.0274	0.0303	**0.0612**
Unskilled	Food	-0.0005	-0.0010	-0.0124	-0.0079	**-0.0218**
	Wood	-0.0117	0.0031	-0.0110	0.0075	**-0.0120**
	Rubber	-0.0011	-0.0010	-0.0048	-0.0056	**-0.0125**
	Non-Metallic Mineral	-0.0010	-0.0010	-0.0098	-0.0032	**-0.0151**
	Machinery	-0.0003	0.0038	0.0062	0.0011	**0.0108**
	Electrical Machinery	0.0102	-0.0069	0.0389	-0.0078	**0.0343**

5.5 Measuring the SBTC in the Cost Function Framework

5.5.1 An Analysis of Skill Biased Technological Change.

In Sections 5.3 and 5.4, we found that technological change is the dominant factor that has affected the relative demand for workers in Malaysian manufacturing. We concluded that technological changes accounted for most of the decrease in the relative demand for skilled and unskilled workers and the increasing relative demand for semiskilled workers. This section provides a further explanation of factors that might explain these within-industry changes in the skill groups' wage bills. The analysis here focuses on a cost function framework.

The aims of this section are twofold: the first is to test the SBTC hypothesis, as the previous section has done, but this time using a rather different approach to further explore factors that might explain within-industries changes detailed earlier. The second is to measure the sector bias of SBTC.

To measure SBTC, we have adopted a slightly modified version of the original model used in Berman *et al.* (1994) and Haskel and Slaughter (2002) in that in contrast to their analysis, we include semiskilled workers in the model. As we saw earlier in Sections 5.3 and 5.4, the increased demand for semiskilled workers is the important change that has taken place in Malaysia. However, the general approach follows Berman *et al.* (1994) and Haskel and Slaughter (2002) in that we use share equations derived from a translog cost function with constant returns to scale technology. This approach has been used often in the empirical literature on SBTC (see, for example, Berman *et al.*, 1994; Machin and Van Reenen, 1998; Berman, Bround and Griliches, 1994; and Haskel and Slaughter, 2002). The equation for the change of each group's share of wages and employment in first differences can be written as follows:

$$\Delta\left(\frac{WB_{Si}}{WB}\right)=\beta_0+\beta_1\Delta\ln(W_{Si}/W_{SSi})+\beta_2\Delta\ln(W_{Si}/W_{Ui})+\beta_3\Delta\ln(K_i/Y_i)+\varepsilon_i, \quad \text{(Equation 5.6)}$$

$$\Delta\left(\frac{WB_{SSi}}{WB}\right)=\alpha_0+\alpha_1\Delta\ln(W_{SSi}/W_{Si})+\alpha_2\Delta\ln(W_{SSi}/W_{Ui})+\alpha_3\Delta\ln(K_i/Y_i)+\varepsilon_i, \quad \text{(Equation 5.7)}$$

Equations 5.6 and 5.7 represent changes in the share of the wage bill for skilled and semiskilled workers shown by $\frac{WB_S}{WB}$ and $\frac{WB_{SS}}{WB}$ respectively, i indices relate to industry; W_{Si}, W_{SSi}, W_{Ui} denote the wage rates of skilled, semiskilled and unskilled workers respectively and K represents capital stock and Y represents value added. The relative wage terms denote the skill premia associated with employment in skilled or semiskilled occupations. The approach is based on the assumption that changes in wage shares that cannot be explained by either the skill premium or by changes in the capital labour ratio are due to SBTC. In Equation 5.6 β_0 is considered to be a measure of the cross-industry bias in technological change, while $\beta_0+\varepsilon_i$ represents the industry-specific bias. β_1 and β_2 (α_1 and α_2) can take any value below or above one. Any value above one indicates that the elasticity of substitution between skilled and semiskilled and skilled and unskilled workers is elastic and any value below one indicates the elasticity of substitutions is inelastic. Similarly, in Equation 5.7, changes in the wage share of semiskilled workers depend on the elasticity of substitution between semiskilled workers and skilled workers and semiskilled workers and unskilled workers captured by α_1 and α_2 respectively and α_0 and $\alpha_0 + \varepsilon_i$ measure average and industry-specific SBTC.

In the second stage of the analysis we use the estimates of SBTC from Equation 5.6 (5.7) to see if SBTC is correlated with the skilled (semiskilled) intensity of each industry, $(S/U)_i$ and $(SS/U)_i$ for skilled and semiskilled workers respectively. Although we expect from the earlier discussion that Malaysian manufacturing will shift towards semiskilled workers, here we intend to estimate and measure the sector bias of SBTC to confirm these results and because this is a central tenet of our empirical investigation. Furthermore this estimation considers SBTC that arises from changes in the patterns of trade as described in Chapter 3. Recalling the HOS model, SBTC is induced by the trade and the bias of SBTC depends on the ratio of skilled to unskilled (semiskilled to unskilled) labour. As stated in standard trade theory an increase in the price of a product raises the return to factors used relatively intensively in the production of that good and lowers the return to factors used relatively sparsely. Here we use three types of labour, skilled (*S*) and unskilled (*U*) (S/U) and semiskilled (*SS*) and unskilled (*U*) (SS/U) and the price ratios for these factors are W_S / W_U or W_{SS} / W_U respectively.

Equation 5.8 (5.9) also follows Lawrence and Slaughter (1993), who measure the sector bias of product price changes by regressing sector price changes on $(S/U)_i$. A positive coefficient on β_{bias} indicates that SBTC had contributed to the rise in the skill premium. Hence we are able to measure the sector bias of SBTC by estimating the following equation in the two stage estimation.

$$SBTC_i = \sigma + \beta_{bias}\left(\frac{S}{U}\right)_i + \upsilon_i \qquad \text{(Equation 5.8)}$$

$$SBTC_i = \sigma + \alpha_{bias}\left(\frac{SS}{U}\right)_i + \upsilon_i \qquad \text{(Equation 5.9)}$$

where, $SBTC_i$ is a $(i \times 1)$ vector of SBTC and υ_k is an error term. The coefficient β_{bias} (α_{bias}) is the estimate of sector bias of SBTC. The positive coefficient β_{bias} (α_{bias}) indicates SBTC was concentrated in skill-intensive (semiskilled) industries, negative coefficients indicates that SBTC favours the employment of less skilled workers.

Equations 5.6 (5.7) and 5.8 (5.9) are estimated using ordinary least squares over the whole period (1985-1999) and for three sub-periods: from 1985 through to 1990, from 1990-1994 and from 1994 through to 1999. We start from 1985 and not from 1983, due to limitations in the data on capital and value added for 1983 and 1984. Data for capital and value added are both obtained from various DOS official publications.[19]. Capital includes all fixed assets (purchases of new and used capital, for example) building and other construction, machinery and equipment, furniture and fittings, land, ships, lorries, buses, passengers cars, taxis and computers. On the other hand, the data for value added are obtained from the difference between the gross values of output and the cost of input for each industry[20].

Table 5.11 reports the results of estimates of Equation 5.6. Consider column 1, it shows that changes in capital output ratio are not significant in explaining changes in the share of skilled workers wage bill. During the whole period, 79 percent of the change in the share of skilled workers in the wage bill is explained by the wage variables and the capital-output ratio.

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[19] Malaysia, Annual Survey of Manufacturing Industries.
[20] These data are available at Annual Survey of Manufacturing Industries.

Table 5.11: Changes in the Share of Skilled Workers in the Wage Bill, 1985-1990, 1990-1994 and 1994-1999

	1985-1999 (1)	1985-1990 (2)	1990-1995 (3)	1995-1999 (4)
$d\ln(W_{Si}/W_{SSi})$	0.093*	0.120*	0.124*	0.036
	(3.75)	(2.87)	(2.47)	(1.47)
$d\ln(W_{Si}/W_{Ui})$	0.088*	0.101*	0.789*	0.0926*
	(39.07)	(27.19)	(23.76)	(23.56)
$d\ln(K/Y)$	0.0068	-0.010	0.010	-0.146
	(1.38)	(-0.83)	(1.66)	(-1.64)
Constant	0.0022	-0.005	0.002	-0.011
	(0.38)	(-0.50)	(0.20)	(-1.59)
Number of observation	406	146	174	145
R^2	0.798	0.846	0.776	0.823
F test	531.8	260.9	196.5	218.9
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance				
chi2(1)	0.09	0.07	0.96	0.03
Prob > chi2	0.7706	0.7862	0.3274	0.8659

Note: Each sub-period reports the first stage regression of Equation 5.6 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. T-Statistics are reported in parentheses.and an asterisk indicates significant at 0.05 level or better. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

At the second stage of estimation, we estimate Equation 5.8 and the results are presented in Table 5.12. This equation is estimated using ordinary least squares and allows us to see if SBTC is related to the proportion of skilled workers across industries and to see if there is sector bias. The results show that skill biased technological change did not contribute to wage trends in Malaysian manufacturing. Nor is there evidence that skill biased technological change exhibited any sector-bias. This result is consistent with the decomposition results reported in Sections 5.3 and 5.4 which primarily showed that technology changes resulted in a decrease in the relative demand for skilled workers.

Table 5.12: Sector bias of SBTC

	1985-1999 (1)	1985-1990 (2)	1990-1995 (3)	1995-1999 (4)
S/U	-0.011	-0.003	-0.0062	-0.002
	(-1.00)	(-0.78)	(-0.44)	(-0.35)
Constant	0.008	-0.004	0.034	0.122
	(0.44)	(-0.27)	(0.16)	(7.75)
Number of Observations	406	146	174	145
R^2	0.011	0.012	0.042	0.051
F test	7.1	6.4	17.9	18.2
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance				
chi2(1)	0.27	0.26	2.06	0.03
Prob > chi2	0.6005	0.6091	0.1509	0.8689

Note: Each sub-period reports the second stage regression of Equation 5.8 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. T-Statistics are reported in parentheses. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

Following from the results of the decomposition section, which indicated that relative demand shifted towards semiskilled workers, we now examine the effect of technology changes on the demand for semiskilled workers in the same way as we have done for skilled workers. As clearly shown in Table 5.13, the elasticity of substitution between semiskilled and skilled workers is less inelastic throughout the whole period and the three sub-periods compared to the elasticity of substitution between semiskilled workers and unskilled workers. In this case, industries preferred to substitute semiskilled workers for unskilled workers when the relative wage premia changed. As shown in Table 5.13, the capital-output ratio explains of the changes in the share of semiskilled workers except in the period 1995-1999.

Table 5.13: Changes in the Share of the Semiskilled Worker in terms of Wage Bills, 1985-1990, 1990-1994 and 1994-1999

	1985-1999	1985-1990	1990-1995	1995-1999
$d\ln(W_{SSi}/W_{Si})$	0.0014	0.00016	-0.0004	0.0017
	(0.19)	(0.22)	(-0.70)	(0.49)
$d\ln(W_{SSi}/W_{Ui})$	0.0375*	0.0373*	0.0376*	0.0432*
	(24.34)	(14.77)	(17.50)	(12.68)
$d\ln(K/Y)$	0.0039	0.0020	0.0091	0.0067
	(2.18)	(2.25)	(2.30)	(0.72)
Constant	0.0087*	0.0078	0.0142*	0.0083
	(2.09)	(1.09)	(2.23)	(1.31)
Number of Observations	406	146	174	145
R^2	0.6155	0.6080	0.6310	0.6860
F test	199.0	73.5	103.3	62.7
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance	0.01	0.05	0.41	1.68
chi2(1)	0.9330	0.8172	0.5234	0.1955
Prob > chi2				

Note: Each sub-period reports the first stage regression of Equation 5.7 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. T-Statistics are reported in parentheses. An asterisk indicate level of significant at 0.05 levels. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

In Table 5.14 we present the results of estimating Equation 5.9. Clearly as presented in Table 5.14, SBTC was concentrated in those industries employing more semiskilled workers during the whole period and in the three sub periods. This result confirms our earlier analysis that skill biased technological change in Malaysian Manufacturing during the period 1985-1999 favoured the employment of semiskilled workers.

Table 5.14 Sector bias for semiskilled workers

	1985-1999	1985-1990	1990-1995	1995-1999
SS/U	0.138**	0.043**	0.054**	0.041**
	(4.67)	(3.07)	(3.46)	(3.25)
Constant	-0.240**	-0.208**	-0.310**	0.300**
	(-2.97)	(-1.81)	(-2.15)	(-2.29)
Number of Observations	406	146	174	145
R^2	0.054	0.061	0.065	0.084
F test	21.8	9.4	11.9	10.5
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance				
chi2(1)	0.11	0.07	0.32	0.19
Prob > chi2	0.7447	0.7877	0.5737	0.6623

Note: Each sub-period reports the second stage regression of Equation 5.9 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. T-Statistics are reported in parentheses. An asterisk indicate level of significance at 0.05 level. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

Following Haskel and Slaughter (2002) and Berman *et al.* (1994), we can test the robustness of our results by considering different measures of SBTC to those derived from Equation 5.6 and 5.7. In the first place we exclude the wage rate variables from these equations on the grounds that these variables could be capturing unmeasured differences in the skill mix of industries. The results of this exercise are shown in Table 5.15 (for skilled workers) and 5.16 for (semiskilled workers).

In this case, the constant β_0 in Equation 5.6 and α_0 in Equation 5.7 measure average SBTC across all industries, and sector specific SBTC is measured as ε_k. Table 5.15 shows that, without the wage variables, the coefficient of $d\ln(K/Y)$ is significantly negative for the whole period and for 1995-1999 period (it is not significant in the periods 1985-1990 and 1990-1995).

Table 5.15: Robustness Test: Changes in the Share of Skilled Workers in Wage Bills 1985-1990, 1990-1994 and 1994-1999

	1985-1999	1985-1990	1990-1995	1995-1999
$d\ln(K/Y)$	-0.8218	-0.0052	-0.0078	-0.8138
	(-2.00)	(-0.307)	(-0.61)	(-4.06)
Constant	0.1167	0.0147	0.020	-0.0038
	(0.88)	(0.54)	(1.02)	(-0.25)
Number of Observations	406	146	174	145
R^2	0.009	0.010	0.012	0.121
F test	4.0	5.10	6.7	19.8
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance				
chi2(1)	0.10	0.33	1.32	0.48
Prob > chi2	0.7479	0.5680	0.2500	0.4885

Note: Each sub-period reports the first stage regression of Equation 5.6 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. We exclude the wage rate variables from these equations on the grounds that these variables could be capturing unmeasured differences in the skill mix of industries. T-Statistics are reported in parentheses. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

The same robustness test is undertaken for semiskilled workers, excluding wage variables from Equation 5.7, and the results are presented in Table 5.16. Firstly, we will look at the cross-industry average rate represented by α_0. The results also indicate that the cross-industry average rate significantly explains the share of semiskilled workers except for the sub period 1995-1999. The capital output variables are only significant for the sub period 1985-1990.

Table 5.16: Robustness Test: Changes in the Share of the Semiskilled Workers in Wage Bills 1985-1990, 1990-1994 and 1994-1999

	1985-1999	1985-1990	1990-1995	1995-1999
$d\ln(K/Y)$	0.0377*	0.0012*	0.0022*	0.0363*
	(2.57)	(0.10)	(2.03)	(3.54)
Constant	0.0107*	0.0140*	0.270*	0.0513
	(2.68)	(2.30)	(2.24)	(0.55)
Number of Observations	406	146	174	145
R^2	0.006	0.009	0.010	0.080
F test	2.4	2.1	5.1	12.5
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity Ho: Constant variance				
chi2(1)	0.03	1.04	0.28	0.16
Prob > chi2	0.8607	0.3078	0.5979	0.6936

Note: Each sub-period reports the first stage regression of Equation 5.7 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. We exclude the wage rate variables from these equations on the grounds that these variables could be capturing unmeasured differences in the skill mix of industries. T-Statistics are reported in parentheses. An asterisk indicate level of significance at 0.05 level. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

Based on these models, estimates of SBTC are again regressed on the share of skilled to unskilled labour to obtain estimates of β_{bias} and the share of semiskilled to unskilled labour to obtain estimates of α_{bias}. As shown in Table 5.17, SBTC for skilled workers is not significant for any of the periods considered. There is therefore no evidence of sector specific SBTC in Malaysian Manufacturing. However, as shown in Table 5.18, sector specific SBTC has contributed to a rise in the wages of semiskilled workers and we can conclude that the impact of technological change is concentrated in industries with more semiskilled workers.

Table 5.17 Sector bias of skilled workers

	1985-1999	1985-1990	1990-1995	1995-1999
SBTC	-0.046	-0.213	-0.010	-0.0084
	(-0.45)	(-0.72)	(-0.37)	(-1.00)
Constant	0.005	-0.022	0.010	0.012
	(0.30)	(-0.55)	(0.30)	(0.62)
Number of observations	406	146	174	145
R^2	0.000	0.003	0.000	0.007
F test	0.2	0.5	0.1	1.0
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance				
chi2(1)	2.64	0.03	0.60	0.08
Prob > chi2	0.1043	0.8619	0.4376	0.7835

Note: Each sub-period reports the second stage regression of Equation 5.8 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. We exclude the wage rate variables from these equations on the grounds that these variables could be capturing unmeasured differences in the skill mix of industries. T-Statistics are reported in parentheses. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

Table 5.18 Sector bias of semiskilled workers

	1985-1999	1985-1990	1990-1995	1995-1999
SBTC	0.129*	0.0420	0.055*	0.022*
	(2.10)	(1.83)	(2.04)	(3.13)
Constant	-0.023	-0.027	-0.045	-0.020
	(1.82)	(-1.49)	(-1.85)	(-1.02)
Number of Observations	406	146	174	145
R^2	0.010	0.022	0.023	0.018
F test	4.3	3.3	4.1	5.2
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance				
chi2(1)	1.62	0.18	0.54	0.09
Prob > chi2	0.2033	0.6689	0.4625	0.7603

Note: Each sub-period reports the second stage regression of Equation 5.9 using Ordinary Least Square (OLS) estimation method. Each column includes 406, 146, 174 and 145 number of observations of industries respectively. We exclude the wage rate variables from these equations on the grounds that these variables could be capturing unmeasured differences in the skill mix of industries. T-Statistics are reported in parentheses. An asterisk indicate level of significance at 0.05 level. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

5.5.2 Analysis of Skill Biased Technological Change Using The More General Wage Share Model.

In the previous analysis we estimated the impact of technological change on the demand for different skill levels using an indirect approach in which the bias of technology was captured through the constant and error terms. The problem with such an approach is that different model specifications and functional forms can give rise to different intercept terms and estimated residuals. In this section therefore we adopt a rather different approach in which technology is included in the wage share model and so technology bias can be measured directly.

A slightly different approach also proposed by Haskel and Slaughter (2001), in which a measure of technology designed to capture SBTC is included directly in Equation 5.6 (5.7). Following Machin (2001), Berman *et al.* (1994) and Machin and Van Reenan (1998) the extended estimation equation can be written as;

$$\Delta\left(\frac{WB_{Si}}{WB}\right) = \beta_0 + \beta_1 \Delta\ln(W_{Si}/W_{SSi}) + \beta_2 \Delta\ln(W_{Si}/W_{Ui}) + \beta_3 \Delta\ln(K_t/Y_t) + \beta_4 TFP_t + \varepsilon_t, \quad \text{(Equation 5.10)}$$

And for semiskilled workers the cost share equation is:

$$\Delta\left(\frac{WB_{SSi}}{WB}\right) = \alpha_0 + \alpha_1 \Delta\ln(W_{SSi}/W_{Si}) + \alpha_2 \Delta\ln(W_{SSi}/W_{Ui}) + \alpha_3 \Delta\ln(K_t/Y_t) + \alpha_4 TFP_t + \varepsilon_t, \quad \text{(Equation 5.11)}$$

Equations 5.10 and 5.11 above represent the change in the shares of the total wage bill of skilled and semiskilled workers respectively. Referring to Equation 5.10 [5.11], $\Delta\left(\frac{WB_{Si}}{WB}\right)\left[\Delta\left(\frac{WB_{SSi}}{WB}\right)\right]$ is the level of change in the skilled (semiskilled) workers' share of the total wage bill, W_{Si} denotes the share of skilled workers' wages in industry i. W_{Ui} and W_{SSi} are constructed analogously for unskilled and semiskilled workers respectively. K represents capital, Y is real value added output, TFP_i is the technology indicator and ε_i is an additive error term.

Due to limitations of data and the fact that computer usage variables were not available in a Malaysian Manufacturing time series data set, this study used Total Factor Productivity (TFP) to measure technology which Haskel and Slaughter (1999) and Machin (2001) also used in their empirical work. Data on total factor productivity (TFP) was calculated from output, value added and capital data using Data Envelopment Analysis DEA. DEA is a nonparametric method that has been used in the operations management literature (see Charnes, 1978) and which has been previously used in a Malaysian context by Mahadevan (2002). DEA has the advantage that it can handle multiple inputs and outputs, is flexible in terms of determining weights and makes few assumptions regarding production technology.

Tables 5.19 and 5.20 present the sets of estimates of Equations 5.10 and 5.11 respectively with $\beta_0\,(\alpha_0)$ measuring the cross sector average of SBTC and $(\beta_0+\varepsilon_i)[(\alpha_0+\varepsilon_i)]$ measuring SBTC in industry i. Coefficients $\beta_1,\beta_2(\alpha_1,\alpha_2)$ will be positive or negative depending on the elasticity of substitution between skilled workers and unskilled and skilled and semiskilled workers (semiskilled and skilled workers, semiskilled and unskilled workers). $\beta_1,\beta_2(\alpha_1,\alpha_2)>0$ indicates that capital skill complementary. Since we add the variable TFP in this equation, the main focus of this estimation is the coefficient $\beta_4\,(\alpha_4)$. According to Machin and Van Reenan (1998), Berman *et al.* (1994) and Machin (2001) a positive value of coefficient $\beta_4(\alpha_4)$ indicates that skill biased technological change lies behind the demand shifts favouring relatively skilled workers. We present the results for skilled workers in Table 5.19 and for semiskilled workers in Table 5.20

Table 5.19: Changes in the Skilled Workers' Share in the Wage Bill, 1985-1999

		Coefficient
Constant	β_0	0.023 (0.30)
$d\ln(W_S / W_{SS})$	β_1	0.0883* (37.57)
$d\ln(W_S / W_U)$	β_2	0.0881* (3.39)
$d\ln(K/Y)$	β_3	0.0090 (1.69)
TFP	β_4	-0.0025 (-0.87)
R^2		0.796
F test		363.9
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance		
chi2(1)		0.06
Prob > chi2		0.8144

Sources: Manufacturing data, DOS 1985-1999, the calculation begins with 1985 because there is no complete data on capital in 1983 and 1984. T-Statistics are reported in parentheses. An asterisk indicate level of significance at 0.05 level. The dependent variable is changed in skilled workers' share of the total wage bill. The table describes wage changes common to all sectors and SBTC is measured by $\beta_0 + \varepsilon_i$. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, the regression result shows s that the error terms is homoscedastic.

As shown by the coefficient β_4, there is no relationship between the impact of technological changes and the demand for skilled workers in Malaysian manufacturing during the period 1985-1999. This result is consistent with the results from the previous section and we conclude that the technological change is not skill biased technological change. It is worth noting that the estimations without the wage variables indicate a weak correlation between the dependent variable 'changes in skilled wage bill and the independent variables: the ratio of capital and value added and *TFP*.

Regression for Semiskilled Workers

Table 5.20 presents the estimates of Equation 5.11. The aim of this regression analysis is to estimate the coefficient α_4 and to determine whether SBTC has occurred. As shown in Table 5.20, the coefficient α_4 shows a positive value, this result indicates that increasing technological change has increased the change in the share of semiskilled workers in Malaysian manufacturing during the period of study.

Table 5.20: Changes in the Semiskilled Workers' Share in the Wage Bill, 1985-1999

Equation		Coefficient
Constant	α_0	0.007
		(1.47)
$d\ln(W_{SS}/W_S)$	α_1	0.368*
		(23.23)
$d\ln(W_{SS}/W_U)$	α_2	0.0006
		(0.22)
$d\ln(K/Y)$	α_3	0.0533*
		(2.48)
TFP	α_4	0.0076*
		(3.34)
R^2		0.612
F test		135.3
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance		
chi2(1)		0.17
Prob > chi2		0.6792

Sources: Manufacturing data, DOS 1985-1999, the calculation begins with 1985 because there is no complete data on capital in 1983 and 1984. T-Statistics are reported in parentheses. An asterisk indicate level of significance at 0.05 level. The dependent variable is changed in Semiskilled workers' share of the total wage bill. The table describes wage changes common to all sectors and SBTC is measured by $(\alpha_0 + \varepsilon_i)$. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, the regression result shows s that the error terms is homoscedastic

5.6 Measuring the Relative Labour Demand or Wage Inequality under the Mandated Wage Methodology

Sections 5.3, 5.4 and 5.5 analysed the effects of trade and technological change using the decomposition and cost function approaches. In this section, we are interested in assessing the effects of technology and trade on the changes in the wage bill for skilled, semi-skilled and unskilled workers in Malaysia using what has been called the mandated wage methodology. The basis of this approach is that it considers the changes in wages that are consistent with the long run relationship between product and factor prices that follow from the Samuelson-Stolper theory. The basic proposition that underlies the approach is that product price changes will be proportional to changes in factor prices so that skill premiums will increase if price increases are higher in skill-intensive industries. As a result, Slaughter labels the mandated wage model as testing the correlation version of the Stolper Samuelson theorem since, 'For any vector of goods price change, the accompanying vector of factor price change will be positively correlated with the factor intensity-weighted averages of the goods price changes'(Slaughter, 2000).

The underlying theory of this approach was explained in Chapter 3 and empirical literature presented in Chapter 4. Following that discussion, to measure the effects of technological change on relative wages, we again use total factor productivity (TFP). Using three factors, skilled, semiskilled and unskilled labour, the estimating equation for technology is as follows:

$$\Delta \log TFP_{it} = \beta_0 + \beta_1 W_{Sit} + \beta_2 W_{SSit} + \beta_3 W_{Uit} + \varepsilon_{it} \qquad \text{(Equation 5.12)}$$

Where the $\Delta \log TFP_{it}$ is the growth in total factor productivity for sector i at time t; $W_{Sit}, W_{SSit}, W_{Uit}$ are the shares of factors (skilled workers, semiskilled, unskilled) in total cost in sector i at time. Coefficients β_1, β_2 and β_3 are parameters to be estimated. ε_{it} is an additive error term. A positive β_1, β_2 or β_3 indicates that the technical change is larger in a particular sector and the particular factors. Hence, we interpret each of $\beta_1, \beta_2, \beta_3$ to represent the wage changes 'mandated' as explained in Chapter 3 to restore the zero profit condition in all sectors in response to the sector bias of technical change.

As for trade, we estimate a similar factor with price, as described below.

$$\Delta \log p_{it} = \gamma_1 W_{Sit} + \gamma_2 W_{SSit} + \gamma_3 W_{Uit} + \varepsilon_{it} \qquad \text{(Equation 5.13)}$$

Where ε_{it} is an additive error term, $\gamma_{1.}, \gamma_2$ and γ_3 are the parameters to be estimated for skilled, semiskilled and unskilled workers respectively. These parameters imply that zero profit condition restores changes in factors of wages for skilled, semiskilled, and unskilled workers 'mandated' by the sector bias of price changes. Finally, we combine the parameters β_1, β_2 and β_3 and γ_1, γ_2 and γ_3 from Equations 5.12 and 5.13 to calculate the net wage changes 'mandated' by technology and trade.

5.6.1 Mandated Wage Regression

The results of estimating Equations 5.12 and 5.13 are presented in Table 5.21, for Malaysian manufacturing during the period 1985-1999. From column 1 of Table 5.21, it can be seen that the dependent variable of this equation is TFP, which refers to technological change. The coefficient on W_{Si} is -0.45 and shows that the industry bias of growth *TFP* mandated a fall in the skilled wage of 45 percent to maintain *zero profits* in all sectors. However it is not statistically significant. Similarly, the mandated change in the unskilled wage showed a fall of 49 percent. The mandated change in the semiskilled wage was an increase of 63 percent. These results indicate that the effects of changes in wages of semiskilled workers were important to changes in technological change. This result is consistent with the findings reported in Sections 5.3 and 5.4, which indicate that the demand for workers favours semiskilled workers and shifts away from skilled and unskilled workers.

Table 5.21: One Stage Mandated Wage Regression: Estimates of Equation (5.12) and (5.13)

	$\Delta \log TFP_{it}$ (1)	$\Delta \log P_{it}$ (2)
W_{Si}	-0.4550	0.00120*
	(-0.30)	(3.86)
W_{SSi}	0.632*	0.00288*
	(2.31)	(7.66)
W_{Ui}	-0.4910	-0.0012
	(-0.21)	(-0.07)
R^2	0.029	0.585
F test	3.05	13.76
Number of Observation	406	435
Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity Ho: Constant variance		
chi2(1)	0.93	1.89
Prob > chi2	0.3336	0.1697

Note: The number of observation is different, as TFP data was not available in 1999. This is because TFP is calculated as differences between 2 years, and the lack of available data in 1998 means that we cannot calculate the TFP in 1999. T-Statistics are reported in parentheses. An asterisk indicate level of significance at 0.05 level. To identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, the regression result shows s that the error terms is homoscedastic.

Turning to the price regression presented in Column 2 of Table 5.21, the column indicates that the mandated changes in the skilled and semiskilled wage showed increases of 0.0012 and 0.0028 respectively. On the other hand, the mandated change in the unskilled wage saw no relationship to maintain zero profit in all sectors. Although the increases in trade have augmented skilled and semiskilled wages, these effects are too small to influence the change in relative wages or demand for skilled workers compared to the impact form technological change. This the results of the estimation, however, show that the direction of the trade and the demand for labour increased as the demand for skilled and semiskilled workers increased.

In conclusion, the results presented in Table 5.21 are consistent with the results in Sections 5.3 and 5.4, in which we found that, between the two effects, technology is the dominant effect in explaining the changes in relative wage, especially for semiskilled workers. We also found that the effect of trade has a positive relationship with the demand for skilled and semiskilled workers, but the effect is small and not strongly influential on the changes in relative wages and demand. The demand for unskilled workers consistently reduced with increases in trade and technology. The findings of mandated unskilled wages are consistent with the studies of Haskel and Slaughter (1999).

5.7 Conclusions

This chapter has presented empirical analysis of relative labour demand and wages in Malaysia during the period 1983-1999 using aggregate data. A series of analyses presented in this chapter is based on the two main hypotheses; that changes in the pattern of trade and changes in technology have led to structural changes in the labour market. We are especially interested in establishing which of these factors is more important in explaining changes in the relative demand for labour. Generally, the results suggest that the relative demand for workers in Malaysian manufacturing during the period 1983-1999 shifted away from skilled and unskilled workers in favour of semiskilled workers. Technological changes are the most influential factor in these changes.

The first part of the analysis used employment and wage bill data in separate decomposition analysis. These analyses looked at the effects of trade, represented by between-industry effects, and technological change measured by within-industry effects on the relative demand for labour. Both decompositions led to the same results in terms of overall changes. These analyses provide a general picture of relative demand for skill groups by industry. Interestingly, we have three main findings from these decompositions. Firstly, comparing trade and technological change, the impact of technological change is dominant in explaining changes in the relative demand for labour in the Malaysian labour market. Secondly, the impact of technological change favours semiskilled workers rather than skilled and unskilled workers.

In the third stage, we considered both employment and wage premium data using the decomposition methodology. As in the previous decompositions, again we consider the effects of trade (the between-industry effects) and technological change (the within-industry effects) on the relative demand for labour but this time distinguishing the wage premium and employment data in the same analysis. In the context of wage premiums, the changes may be due to either an individual industry having, on average, higher paid skilled workers (within effects) or to the fact that average wages have grown more rapidly in industries generally, across all skill groups, paying relatively higher wages (between effects). In terms of the employment component, the skilled employment share arises from two separate factors: either an individual industry has, on average, become more or less skill-intensive (the within-industry effect) or employment has shifted towards industries that are relatively intensive in terms of skilled workers (the between-industry effect).

Here we address three important findings of this decomposition analysis. Firstly, we found that, consistent with the previous decomposition, relative demand favours semiskilled workers and technology is the dominant factor contributing to the changes in relative demand for all groups. Secondly, we found that the movement in the employment component is more important in explaining relative demand than the movement in the wage premium component. We suggest that this result is due to changes in the supply of workers and the fact that bargaining power is not strong in the

Malaysian labour market. Shortages in the supply of skilled and semiskilled workers lead the government to encourage foreign workers into the country. As a result, the employment factor is more important, because normally workers will accept a job without bargaining over wages. Foreign workers also led to a lowering of bargaining power, because they are not involved in trade unions for two reasons: first, they are restricted by their employers; second, a significant number of illegal migrants entered the country who work in the informal sector. The third major finding was that electrical machinery contributed the most towards increased changes in the relative demand for all three skills groups. This result is consistent with the structure changes in the Malaysian economy, as documented in Chapter 2. These changes indicate that many of the exports and imports in Malaysian manufacturing are in electrical and machinery goods.

In stage four, we used the cost function approach to measure the effects of technological change on relative wages and to estimate the sector bias of skill biased technological change (SBTC) for two groups of workers: skilled and semiskilled workers. Consistent with the decomposition results, we found that SBTC favoured semiskilled workers and decreased the share of skilled workers. We then added the *TFP* variable as a direct measure of technological change in the relative demand for labour and we found a similar result: technological change significantly explains the changes in the employment of semiskilled workers but that it does not explain changes in what has happened to skilled workers in Malaysia.

As we were interested in testing the effects of trade and technological change in the cost function approach, the last analysis in this chapter dealt with the so-called mandated wage methodology. In this section, changes in trade and technology are mandated responses to the wages of the different skill groups. As with previous analyses, we found that the effects of technological change favoured semiskilled, rather than skilled and unskilled, workers. Trade, on the other hand, had a small effect in explaining the increase in relative wages for both skilled and semiskilled workers. No evidence was found that it had any effect on the changes in the wages of unskilled workers. Again, in a comparison between the two effects, we find that the effect of technological change dominated the effect of trade in explaining the relative demand for labour during the sample period. These results support the findings from developed countries (Machin, 2002; Berman *et al.*, 1998) and some studies from developing countries (Manasse *et al.*, 2004) which are that the effects of technological change are more important than the effects of trade. In addition, Berman and Machin (2000) also found that skilled biased technological change was negative in the Malaysian labour market of the 1980s, which means that technological change moved away from skilled workers in Malaysia during this period.

The analysis presented in this chapter has used aggregate data to assess the way the labour market, and wage inequality, changed at a time when the Malaysian economy was in transition from being agriculture based to one with a significant manufacturing sector. The data have highlighted how the composition of the skill structure changed over time and the implications of this change for the process of economic development. However, the nature of the data employed has limited the types of analysis that can be undertaken, for example, it is limited in terms of gender and levels of education, and in terms of the methodologies that can be used.

In Chapters 6 and 7, we build upon the work presented in this chapter using household survey data. The Malaysian Government has conducted regular surveys of household incomes which contain a rich array of information on household members. Indeed, Chung (2003) and Milanovic (2006) argue that the income data contained in the surveys are the most comprehensive measures of individual earnings available for Malaysia. These surveys therefore provide a suitable basis to further investigate changes in income inequality and labour demand, and the reasons for these changes.

CHAPTER 6
HOUSEHOLD INCOME SURVEY

6.1 Introduction

In the previous chapter we discussed the changes in relative demand for different skill groups in the manufacturing sector in Malaysia between 1983 and 1999 using aggregate data. This was done using both the decomposition and cost function approaches. However, to provide a more detailed analysis of changing wage inequality we now turn to consider the changes that have taken place in the Malaysian labour market using micro data. This has two significant advantages. First, we are able to adopt a variety of empirical methodologies to provide a thorough test of the hypotheses we are considering. Second, the detailed data we have available in the various household income surveys provide a rich source of data on wage inequality which we are able to link with data from other sources on technology and trade.

The detailed analysis is provided in Chapter 7. In this chapter, we present a descriptive analysis of the data to be used in the micro-analysis of wage inequality in Malaysia. This micro-analysis uses the Household Income Survey (HIS) for the years 1984, 1989, 1992, 1995 and 1997. The HIS is a household-based survey that provides data on earnings and various labour market and individual characteristics and thus enables a detailed analysis of the changing nature of wage inequality over time. The HIS are data normally available at two levels, the household and the individual, though in this study the focus is on the individual data.

The following section, 6.2, focuses on the total sample covered by the HIS survey. Section 6.3 then considers the changing pattern of employment in Malaysia, with particular attention to changes in the levels of education and training of the workforce. Section 6.4

reports an analysis of the wage structure, with a focus on how changes in the level of pay and in inequality are linked to changes in education and training amongst Malaysian workers. Finally, section 6.5 concludes the discussion.

6.2 The Household Income Survey

The data collected from the HIS have been used primarily for the preparation of the various Malaysia Development Plans which influence public policy. The Department of Statistics Malaysia (DOS) is responsible for the survey design, data collection and the processing activities for the surveys. The surveys were first carried out in 1974 and the most recent was for 2002. The survey covers both urban and rural areas of Malaysia. A two-stage stratified sample design has been adopted for the HIS. The first sampling stage is the definition of what we call Enumeration Blocks, which are geographical areas artificially created to have about 80-120 living quarters, each with a population of about 60. In the second stage, living quarters are selected from each of the sampled Enumeration Blocks. The concept of a household is based on arrangements made by persons residing within the same living quarters, individually or in groups, for food and other essentials. Thus, a household may consist of related and unrelated members.

The present research uses the HIS for the years 1984, 1989, 1982, 1995 and 1997, from which information on employment, wages, age, activity, location, status of employment, 3-digit occupation and 5-digit industry data are obtained. The number of individuals surveyed in each year is shown in Table 6.1. We use the HIS starting in year 1984 and ending in 1997 for a number of reasons. The first is because we want to standardize the time period used in the micro analysis with that based on the aggregate data as presented in chapter 5. The focus of the thesis involves looking at changes in labour demand through the 1980s and 1990s. We do not cover the 1970s for two reasons. The first is because secondary information suggests that there was no significant technological change or change in the composition of trade during the 1970s. The second is because variable definitions and measurement in the 1970s data are different from that for later years.

In addition, we do not use the 2002 data, again because the definitions and measurement have been revised and cannot be compared with the previous data. We are also not using the 1999 HIS survey because the survey in 1999 was restricted and just involved 40,000 households.

Table 6.1: Number of people surveyed by gender 1984-1997

	Male	Female	Total
1984	126065	126794	252859
	(49.86)	(50.14)	(100)
1989	138859	140133	278992
	(49.77)	(50.23)	(100)
1992	133235	132739	265974
	(50.09)	(49.91)	(100)
1995	90646	89480	180126
	(50.32)	(49.68)	(100)
1997	86350	85442	171792
	(50.26)	(49.74)	(100)

Source: HIS DOS 1984-1997

The data in Table 6.1 indicate that there has been a fall in the sample size since 1989. As can be seen, the number of people surveyed fell from 252,859 in 1984 to 171,792 in 1997. The decrease in the number of people surveyed primarily reflects a governmental decision that statistical accuracy could be maintained with a smaller, and thus less costly, survey. Thus, reducing or increasing the sample size by 10 percent has little or no impact on the validity of the data. The decision by the DOS to reduce the sample size, however, is also motivated by the need to control costs. Although the sample size has fallen over time, changes in the percentage of male and female respondents are fairly constant. The percentage of males in the sample increased to 50.26 percent in 1997 compared to 49.86 percent in 1984, while the percentage of females fell from 50.14 percent to 49.74 percent for the same period.

Turning to the information collected on economic activity, seven categories of economic activity are measured in the HIS: whether someone is self-employed or an employer, an employee, student, housewife, unpaid family worker, children with no schooling and others (babies, the unemployed and pensioners). Although this research focuses on economic activities and on employees within these groups, the other categories warrant brief consideration to provide an overall picture of the Malaysian economy. The categories 'self-employed' and 'employer/owner' refer to those who own an establishment or businesses. Employees are all those people who receive payment for full-time or part-time work. All employees are further categorized into the following occupational groups: managerial and professional, technical and supervisory, clerical and related occupations, general workers and production and operative workers. Unpaid family workers include all persons within a household of those classed as owners of an establishment who, during the specified period, worked a minimum of one-third of the normal working time but who did not receive payment for the work done. Such workers receive food, shelter and other support as part of the household but this would continue whether they worked or not. Other categories include retired persons, babies and people who are unemployed. This is a broad residual category and is not suitable for any sort of analysis.

Economic activity rates, presented in Table 6.2, show the proportions of males and females in each census who were self-employed/employer, employees, housewives, students, family workers, children with no schooling and others (more detailed breakdowns of Tables 6.2 through 6.8 are presented in the Appendix). The 'others' category includes unemployed people whose ages fall within the working age range, as they cannot be separated in the data. Overall, Table 6.2 shows that males constitute by far the largest group in self-employment/ employer and employee activities. Throughout the period, employees have accounted for about one third of all female economic activity, whereas this category represents about 67 percent of male economic activity.

Interestingly, whilst males in the 'employee' category remained fairly constant, accounting for about 67 percent[21] of all male activity, the proportion of women categorized as employees increased between 1984-1997. Not unexpectedly, the proportion of women of

[21] See Appendix A6.2

working age who were classified as housewives is high, and was in excess of 30 percent in every year. However, there has been a definite decline over time, mirroring the growth of females in employment. Although women make up the majority of family workers, there is a definite downward trend in the incidence of family working amongst both males and females.

Considering the distribution of economic activity in the Malaysian labour market, in 1984, 25 percent of the population were employees, 24 percent were students and 18 percent were children with no schooling. Housewives made up 16 percent of the population, with the self-employed and employers accounting for 7.9 percent. Family workers (at 3.4 percent) and others (at 4.6 percent) made up the remainder. These numbers indicate that 25 percent of economic activity is in the group of employees, while 58 percent are engaged in non-productive activity[22]. The overall trend of people categorized as employees, however, shows an upward trend from 1989 to 1997, with an increase to 28 percent in 1997. Interestingly, in association with the shift to a more mature economy, the employee category decreased slightly, from 25.4 percent in 1984 to 23.7 percent in 1989, due to the economic recession in 1985 and 1986. This downward trend is consistent with the trend in the 'others' group, which includes the unemployed. This group increased from 1984 to 1989 and 1992 before starting to fall in 1995 and 1997. It is also interesting to note that the proportion of family workers has been falling over time, again reflecting Malaysia's shift towards a more developed economy.

[22] Non productive activity includes Students (24%), Housewives (16%), Children with no schooling and Others (18%).

Table 6.2: Distribution of Economic Activity by Gender (1984-1997)

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Self-Employed	6.0	1.9	7.9	6.6	1.9	**8.5**	6.4	1.9	**8.3**	6.1	1.8	**8**	6.0	2.0	**8**
Employee	17.3	8.1	**25.4**	15.9	7.8	**23.7**	17.4	8.8	**26.2**	17.7	9.0	**26.7**	18.3	9.7	**28**
House Wife	0.9	15.3	**16.2**	1.1	15.3	**16.4**	0.6	14.2	**14.8**	0.7	14.8	**15.5**	0.5	14.4	**14.9**
Student	12.4	12.0	**24.4**	12.5	12.2	**24.7**	12.7	12.5	**25.2**	13.6	13.0	**26.6**	13.4	12.8	**26.2**
Family Worker	1.0	2.4	**3.4**	1.2	2.6	**3.8**	0.9	2.0	**2.9**	0.7	1.6	**2.3**	0.5	1.6	**2.1**
Children No Schooling	9.3	8.8	**18.1**	8.2	7.8	**16**	7.8	7.4	**15.2**	7.5	7.1	**14.5**	7.7	7.1	**14.8**
Others	2.9	1.7	**4.6**	4.3	2.6	**6.9**	4.3	3.0	**7.3**	4.0	2.4	**6.4**	3.9	2.2	**6.1**

Note: Figures calculated from HIS 1984-1997 in percentage points.

For comparative purposes, the economic activity rates of working age groups 15-64 are presented in Table 6.3. The participation of men in the labour force has been always high and remained steady at around 60 percent in the employee category and 75 percent in the self-employed category. The work rate for women was also stable in all categories of economic activity. Considering the pattern of women's activities, the participation of women in the 'housewife' category is considerably high, with almost 45 percent of women being classified as housewives over the 13 years. However, more than half of the males surveyed worked as employees during the same period, with a slight increase in recent years, with three-fifths of males being employees in 1997.

Table 6.3: Distribution of Working Age Population by Economic Activity by Gender over the Period 1984 -1997

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Self-Employed	9.5	3.1	**12.7**	10.5	3.1	**13.6**	10.0	3.1	**13.1**	9.5	2.8	**12.4**	9.3	3.1	**12.4**
Employee	29.3	13.7	**43.0**	26.9	13.3	**40.2**	29.3	14.9	**44.2**	29.9	15.1	**45.0**	30.3	16.1	**46.5**
House Wife	0.9	23.7	**24.5**	1.2	23.6	**24.8**	0.6	22.2	**22.8**	0.7	22.7	**23.4**	0.4	21.5	**22.0**
Student	5.5	5.3	**10.9**	5.3	5.4	**10.7**	5.2	5.5	**10.7**	5.7	6.0	**11.7**	6.1	6.3	**12.5**
Family Workers	1.5	3.9	**5.4**	1.9	4.3	**6.2**	1.4	3.3	**4.7**	1.1	2.6	**3.7**	0.8	2.5	**3.4**

Note: Figures calculated from HIS 1984-1997 in percentage points.

6.2.1 Education Levels in Malaysia

It is generally agreed that labour force participation and work profiles are influenced by education, occupation and sector differences. Our concern here is to present the distribution of workers by different types of education. For comparative purposes, Tables 6.4 and 6.5 provide information on levels of education and qualification by gender over the period from 1984 through 1997. Education is measured in two ways, first using four education levels, which are 'no schooling', 'primary', 'secondary' and 'tertiary', and second by qualifications attained, which are divided into six categories, 'No qualifications', 'Other qualifications', 'Lower Qualification of Education (LCE)', 'Medium Qualification of Education (MCE)', 'High School Qualification (HSCE)', 'Diploma' and 'Degree'.

The level of qualification provides information that is more precise because it measures the specific qualifications of workers. Education level is more general because it measures groups of people who were at school for a certain period of time but who may not have achieved the equivalent qualification level. At the no qualification level, people with no qualifications are those with no schooling and with schooling including primary and secondary school, but who were not able to pass the LCE examination in year 9. In Malaysia, primary education is from years one to six and secondary school is from years seven to eleven. In year eleven, there is another compulsory examination: the MCE. This qualification is important for those students to go into tertiary education, enabling students either to go on to advanced level Matriculation and the HSCE or to take diploma courses and then degrees. The LCE is the basic qualification, and people with LCE are in secondary education, but those with secondary education do not necessarily have the LCE: they might have no qualifications or just the MCE. Based on this classification, people with 'no schooling' and those with primary education have no qualifications at all. Secondary education levels, however, signify groups of people with no qualifications, LCE and MCE qualifications. In the HIS survey, people are classed as having tertiary education if they hold HSCE, Diploma or Degree qualifications. Nevertheless, tertiary education does not necessarily mean those people at university level.

Table 6.4: Distribution of Gender by Education Level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
No Schooling	12.9	17.4	**30.3**	12.4	16.2	**28.6**	12.0	15.2	**27.3**	11.2	14.0	**25.2**	11.0	13.5	**24.4**
Primary	19.6	18.4	**38.0**	18.7	17.8	**36.5**	17.6	16.6	**34.2**	16.8	15.9	**32.7**	16.1	15.5	**31.6**
Secondary	15.1	12.8	**27.9**	16.0	14.3	**30.3**	17.4	15.6	**33.0**	18.9	16.9	**35.9**	19.2	17.5	**36.7**
Tertiary	2.2	1.5	**3.7**	2.6	2.0	**4.6**	3.1	2.5	**5.5**	3.3	2.8	**6.2**	4.0	3.3	**7.3**

Note: Figures calculated from HIS 1984-1997 in percentage points

If we look at types of education completed, Table 6.4 shows that in 1984, 68 percent of the population had only a primary education or had no formal schooling. A further 27 percent had received secondary education and only 3.7 percent had achieved tertiary level education. Although these percentages show a generally low level of education in Malaysia, the data also show a marked improvement in the level of educational attainment over the period 1984-1997. The percentage of those with either primary education or no schooling has fallen to 56 percent in 1997, whereas the share of those with tertiary education had increased to 7 percent. The number of people going to secondary schools increased by 10 percentage points in this period, from 27 percent in 1984 to 37 percent in 1997.

Table 6.5 shows the distribution of the population in Malaysia by qualification level. Looking at 1984, 50.2 percent of the Malaysian population had no qualifications. This percentage, however, decreased to 44 percent by 1997. On average, 26 percent of the Malaysian population achieved no formal qualifications over the 1984-1997 period. Throughout the 1984-1997 period, the highest increment in qualification growth was for secondary qualifications. The growth in education level in this particular group was 4.3 percent during the sample period. People with Primary qualifications saw a growth of 3.1 percent, Diploma 1 percent, High School 0.4 percent and Degree 0.7 percent.

Table 6.5 also shows the gender distribution of educational qualifications. There are a number of interesting gender differences in the education distributions. First, women are more likely to have received no formal schooling, although the incidence of this had fallen dramatically by 1997. In contrast, the proportion of women achieving tertiary level education was significantly less than that of men in 1984, but the gap had narrowed in 1997. The differences noted above in terms of level of schooling do not seem to be reflected in the distribution of qualifications. This probably reflects the fact that around half of the population do not have any qualifications. Not unexpectedly, the proportion of women with higher-level qualifications is about half that of men in 1997, although the figures for both males and females are small. This does, however, represent a significant improvement since 1984.

Table 6.5: Distribution of Gender by Qualification Level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Other Qualification	12.4	16.2	**28.6**	2.7	2.5	**5.1**	12.0	15.2	**27.3**	11.2	14.0	**25.2**	11.0	13.5	**24.5**
No Qualification	26.1	24.1	**50.2**	35.1	12.9	**48.0**	24.8	22.8	**47.6**	23.8	21.8	**45.6**	23.3	21.6	**44.9**
Low Qualification Education (LCE)	3.9	3.5	**7.4**	7.6	3.1	**10.7**	4.9	4.4	**9.3**	5.4	4.9	**10.3**	5.5	5.0	**10.5**
Medium Qualification Education (MCE)	5.2	4.9	**10.1**	14.5	10.2	**24.7**	5.9	5.5	**11.5**	7.1	6.8	**13.9**	7.3	7.1	**14.4**
High School Qualification Education (HSCE)	0.7	0.6	**1.3**	1.8	1.2	**3.1**	0.8	0.8	**1.6**	0.9	0.9	**1.8**	0.8	0.9	**1.7**
Diploma	0.7	0.6	**1.3**	2.5	2.0	**4.5**	0.8	0.6	**1.4**	0.9	0.8	**1.5**	1.2	1.0	**2.3**
Degree	0.8	0.4	**1.1**	2.6	1.2	**3.8**	0.9	0.4	**1.3**	0.9	0.5	**1.4**	1.1	0.7	**1.8**

Note: Figures calculated from HIS 1984-1997 in percentage points.

6.3 Distribution of Employees in Malaysia

6.3.1 Distribution of Employees by Education

As this study is concerned with employees, this section discusses how education is distributed across employees. We present this distribution in Table 6.6. Generally, workers are most likely to have secondary education, with 58 percent of workers in 1997 having secondary education. The size of this particular group of workers has increased by almost 8.8 percentage points over the sample period. Although the number of workers with tertiary education was below 20 percent, the number of workers with tertiary education had almost doubled from 1984. The contribution of workers with primary education to the labour force was relatively high, at around 33 percent in 1984. However, the percentage in this particular group decreased continuously throughout the sample period. A decreasing trend of workers also occurs in the 'no schooling' category. The number of workers with no schooling in 1997 was almost half that of workers in the same category in 1984. Comparing the results from Tables 6.4 and 6.6 yields the conclusion that non-production workers are likely to have primary education or no schooling.

Table 6.6 also shows the distribution of employees by gender and education. As mentioned earlier in Table 6.3, males constituted by far the largest group in self-employment/ employer and employee activities, while in terms of education level, there were twice as many males as females in secondary education. Throughout the period, males with primary education accounted for about three quarters of all male activity, whereas only about 25 percent of females with primary education were in the labour market. Although the contribution of females in both the secondary and primary groups are quite small compared to males, the growth in females with tertiary education almost doubled during the sample period 1984-1997. Also, in the 'no schooling' category, the percentages of females and males in 1997 was half that in 1984.

Table 6.6: Distribution of Employees by Gender and Education level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
No Schooling	3.9	3.6	**7.5**	2.7	2.5	**5.2**	2.8	2.3	**5.0**	2.5	1.9	**4.4**	2.0	1.5	**3.5**
Primary	25.2	8.6	**33.8**	21.7	7.6	**29.2**	19.0	7.1	**26.2**	16.7	6.3	**23.0**	15.6	6.6	**22.2**
Secondary	32.8	16.4	**49.2**	35.1	18.5	**53.6**	36.4	19.2	**55.7**	38.6	19.9	**58.5**	38.2	19.8	**58.0**
Tertiary	6.2	3.3	**9.5**	7.4	4.6	**12.0**	8.0	5.1	**13.1**	8.6	5.5	**14.2**	9.6	6.8	**16.4**

Note: Figures calculated from HIS 1984-1997 in percentage points.

Table 6.7 contains information about employees by type of qualification. Over the 13 years, more females with education joined the workforce. In 1984, slightly more than half of the workforce in Malaysia was made up of people with no form of qualification (other qualifications). However, this figures dropped to just 35% in 1997, indicating that more people now gain some sort of qualification before joining the workforce. Looking at the male workforce, in 1984 the majority of them (55%) had no qualifications, but this figure fell to just under 40% in 1997. However, the female workforce shows a different composition. In 1984, about 41% of the female workforce had no qualifications, but the composition in 1997 had changed, as most females (37%) had at least secondary qualification. This might be because most women with no qualifications are not actively involved in the job market. They might choose to be housewives: refer to Table 6.3. Turning to skilled labour, at the higher education level, unlike the 'no qualification' group, the proportion of the workforce with a diploma or a degree increased by 81% and 58% respectively between 1984 and 1997.

Table 6.7: Distribution of Employees by Gender and Qualification level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Mal	Female	Total	Male	Female	Total
Other Qualification	3.9	3.6	**7.4**	2.7	2.5	**5.1**	2.8	2.3	**5.0**	2.5	1.9	**4.4**	2.0	1.5	**3.5**
No Qualification	37.6	13.1	**50.7**	35.1	12.9	**48.0**	29.6	11.2	**40.7**	26.2	9.6	**35.8**	25.2	9.9	**35.1**
Low Qualification Education (LCE)	8.8	3.7	**12.6**	7.6	3.1	**10.7**	9.9	4.3	**14.3**	10.6	4.5	**15.0**	10.1	4.0	**14.2**
Medium Qualification Education (MCE)	12.1	8.4	**20.5**	14.5	10.2	**24.7**	16.3	11.0	**27.3**	18.5	12.3	**30.8**	18.8	12.7	**31.5**
High School Qualification Education (HSCE)	1.2	0.7	**1.9**	1.8	1.2	**3.1**	2.2	1.7	**4.0**	2.5	1.8	**4.2**	2.1	1.8	**4.0**
Diploma	2.1	1.6	**3.7**	2.5	2.0	**4.5**	2.6	2.0	**4.6**	3.0	2.3	**5.3**	3.7	3.0	**6.7**
Degree	2.5	0.8	**3.2**	2.6	1.2	**3.8**	2.8	1.2	**4.1**	2.9	1.4	**4.3**	3.4	1.8	**5.2**

Note: Figures calculated from HIS 1984-1997 in percentage points.

6.3.2 Distributions of Employees by Occupation and Gender

Table 6.8 reports the percentage distribution by occupation and gender for each survey. There are seven major occupational groups defined in the data, namely, Professional, Manager, Clerical, Sales, Service sector, Agricultural workers, Production workers and unknown categories of workers. We ignore the 'unknown' category because it is not reliable in terms of presenting the employees.

Table 6.8 reports the composition of employees by occupational groups and gender for each reported year. In 1984, the major occupational group was production workers, representing about 37 percent of total employees in Malaysia. This was followed by clerical workers, at about 16 percent, service workers at 15 percent and agricultural workers at about 12 percent. Interestingly, the composition had changed for several groups by 1997. Although the production group remained as the biggest employee group and increased by around 3 percentage points, some other occupational groups changed more significantly. The agricultural sector dropped by almost 50 percent, from contributing 12 percent in 1984 to just under 7 percent in 1997. Among the main gainers were the managerial group, which increased by 52 percent from 2.7 percent to 4.1 percent.

Analysis of the trend in employment by occupational group by gender suggests some interesting points. The male trend has not changed significantly throughout the years, as production jobs remains the occupational choice of half of the male workforce in Malaysia. However, the female distribution has shown some interesting trends. Clerical and production work are the two main occupational groups for females. In 1984, clerical work was the top choice for females, and more than a quarter of females were in this group. However, in 1992, the production group had significantly increased to 31percent, overtaking the clerical group to become the top occupational group between 1989 and 1995. In 1997, the table indicates that both clerical and production contributed around 26 percent.

Some other interesting points arise when looking at the gender composition for a particular occupational group through time. Males are more dominant in every occupational group apart from clerical work, where females consistently account for more than half of the group. One of the most obvious trends is that the female contribution to each occupational group has increased from 1984 to 1997 in all categories apart from agricultural work. The number of female managers has more than doubled, bringing females to 24% of the managerial sector from just 11% in 1984. There is also a significant increase in the number of females working in sales, from just 30% in 1984 to 40% in 1997.

Table 6.8 Distribution of Employees by Occupation and Gender

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	Total
Professional, Technical and Related Workers	6.6	4.6	**11.2**	6.7	5.2	**11.9**	6.6	5.3	**11.9**	8.1	6.0	**14.1**	8.0	6.3	**14.3**
Administrative & Managerial Workers	2.4	0.3	**2.7**	2.4	0.4	**2.8**	2.4	0.5	**2.9**	2.6	0.8	**3.5**	3.2	1.0	**4.1**
Clerical & Related Workers	7.8	8.1	**15.9**	7.5	0.8	**8.3**	6.7	7.5	**14.2**	6.9	7.9	**14.9**	6.8	9.1	**15.9**
Sales Workers	5.0	2.1	**7.1**	4.8	2.3	**7.1**	4.1	2.0	**6.1**	4.3	2.5	**6.8**	3.9	2.5	**6.4**
Services Workers	9.0	5.6	**14.6**	9.3	5.9	**15.2**	8.0	5.2	**13.2**	7.7	4.8	**12.5**	7.4	5.3	**12.7**
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	7.8	4.0	**11.8**	7.5	2.8	**10.3**	7.9	2.6	**10.5**	6.3	1.7	**8.0**	5.4	1.4	**6.7**
Production & Related Workers, transport Equipment Operators & Labourers	29.7	7.1	**36.8**	28.7	8.5	**37.2**	30.4	10.5	**40.9**	30.4	10.0	**40.4**	30.8	9.0	**39.8**

Note: Figures calculated from HIS 1984-1997 in percentage points.

6.3.2.1 Distributions of Employees by Occupations and Education

Table 6.9 presents the distribution of workers by education level over the period from 1984 to 1997. Generally, as mentioned earlier in Table 6.7, the distribution of the labour force favours workers with secondary education, except for the professional and managerial group.

It is not surprising that professional and managerial workers are relatively more educated as compared to workers in the other occupational groups, especially agricultural workers. As revealed in Table 6.9, in 1984, as many as 48.6 percent of professional workers received tertiary education, in comparison to only 0.7 percent of workers in the agriculture sector. In fact, throughout the sample period, professional workers contributed the largest percentage of workers with tertiary education. Table 6.9 also indicates that 57 percent of workers with tertiary education entered the labour force as professional workers in 1984. It comes as no surprise that only 0.9 percent of educated workers are farmers. Although the contribution of professionals with tertiary education in employment fell from about 57 percent in 1984 to 51 percent in 1997, the contribution of professional workers with tertiary education to the overall workforce gradually increased, from 5.4 percent in 1984 to 8.5 percent in 1997.

As revealed in Table 6.9, workers with secondary qualifications are more likely to be involved in production. Analysis reveals that the trend of workers with secondary education in production work has increased from 33 percent to around 42 percent during the sample period. This information is consistent with the figures reported in Tables 6.8 and 6.7. In Table 6.8, production work is the largest occupation group during the 13 years, and Table 6.7 illustrates that generally in Malaysia, workers with secondary qualifications dominate the workforce. The second largest occupational group for workers with secondary qualifications is clerical jobs, which contributed to 26 percent of secondary employment in 1984. The share of this particular group dropped to 19.9 percent in 1992 and increased to 21.5 percent in 1997.

Examination of the shares of employees by qualification reveals that four-fifths of workers with secondary qualifications enter the workforce in clerical jobs. However, the proportion of clerical workers with secondary education fell slightly to 78.5 percent in 1997. As clearly shown in Table 6.9, sales occupations employed more than half of workers with secondary qualifications in 1984 and this figure increased to around 70 percent during the 1990s.

The distribution of workers with primary education in total employment shows that most of them have a tendency to enter production and agricultural work. The contribution of workers with primary education in production work decreased from 17 percent in 1984 to 12 percent in 1997. Most workers with primary education joined the workforce as production workers. In 1984, for example, 50 percent of workers with primary education were production workers, and this trend increased to 54 percent in 1997. This is not surprising, as the figures also suggest that employees with primary education or no schooling were least likely to be found in professional and managerial occupations.

Table 6.9: Distribution of by Occupation and Education Level 1984 to 1992

Occupation	1984				1989				1992			
	No Schooling	Primary	Secondary	Tertiary	No Schooling	Primary	Secondary	Tertiary	No Schooling	Primary	Secondary	Tertiary
Professional, Technical and Related Workers	0.1	0.5	5.1	5.4	0.1	0.5	5.0	6.4	0.0	0.4	4.8	6.7
Administrative & Managerial Workers	0.2	0.2	1.1	1.3	0.0	0.2	1.1	1.5	0.0	0.1	1.1	1.7
Clerical & Related Workers	0.1	1.0	13.1	1.7	0.0	0.8	12.3	2.4	0.0	0.7	11.2	2.4
Sales Workers	0.2	1.8	4.7	0.4	0.2	1.6	4.8	0.4	0.1	1.1	4.3	0.5
Services Workers	1.6	6.3	6.5	0.2	1.2	5.5	8.1	0.4	1.0	4.5	7.3	0.5
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	2.8	6.9	2.0	0.1	1.8	4.0	2.4	0.1	2.0	5.7	2.7	0.2
Production & Related Workers, Transport Equipment Operators & Labourers	2.8	17.1	16.6	0.4	1.9	14.6	19.9	0.7	1.8	13.7	24.2	1.2

Note: Figures calculated from HIS 1984-1997 in percentage points. It refers to the percentage of workers with no schooling (primary, secondary, tertiary) in total employment.

Table 6.9: Distribution of by Occupation and Education Level 1995 to 1997 (continued)

	1995				1997			
Occupation	No Schooling	Primary	Secondary	Tertiary	No Schooling	Primary	Secondary	Tertiary
Professional, Technical and Related Workers	0.0	0.5	6.3	7.2	0.0	0.4	5.6	8.4
Administrative & Managerial Workers	0.0	0.1	1.4	1.9	0.0	0.1	1.4	2.7
Clerical & Related Workers	0.0	0.7	11.6	2.4	0.0	0.7	12.5	2.7
Sales Workers	0.2	1.1	4.9	0.6	0.1	1.1	4.8	0.6
Services Workers	0.9	3.9	7.1	0.5	0.8	4.2	7.1	0.6
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	1.3	4.2	2.3	0.1	0.9	3.7	2.0	0.1
Production & Related Workers, Transport Equipment Operators & Labourers	1.8	12.4	24.8	1.3	1.5	12.1	24.8	1.3

Note: Figures calculated from HIS 1984-1997 in percentage points. Refers to the percentage of workers with no schooling (primary, secondary, tertiary) in total employment

Table 6.10 presents the distribution of employees by qualification level in 1984. Following on from Table 6.9, the tables below (Tables 7.10-7.15) explore the distribution of employees by qualification level. In Table 6.9, we recognize that the proportion of workers with tertiary education is greatest in professional and managerial professions. Table 6.10, however, splits tertiary education into diploma and degree qualifications. In other words, we can say that the information on qualification levels is more precise and better able to explain the distribution of education of employees by different professions.

The overall distribution of employees' qualifications shows that employees with MCE qualifications are more likely to be found in the professional, managerial and clerical groups. On the other hand, surprisingly, large percentages of employees with no qualifications are employed in sales, service jobs, agriculture and production occupations. Comparing diploma and degree qualifications in Table 6.10 shows that diploma qualifications lead degree qualifications by 8.7 percent in explaining the proportions in the professional group. However, approximately one-third (32.5%) of employees with degree qualifications work as managers compared to just 9.7 percent of diploma holders. As presented in Table 6.10, 80 percent of diploma holders hold professional positions and 7.3 percent are in clerical jobs. The proportion of employees with degree qualifications is also very high in professional occupations. About 61 percent and nearly 27 percent of workers in these categories respectively have professional and managerial careers.

Table 6.10 also presents the proportion of workers at secondary education level. As can be seen in Table 6.10, production work favours workers with no qualifications, followed by workers with LCE and MCE qualifications. It is important to note that we cannot separate workers with no qualifications into those with primary and secondary levels of schooling, because both levels include this type of worker.

Table 6.10: Distribution of Employees by Occupation and Qualification Level 1984

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.9	0.0	1.1	3.7	0.5	2.9	2.0
Administrative & Managerial Workers	0.3	0.0	0.2	0.8	0.2	0.3	0.9
Clerical & Related Workers	2.6	0.1	3.2	8.8	0.8	0.3	0.2
Sales Workers	3.8	0.2	1.2	1.5	0.2	0.1	0.1
Services Workers	8.8	1.6	2.1	2.0	0.1	0.0	0.0
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	8.2	2.8	0.4	0.3	0.0	0.0	0.0
Production & Related Workers, Transport Equipment Operators & Labourers	26.1	2.7	4.3	3.4	0.1	0.1	0.0

Note: Figures calculated from HIS 1984-1997 in percentage points. It refers to the percentage of workers with no qualifications (other qualification, LCE, MCE, HSCE, Diploma and Degree) in total employment.

Table 6.11 contains information on workers by level of qualification in 1989. Comparing the share between the two years, 1984 and 1989, Table 6.11 clearly shows that the share of workers in professional occupations increased and simultaneously the share of workers in the agriculture sector decreased. The share of other qualification levels also decreased in 1989 in all occupational groups. This indicates that the education level in Malaysia in 1989 was much improved compared to 1984. At tertiary education level, represented by HSCE, diploma and degree qualifications, holders of diplomas and degrees are concentrated in professional and managerial occupations. On the other hand, workers with HSCE are evident in greater proportions in clerical occupations. The share of workers with HSCE in all occupational groups is relatively low compared to other workers.

Not surprisingly, the proportion of the no qualifications group is higher in production occupations: 67 percent of production workers have no qualifications. Table 6.11 also shows that the distribution of workers with MCE is relatively high in all categories of occupations, especially in clerical jobs. Workers with MCE contribute more than half those employed in clerical jobs.

Table 6.12 presents the distribution of employees by qualification level in 1992. Comparing the two years, 1989 and 1992, reveals that 1992 saw an increase in the share of tertiary education levels, as shown by the numbers with HSCE, diploma and degree qualifications. Workers with no qualifications remained the highest proportion of production workers, but the percentage of workers with no qualifications fell slightly during 1992. The percentage of workers with LCE qualifications remained unchanged during the 1989-1992 period, except that the number of production workers with LCE increased by almost 100 percent. These results indicate that the level of education in Malaysia again improved compared to 1989 and 1984.

Tables 6.13 and 6.14 present information on working age by qualification level in 1995 and 1997. Generally, the share of workers at higher education level improved significantly during 1995 and 1997. This result can be seen directly from the increasing share of diploma and degree holders and the decreasing share of other/no qualification workers in all occupational groups. The distribution of workers with degrees in professional occupations increased by 50 percent during the 1984-1997 period. Consistent with the trend in 1984, 1989 and 1992, the distribution of workers in 1995 and 1997 favoured workers with no qualifications doing production work.

The distribution of levels of education among managers is quite similar to that of professional workers. In terms of tertiary education among managers, the number of workers with this level of education is the highest, while employees with no schooling make up the smallest percentage. In fact, in 1997, 35 percent of workers among managers were degree holders and 22 percent were diploma holders. Remarkably, the share of diploma holders in managerial occupations increased significantly, from 9.7 percent in 1984 to 20.2 percent in 1997. Clerical and sales jobs also saw marked changes in the share of diploma holders over the 1984 to 1997 period. The share of diploma holders in clerical jobs increased from 1.7 percent to 5.2 percent in 1997. Meanwhile, almost 70 percent of employees in sales occupations had secondary level education. The tables also show that the proportion of secondary educated workers increased significantly, as shown by the increase of almost 40 percent in the share of MCE holders and the decrease of nearly 62 percent in the share of unqualified workers during the 1984-1997 period.

Summing up the discussion, throughout the period, there are two occupational groups that have identical patterns, namely service and production workers. These two groups have the highest numbers of employees with secondary education but the lowest numbers of employees with tertiary education. Concerning service workers, in 1984, 60 percent of employees in the service sectors had no qualifications, while 14 percent had LCE qualifications. At a much lower percentage were those with MCE qualifications, with 13 percent, and those with degree qualifications at only 0.2 percent. It is interesting to note that although the distributions of employees with tertiary level education are relatively trivial compared to employees with other levels of education, the percentage of employees with tertiary education increased significantly between 1984 and 1997.

Table 6.11: Distribution of Employees by Occupation and Qualification Level 1989

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.8	0.0	0.8	3.7	0.7	3.5	2.2
Administrative & Managerial Workers	0.3	0.0	0.2	0.8	0.3	0.3	1.0
Clerical & Related Workers	2.2	0.0	2.2	8.9	1.3	0.5	0.4
Sales Workers	3.7	0.2	1.0	1.9	2.5	0.1	0.1
Service Workers	8.4	1.2	2.1	3.1	0.2	0.1	0.0
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	7.5	1.8	0.5	0.5	0.0	0.0	0.0
Production & Related Workers, Transport Equipment Operators & Labourers	25.0	1.8	4.0	5.7	0.4	0.1	0.1

Note: Figures calculated from HIS 1984-1997 in percentage points. It refers to the percentage of workers with no qualifications (other qualification, LCE,MCE, HSCE, Diploma and Degree) in total employment.

Table 6.12: Distribution of Employees by Occupation and Qualification Level 1992

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.5	0.0	0.8	3.8	1.0	3.2	2.5
Administrative & Managerial Workers	0.2	0.0	0.2	0.8	0.3	0.4	1.0
Clerical & Related Workers	1.5	0.0	2.0	8.5	1.4	0.5	0.3
Sales Workers	2.3	0.1	1.2	2.0	0.2	0.1	0.1
Service Workers	6.5	1.0	2.2	3.2	0.3	0.1	0.0
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	7.2	2.0	0.6	0.6	0.1	0.0	0.0
Production & Related Workers, Transport Equipment Operators & Labourers	22.5	1.8	7.3	8.4	0.7	0.2	0.1

Note: Figures calculated from HIS 1984-1997 in percentage points. It refers to the percentage of workers with no qualifications (other qualification, LCE,MCE, HSCE, Diploma and Degree) in total employment.

Table 6.13: Distribution of Employees by Occupation and Qualification Level 1995

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.8	0.0	0.9	5.0	1.2	3.5	2.6
Administrative & Managerial Workers	0.2	0.0	0.2	1.1	0.4	0.5	1.0
Clerical & Related Workers	1.5	0.0	1.9	9.1	1.4	0.7	0.3
Sales Workers	2.3	0.2	1.3	2.4	0.3	0.2	0.2
Service Workers	5.5	0.9	2.2	3.4	0.2	0.1	0.1
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	5.3	1.3	0.7	0.5	0.1	0.0	0.0
Production & Related Workers, Transport Equipment Operators & Labourers	20.2	1.8	7.8	9.3	0.7	0.3	0.1

Note: Figures calculated from HIS 1984-1997 in percentage points. It refers to the percentage of workers with no qualifications (other qualification, LCE, MCE, HSCE, Diploma Degree) in total employment.

Table 6.14 Distribution of Employees by Occupation and Qualification Level 1997

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.6	0.0	0.7	4.6	1.1	4.2	3.1
Administrative & Managerial Workers	0.2	0.0	0.2	1.1	0.3	0.8	1.5
Clerical & Related Workers	1.4	0.0	1.9	10.0	1.5	0.8	0.3
Sales Workers	2.1	0.1	1.3	2.3	0.2	0.2	0.2
Service Workers	6.1	0.8	2.2	3.2	0.3	0.2	0.1
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	4.6	0.9	0.6	0.6	0.0	0.0	0.0
Production & Related Workers, Transport Equipment Operators & Labourers	20.3	1.5	7.3	9.7	0.5	0.4	0.1

Note: Figures calculated from HIS 1984-1997 in percentage points. It refers to the percentage of workers with no qualifications (other qualification, LCE,MCE, HSCE, Diploma and Degree) in total employment.

6.3.3 Distributions of Employees in Sectors by Gender.

In this section, the discussion will turn to the distribution of employees by ten major sectors during the sample period. Table 6.15 summarises the distributions of employees in ten major sectors in Malaysia during the period from 1984 to 1997. This study uses the sector classifications applied by the Department of Statistics of Malaysia, namely the Malaysian Standard Industrial Classification 2000 (SIC2000). In this classification, ten major sectors are recognised: the mining and quarrying sector, the manufacturing sector, the electrical, gas and water sector, the construction sector, the wholesale and traded sector, the restaurant and hotel sector, the transportation, storage and communication sector, the finance, insurance, real estate and business services sector, the community, social and personal services sector and the agriculture, forestry, livestock and fishing sector.

Generally, there are two different trends evident in the data first the manufacturing sector provided 1.9 million jobs during the 1990s, meaning that the agriculture sector was no longer the major employer of workers in the 1990s. In 1984, almost 11.6 percent of total employment was in the agriculture sector, but the trend in this sector fell markedly, by roughly 87 percent, over the period from 1984 to 1997. Second, in contrast, the trend of employees tends to favour the manufacturing sector, with increases of around 40 percent during the 13-year period. The distribution across sectors shows that the proportion of males was dominant in all sectors; however, in the manufacturing and restaurant and hotel sectors, the proportions of males and females were about equal.

Examination of the gender distribution shows that the participation of women in total employment has shifted towards relatively better-paid opportunities in the electrical, finance and manufacturing sectors and away from agriculture. The finance and manufacturing sectors saw increases of around 27 percent over the period 1984-1997. The electrical sector, however, employed more female workers in 1997 with an increase of 50 percent compared to 1984. Agriculture was no longer the major employer of women and the proportion of female workers in agriculture declined from 35 percent in 1984 to 22 percent in 1997.

The proportion of males in the agriculture, forestry, livestock and fishing and mining and quarrying sectors increased over the period. Males continuously accounted for more than 90 percent of workers in the construction sector. Male workers were also dominant in the electrical sector; however, the share decreased steadily by 6 percent during the period from 1984-1997.

Table 6.15: Distribution of Employees by Gender, 1984 to 1997

	1984			1989			1992			1995			1997		
SECTOR	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Mining & Quarrying	1.1	0.1	**1.2**	0.7	0.1	**0.8**	0.7	0.1	**0.8**	0.5	0.1	**0.6**	0.5	0.1	**0.6**
Manufacturing	11.4	7.9	**19.3**	12.5	9.6	**22.1**	14.8	12.0	**26.9**	16.5	11.6	**28.1**	16.4	11.0	**27.1**
Electricity, Gas & Water	1.0	0.1	**1.1**	1.0	0.1	**1.1**	0.9	0.1	**0.9**	0.8	0.1	**0.9**	0.8	0.1	**0.9**
Construction	10.7	0.8	**11.5**	8.0	0.4	**8.4**	8.9	0.4	**9.4**	8.8	0.2	**9.5**	9.9	0.8	**10.7**
Wholesale & Retail Trade	7.6	3.6	**11.2**	7.5	3.6	**11.1**	6.3	3.2	**9.6**	6.5	3.7	**10.2**	6.5	4.0	**10.4**

Note: Figures calculated from HIS 1984-1997 in percentage points. The numbers refers to the percentage of males (females) in total employment.

Table 6.15: Distribution of Employees by Gender Level 1984 to 1997 (continued)

	1984			1989			1992			1995			1997		
SECTOR	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Restaurants & Hotel	2.0	1.7	3.7	2.2	1.8	4.1	2.1	1.8	4.0	2.2	1.8	4.0	2.3	2.1	4.3
Transport, Storage & Communication	5.0	0.6	5.6	5.0	0.8	5.8	4.6	0.6	5.2	4.7	0.8	5.5	4.7	0.8	5.6
Finance, Insurance, Real Estate & Business Services	3.3	2.1	5.4	3.8	2.2	6.0	3.2	2.0	5.2	3.4	2.3	5.8	3.5	2.9	6.4
Community, Social & Personal Services	3.3	2.1	5.4	3.8	2.2	6.0	3.2	2.0	5.2	3.4	2.3	5.8	3.5	2.9	6.4
Agriculture, Forestry, Livestock & Fishing	7.5	4.1	11.6	7.0	2.9	9.9	7.6	2.7	10.3	6.0	1.8	7.9	4.8	1.4	6.2

Note: Figures calculated from HIS 1984-1997 in percentage points. The numbers refers to the percentage of males (females) in total employment.

6.3.3.1 Distribution of Employees by Sector and by Education Level.

The distribution of employees by education level and qualifications for each sector is presented in Tables 6.16 to 6.35. Table 6.16 presents the distribution of employees by level of education in the mining sector. As revealed in Table 6.16, the distribution of employees in the mining sector favoured workers with secondary education levels, except in 1984. In 1984, the distribution of workers favoured those with primary education. The share of employees with primary education in total employment was equal to the share of those with secondary qualification, at 0.5 percent, but the percentage of workers with primary education in this sector was greater than the percentage of workers with secondary education, at 41.4 and 38.9 percent respectively. During the 1984-1997 period, the proportion of workers with secondary education decreased from 0.5 percent in 1984 to 0.3 percent in 1997. In Table 6.17, we consider qualification levels. Table 6.17 reveals that workers with no qualifications decreased from 0.7 percent in 1984 to 0.2 percent in 1984. The share of workers with MCE remained constant throughout the sample period.

In Table 6.18, we present the distribution of employees in the manufacturing sector. As regards the rapid growth of the manufacturing sector, this sector created about 0.6 million new jobs between 1990 and 1994 (Ministry of International Trade and Industry: 1995). The share of workers with secondary levels of education was almost double the share of workers with primary education. The gap between the share of primary and secondary educated workers widened in 1997, whereas the share of workers with secondary education increased significantly, from 10.5 percent in 1984 to 17.7 percent in 1997. Meanwhile, the share of primary workers fell slightly, from 6.9 percent in 1984 to 6.3 percent in 1997. The distribution of workers with tertiary education also significantly increased, by more than 100 percent, during the sample period. Workers with no qualifications made the greatest contribution to the increasing share of workers with secondary education, as shown by Table 6.19. However, the pattern throughout the sample period shows that the trends for the employment of people with no qualifications fell and the trend for MCE and higher qualifications increased dramatically, that is, it almost tripled.

The distribution of employees also favoured those secondary with qualifications in the electrical sector. As shown in Table 6.20, workers with secondary qualifications accounted for more than 60 percent of the workforce in the electrical sector. As can be seen in Table 6.21, in contrast to the mining, quarrying and manufacturing sector, workers with MCE qualifications accounted for the majority of those with secondary education, especially in the 1990s. The share of workers with no qualifications was important during the 1980s but fell thereafter.

In the 1980s, workers in the construction sector were more likely to have primary qualifications. However, this trend changed in the 1990s, when workers with secondary education were more likely to be employed in the construction labour market. In 1997, for example, 52 percent of workers with secondary education were employed in the construction sector. Looking at the proportion of qualification levels of these workers, as clearly shown in Table 6.23, the distribution of workers in the construction sector favoured workers with no qualifications. In 1984, for example, 67 percent of workers in the construction sector had no qualifications. Although this percentage fell to 52 percent in 1997, it was still high and represented more than half of the workers in the construction sector. This result also indicates that workers entering the construction labour market in the 1980s were those with primary education only, while in the 1990s, they were those who had pursued education at secondary level but failed their examinations in year 9. This means that these workers had completed their education at 15 years old.

The distribution of employees in wholesale and retail trade is presented in Table 6.24. The majority of workers in this sector had secondary education. The proportion of secondary level compared to tertiary education was almost 700 percent. The participation of workers with tertiary education, however, increased significantly, from 5.9 percent in 1984 to 11.4 percent in 1997. On the other hand, the percentage of workers with primary education decreased from 25 percent to 15 percent during the same period. In keeping with the trend in the construction sector, the table seems to suggest that in the 1990s, there was a general improvement in education levels. Starting from 1995, the trend of workers in wholesale and retail trades moved towards workers with MCE qualifications. Interestingly, although the job descriptions for wholesale and retail trade and restaurant and hotel work are quite similar, the distribution of workers by qualification level shows a different trend. As presented in Table 6.27, workers with no qualifications were predominantly employed in the restaurant and hotel sector compared to workers with other qualifications. In 1984, more than 62 percent of workers in the restaurant and hotel sector had no qualifications. The percentage decreased to just 46 percent in 1997.

Table 6.28 reports the distribution of employees in the transportation, storage and communication sector. As reported in the table, workers with secondary education made up the greatest proportion in the transportation, storage and communication sector. The demand for workers with tertiary education in 1997 was double the percentage in 1984. However, this percentage was still very low compared to the percentage of workers with secondary education. There seems to be a separation in the level of secondary education in Table 6.29 into those with no qualifications in the first group, with the second being made up of workers with MCE qualifications and finally those with LCE qualifications.

The pattern of the distribution of workers was slightly different in Finance, Insurance, Real Estate and Business Services. As shown in Table 6.30, the distribution of workers still favoured those with secondary education; however, this is followed by those with tertiary education. In addition, the share of workers with secondary education fell significantly and at the same time the share of workers at tertiary education level increased over the 1984-1997 period. According to Table 6.31, the share of workers with degrees doubled over the sample period, and amazingly, the share of diploma holders in 1997 was four times that in 1984. Although workers with MCE made up a considerable proportion of workers in the Finance, Insurance and Real Estate sector over the 1984-1997 period, the share of overall total employment increased by just 0.1 percent; on the contrary, the share of MCE holders in the employment sector decreased from 48 percent in 1984 to 44 percent in 1997.

Table 6.32 presents the distribution of employees in the community, social and personal services sector during the period from 1984 to 1997. Clearly, the majority of workers in this sector were those with secondary qualifications, and only around 20 percent of them had tertiary level education. Looking at Table 6.33, the major groups that contributed to the share of secondary education were those workers with no qualifications or with the MCE. It is interesting to note that the trend for workers with no qualifications changed during the 1990s. Starting from 1992, the major groups were those with MCE qualifications. As expected, the Agriculture sector favoured workers with primary education only. In other words, workers with no qualification dominated the share of workers in this sector. As clearly presented in Table 6.34, the share of workers with no schooling was quite high in 1984, but fell significantly to 0.9 percent in 1997, and these workers were replaced by those with MCE qualifications. The share of workers at tertiary education also increased, although only by a small percentage. This information reveals that farmers in Malaysia during the 1990s were more educated compared to those in the 1980s. It is important to note that the distribution of workers in agriculture, forestry, livestock and fishing showed a relative fall throughout the sample period.

Table 6.16: Distribution of Employees in the Mining and Quarrying Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	0.1[1]	0.5	0.5	0.1
	1.4[2]	1.5	1.0	1.5
	8.3[3]	41.4	38.9	11.3
1989	0.0	0.3	0.4	0.1
	0.5	0.9	0.7	1.1
	3.4	32.6	47.9	16.1
1992	0.0	0.2	0.4	0.2
	0.4	0.7	0.7	1.4
	2.5	24.0	49.1	24.4
1995	0.0	0.1	0.3	0.2
	0.4	0.5	0.5	1.1
	2.7	19.7	51.7	25.9
1997	0.0	0.1	0.3	0.1
	0.5	0.6	0.5	0.7
	2.9	23.0	52.9	21.2

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.17: Distribution of Employees in the Mining and Quarrying Sector by Qualification Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	**No Qualification**	**Other Qualification**	**LCE**	**MCE**	**HSC**	**DIPLOMA**	**DEGREE**
1984	0.7[1]	0.5	0.1	0.2	0.0	0.0	0.1
	1.4[2]	1.5	1.0	1.1	0.5	0.9	2.6
	54.7[3]	41.4	9.6	17.3	0.7	2.7	6.6
1989	0.4	0.0	0.1	0.2	0.0	0.0	0.1
	0.8	0.5	0.7	0.7	0.9	0.7	1.8
	47.7	3.3	9.6	23.2	3.6	4.0	8.4
1992	0.3	0.0	0.1	0.2	0.0	0.0	0.1
	0.7	0.4	0.6	0.7	0.7	0.9	2.6
	36.9	2.5	12.1	25.0	3.6	5.8	14.2
1995	0.2	0.0	0.1	0.2	0.0	0.1	0.1
	0.5	0.4	0.4	0.6	0.4	1.6	1.5
	30.6	2.7	10.2	28.9	3.1	13.9	10.5
1997	0.2	0.0	0.1	0.2	0.0	0.0	0.1
	0.6	0.5	0.5	0.5	0.3	0.4	1.5
	35.4	2.9	11.7	29.6	1.8	5.1	13.5

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.18: Distribution of Employees in Manufacturing Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	1.1[1]	6.9	10.5	0.9
	14.1[2]	20.4	21.3	9.3
	5.5[3]	35.7	54.3	4.6
1989	0.9	6.3	13.5	1.4
	16.7	21.7	25.2	11.3
	3.9	28.7	61.2	6.1
1992	0.9	6.5	17.5	1.9
	18.1	25.0	31.4	14.9
	3.4	24.4	65.0	7.3
1995	1.1	6.4	18.3	2.3
	24.6	27.7	31.3	16.3
	3.8	22.7	65.3	8.2
1997	0.9	6.3	17.7	2.5
	24.8	28.4	30.5	15.4
	3.1	23.0	64.6	9.3

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.19: Distribution of Employees in Manufacturing Sector by Qualification Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	No Qualification	Other Qualification	LCE	MCE	HSC	DIPLOMA	DEGREE
1984	11.4[1]	1.1	2.6	3.5	0.2	0.2	0.4
	22.5[2]	14.2	20.8	16.9	12.9	4.9	10.9
	59.0[3]	5.5	13.6	17.9	1.2	0.9	1.8
1989	12.1	0.9	2.5	5.4	0.5	0.3	0.4
	25.2	16.8	23.2	21.9	17.6	5.8	10.8
	54.8	3.9	11.3	24.6	2.4	1.2	1.8
1992	11.5	0.9	4.8	7.8	0.8	0.4	0.5
	28.3	18.1	33.9	28.6	21.1	9.6	12.7
	42.8	3.4	18.0	29.1	3.1	1.7	1.9
1995	10.7	1.1	5.0	9.1	0.8	0.6	0.7
	29.8	24.6	33.1	29.4	19.0	12.0	16.2
	38.0	3.8	17.7	32.3	2.9	2.3	2.5
1997	10.6	0.9	4.4	9.1	0.7	1.0	0.7
	30.2	24.8	31.3	28.8	17.2	14.7	14.3
	38.8	3.1	16.2	33.1	2.5	3.6	2.7

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.20: Distribution of Employees in Electrical, Gas and Water Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	No Schooling	Primary	Secondary	Tertiary
1984	0.0[1]	0.3	0.7	0.1
	0.2[2]	0.9	1.4	1.2
	1.3[3]	27.7	60.5	10.5
1989	0.0	0.2	0.7	0.1
	0.2	0.8	1.4	0.9
	0.8	22.5	66.7	10.0
1992	0.0	0.2	0.6	0.1
	0.3	0.7	1.2	0.7
	1.4	19.5	68.9	10.2
1995	0.0	0.2	0.6	0.1
	0.1	0.7	1.0	0.8
	0.5	17.7	68.3	13.5
1997	0.0	0.1	0.6	0.2
	0.2	0.6	1.0	1.0
	0.7	15.1	65.5	18.7

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.21: Distribution of Employees in Electrical, Gas and Water Sector by Qualification Education Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	No Qualification	Other Qualification	LCE	MCE	HSC	DIPLOMA	DEGREE
1984	0.5[1]	0.0	0.3	0.3	0.0	0.0	0.1
	1.0[2]	0.2	2.1	1.2	0.6	0.6	2.3
	43.3[3]	1.1	23.2	22.8	1.0	2.0	6.6
1989	0.4	0.0	0.3	0.3	0.0	0.0	0.0
	0.8	0.2	2.4	1.3	0.5	0.8	1.3
	37.1	0.8	23.6	29.4	1.4	3.3	4.3
1992	0.3	0.0	0.2	0.3	0.0	0.0	0.0
	0.7	0.3	1.3	1.3	0.6	0.6	1.1
	31.5	1.4	20.4	36.8	2.5	2.8	4.6
1995	0.2	0.0	0.2	0.3	0.0	0.1	0.0
	0.6	0.1	1.2	1.1	0.7	1.0	1.0
	25.8	0.5	20.6	38.8	3.5	5.9	5.0
1997	0.2	0.0	0.2	0.3	0.0	0.1	0.1
	0.6	0.2	1.2	1.1	1.0	0.9	1.1
	22.8	0.7	18.9	39.6	4.6	7.2	6.2

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.22: Distribution of Employees in Construction Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	1.1[1]	5.4	4.5	0.5
	15.0[2]	15.9	9.1	5.1
	9.9[3]	47.0	38.9	4.2
1989	0.6	4.0	3.5	0.3
	10.8	13.8	6.5	2.9
	6.7	48.0	41.1	4.2
1992	0.6	3.9	4.4	0.5
	12.6	14.9	7.8	3.7
	6.8	41.6	46.4	5.2
1995	0.5	3.4	4.9	0.7
	12.4	14.8	8.3	5.1
	5.7	35.7	51.1	7.5
1997	0.5	3.6	5.6	1.0
	14.6	16.1	9.6	6.3
	4.7	33.4	52.1	9.8

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.23: Distribution of Employees in Construction Sector by Qualification Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	**No Qualification**	**Other Qualification**	**LCE**	**MCE**	**HSC**	**DIPLOMA**	**DEGREE**
1984	7.7[1]	1.1	1.0	1.1	0.1	0.1	0.3
	15.3[2]	15.1	8.0	5.5	4.1	2.8	7.8
	67.7[3]	9.8	8.8	9.9	0.7	0.9	2.2
1989	6.0	0.6	0.6	0.9	0.1	0.1	0.2
	12.5	10.9	5.5	3.8	2.3	1.9	4.0
	71.4	6.6	7.0	11.3	0.9	1.0	1.8
1992	5.9	0.6	1.2	1.2	0.1	0.2	0.2
	14.5	12.6	8.2	4.5	3.5	3.3	4.0
	62.8	6.8	12.5	13.1	1.5	1.6	1.7
1995	5.2	0.5	1.5	1.6	0.2	0.2	0.3
	14.5	12.4	9.9	5.2	4.7	4.4	6.2
	54.4	5.7	15.6	17.0	2.1	2.5	2.8
1997	5.6	0.5	1.5	2.1	0.2	0.4	0.4
	16.0	14.6	10.9	6.6	4.8	5.4	7.4
	52.6	4.7	14.5	19.4	1.8	3.4	3.6

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.24: Distribution of Employees in Wholesale and Retail Trade Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	0.4[1]	2.9	7.3	0.7
	5.4[2]	8.5	14.9	7.0
	3.7[3]	25.5	65.0	5.9
1989	0.3	2.6	7.4	0.9
	6.2	8.7	13.7	7.4
	2.9	23.0	66.1	8.0
1992	0.3	1.9	6.5	0.9
	5.0	7.3	11.7	6.8
	2.6	19.9	68.1	9.4
1995	0.3	1.8	7.1	1.1
	5.9	7.7	12.2	7.6
	2.5	17.3	69.7	10.5
1997	0.2	1.6	7.4	1.2
	5.3	7.4	12.8	7.3
	1.7	15.7	71.1	11.4

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.25: Distribution of Employees in Wholesale and Retail Trade Sector by Qualification Level 1984 to 1997

				TYPES OF QUALIFICATION			
YEAR	**No Qualification**	**Qualification Other**	**LCE**	**MCE**	**HSC**	**DIPLOMA**	**DEGREE**
1984	5.6[1]	0.4	1.9	2.7	0.2	0.1	0.2
	11.1[2]	5.5	15.5	13.2	12.1	3.4	7.0
	49.9[3]	3.7	17.3	24.0	2.0	1.1	2.0
1989	5.4	0.3	1.4	3.3	0.3	0.2	0.3
	11.2	6.2	12.9	13.2	10.8	3.6	7.7
	48.3	2.9	12.5	29.3	3.0	1.5	2.6
1992	3.5	0.3	1.7	3.2	0.4	0.2	0.3
	8.7	5.0	12.2	11.7	10.3	4.2	6.2
	36.9	2.6	18.2	33.5	4.2	2.0	2.6
1995	3.4	0.3	1.8	3.7	0.4	0.3	0.3
	9.6	5.9	11.7	12.1	9.2	6.3	7.4
	33.4	2.5	17.2	36.6	3.8	3.3	3.1
1997	3.2	0.2	1.9	4.0	0.3	0.5	0.3
	9.0	5.3	13.4	12.9	8.8	7.0	6.4
	30.2	1.7	18.2	38.8	3.3	4.5	3.2

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.26: Distribution of Employees in Restaurant and Hotel Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	0.4[1]	1.5	1.8	0.1
	5.4[2]	4.3	3.7	0.7
	10.9[3]	39.1	48.3	1.8
1989	0.3	1.4	2.2	0.1
	6.3	4.8	4.1	1.1
	8.1	34.5	54.0	3.3
1992	0.3	1.2	2.2	0.2
	5.8	4.7	4.0	1.5
	7.4	30.9	56.8	4.9
1995	0.3	1.1	2.5	0.2
	6.0	4.6	4.2	1.3
	6.6	26.8	62.0	4.7
1997	0.3	1.3	2.5	0.3
	8.3	5.7	4.4	1.6
	6.6	29.3	58.1	6.1

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.27: Distribution of Employees in Restaurant and Hotel Sector by Qualification Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	**No Qualification**	**Other Qualification**	**LCE**	**MCE**	**HSC**	**DIPLOMA**	**DEGREE**
1984	2.3[1]	0.4	0.5	0.5	0.0	0.0	0.0
	4.6[2]	5.4	3.8	2.3	0.8	0.4	0.4
	62.5[3]	10.8	12.8	12.8	0.4	0.4	0.3
1989	2.4	0.3	0.5	0.7	0.1	0.0	0.0
	5.0	6.4	4.4	2.9	2.2	0.7	0.7
	59.4	8.1	11.5	17.9	1.7	0.8	0.6
1992	2.0	0.3	0.5	0.9	0.1	0.0	0.0
	5.0	5.8	3.8	3.4	2.6	0.8	0.5
	51.5	7.4	13.6	23.4	2.6	1.0	0.5
1995	1.7	0.3	0.7	1.1	0.1	0.1	0.0
	4.8	6.0	4.7	3.6	2.2	1.1	0.8
	42.8	6.6	17.8	28.2	2.4	1.4	0.9
1997	2.0	0.3	0.7	1.1	0.1	0.1	0.1
	5.8	8.3	5.2	3.4	2.6	1.4	1.0
	46.6	6.6	16.9	24.3	2.4	2.1	1.2

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.28: Distribution of Employees in Transportation, Storage and Communication Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	0.3[1]	2.2	2.9	0.3
	3.4[2]	6.5	5.9	3.1
	4.6[3]	38.6	51.6	5.2
1989	0.2	1.9	3.3	0.4
	4.4	6.5	6.1	3.3
	3.9	32.7	56.6	6.8
1992	0.2	1.6	3.1	0.4
	3.0	6.0	5.5	3.0
	2.9	30.2	59.2	7.6
1995	0.1	1.4	3.5	0.5
	2.7	6.0	5.9	3.5
	2.2	25.2	63.5	9.1
1997	0.1	1.3	3.5	0.6
	3.6	5.7	6.1	3.9
	2.3	22.9	63.2	11.6

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.29: Distribution of Employees in Transportation, Storage and Communication Sector by Qualification Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	**No Qualification**	**Other Qualification**	**LCE**	**MCE**	**HSC**	**DIPLOMA**	**DEGREE**
1984	3.2[1]	0.3	0.8	1.2	0.1	0.1	0.1
	6.3[2]	3.5	6.1	5.8	5.7	1.4	2.6
	56.4[3]	4.5	13.7	21.0	1.9	0.9	1.5
1989	3.0	0.2	0.7	1.5	0.1	0.1	0.1
	6.3	4.4	6.7	6.1	4.5	2.4	2.7
	51.6	3.9	12.4	26.1	2.4	1.9	1.8
1992	2.3	0.2	0.8	1.5	0.2	0.1	0.1
	5.7	3.0	5.9	5.5	4.1	2.6	2.5
	44.5	2.9	16.3	28.9	3.1	2.3	1.9
1995	2.1	0.1	0.9	1.8	0.2	0.2	0.1
	6.0	2.7	6.3	5.7	4.8	3.0	2.9
	39.3	2.2	17.2	32.4	3.8	2.9	2.3
1997	2.1	0.1	0.9	1.9	0.2	0.3	0.2
	5.9	3.6	6.1	6.1	4.8	3.8	3.0
	36.9	2.3	15.4	34.5	3.5	4.6	2.8

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.30: Distribution of Employees in Finance, Insurance, Real Estate and Business Services Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	0.0[1]	0.5	3.6	1.3
	0.6[2]	1.5	7.3	13.6
	0.9[3]	9.4	66.0	23.7
1989	0.1	0.6	3.6	1.8
	1.2	2.0	6.7	14.7
	1.1	9.7	59.9	29.3
1992	0.0	0.4	3.0	1.7
	0.7	1.7	5.4	13.3
	0.7	8.4	57.7	33.2
1995	0.0	0.4	3.3	2.0
	1.0	1.6	5.7	14.1
	0.7	6.5	58.2	34.6
1997	0.1	0.4	3.5	2.5
	1.5	1.8	6.0	15.1
	0.8	6.1	54.2	38.9

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.31: Distribution of Employees in Finance, Insurance, Real Estate and Business Services Sector by Education Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	No Qualification	Other Qualification	LCE	MCE	HSC	DIPLOMA	DEGREE
1984	1.0[1]	0.0	0.7	2.7	0.4	0.2	0.5
	1.9[2]	0.6	5.2	13.0	23.8	5.8	14.7
	17.6[3]	0.9	12.0	48.8	8.2	3.9	8.7
1989	1.1	0.1	0.5	2.7	0.7	0.4	0.6
	2.3	1.2	4.5	11.0	22.8	7.8	16.5
	18.2	1.0	8.0	44.9	11.6	5.9	10.3
1992	0.6	0.0	0.5	2.4	0.6	0.4	0.7
	1.6	0.7	3.2	8.8	15.3	8.9	17.2
	12.3	0.7	8.6	45.6	11.5	7.9	13.3
1995	0.6	0.0	0.4	2.6	0.7	0.6	0.8
	1.7	1.0	2.7	8.6	16.3	11.6	17.4
	10.4	0.7	7.1	46.0	12.0	10.6	13.1
1997	0.7	0.1	0.4	2.8	0.7	0.8	1.0
	1.9	1.5	2.8	9.0	16.7	11.3	20.0
	10.3	0.8	6.1	44.4	10.4	11.8	16.2

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.32: Distribution of Employees in Community Social and Personal Services Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	1.4[1]	7.0	15.3	5.4
	17.9[2]	20.7	31.2	57.2
	4.6[3]	24.0	52.7	18.6
1989	1.0	6.2	16.7	6.7
	19.3	21.3	31.2	56.0
	3.3	20.3	54.6	21.9
1992	0.7	4.9	15.2	7.0
	14.2	18.6	27.3	53.0
	2.6	17.5	54.8	25.1
1995	0.7	4.4	15.6	6.9
	16.2	19.0	26.7	48.7
	2.6	15.8	56.6	25.0
1997	0.5	4.1	15.1	7.8
	15.5	18.6	26.0	47.4
	1.9	15.0	54.8	28.3

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.33: Distribution of Employees in Community, Social and Personal Services Sector by Qualification Level 1984 to 1997

YEAR	TYPES OF QUALIFICATION						
	No Qualification	Other Qualification	LCE	MCE	HSC	DIPLOMA	DEGREE
1984	10.3[1]	1.3	4.3	8.0	0.7	2.9	1.6
	20.3[2]	17.1	34.1	38.9	38.0	78.7	50.5
	35.4[3]	4.4	14.7	27.3	2.4	9.9	5.6
1989	10.1	1.0	3.9	9.1	1.1	3.4	2.0
	21.1	18.8	36.0	36.7	37.2	75.5	53.7
	33.1	3.1	12.6	29.6	3.7	11.1	6.6
1992	7.3	0.7	3.8	9.1	1.6	3.2	2.1
	18.0	14.2	26.6	33.2	39.8	68.2	51.9
	26.4	2.6	13.7	32.7	5.7	11.4	7.6
1995	6.5	0.7	3.9	9.7	1.7	3.1	2.0
	18.1	16.2	25.9	31.5	40.6	58.3	45.6
	23.5	2.6	14.1	35.3	6.2	11.2	7.1
1997	6.4	0.5	3.5	9.4	1.7	3.6	2.3
	18.3	15.5	25.0	29.9	42.3	54.5	44.9
	23.3	1.9	12.8	34.2	6.1	13.2	8.4

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

Table 6.34: Distribution of Employees in Agriculture, Forestry, Livestock and Fishing Sector by Education Level 1984 to 1997

	TYPES OF SCHOOLING			
YEAR	**No Schooling**	**Primary**	**Secondary**	**Tertiary**
1984	2.7[1]	6.7	2.0	0.1
	36.4[2]	19.7	4.1	1.4
	23.7[3]	57.6	17.5	1.1
1989	1.8	5.7	2.3	0.1
	34.3	19.4	4.3	1.1
	18.1	57.3	23.2	1.4
1992	2.0	5.4	2.7	0.2
	39.9	20.5	4.9	1.6
	19.5	52.0	26.5	2.1
1995	1.3	4.0	2.3	0.2
	30.7	17.3	4.0	1.5
	17.1	50.6	29.7	2.6
1997	0.9	3.3	1.8	0.2
	25.7	15.0	3.1	1.1
	14.3	53.5	29.2	2.9

Note: Row 1 shows the share of all workers in each particular industry by education level. Row 2 shows the share of all workers by level of education in each industry and row 3 shows the percentage of workers in each industry by level of education.

Table 6.35: Distribution of Employees in Agriculture, Forestry, Livestock and Fishing Sector by Qualification Level 1984 to 1997

	TYPES OF QUALIFICATION						
YEAR	No Qualification	Other Qualification	LCE	MCE	HSC	DIPLOMA	DEGREE
1984	7.9[1]	2.7	0.4	0.4	0.0	0.0	0.0
	15.6[2]	36.9	3.2	2.0	1.4	1.0	1.2
	68.4[3]	23.7	3.4	3.5	0.2	0.3	0.3
1989	7.0	1.8	0.4	0.5	0.0	0.0	0.0
	14.7	34.6	3.8	2.2	0.9	0.7	0.9
	71.4	18.0	4.1	5.5	0.3	0.3	0.4
1992	6.9	2.0	0.6	0.6	0.1	0.0	0.1
	17.0	39.9	4.2	2.3	2.0	0.9	1.2
	66.9	19.5	5.8	6.1	0.8	0.4	0.5
1995	5.1	na	0.6	0.6	0.1	0.0	0.0
	14.3		4.1	2.0	1.8	0.7	1.1
	65.2		7.9	7.8	1.0	0.5	0.6
1997	4.1	0.9	0.5	0.5	0.1	0.0	0.0
	11.8	25.7	3.8	1.6	1.5	0.7	0.5
	66.9	14.3	8.7	8.1	0.9	0.7	0.4

Note: Row 1 shows the share of all workers in each particular industry by qualification level. Row 2 shows the share of all workers by level of qualification in each industry and row 3 shows the percentage of workers in each industry by level of qualification.

6.4 The Distribution of Wages in Malaysia

This section will report on how wage levels have changed over time, and how these changes are associated with transformations in the skill levels of employees. The impact of these changes on the occupational and industrial structure will also be examined. Over the 1984-1997 period, real earnings for females increased by 44 percent, four times the increase in real earnings for males, which was just 10 percent during that particular period. Table 6.36 shows various measures of inequality based on differences between the median and upper and lower deciles. Looking first at the difference between median and the higher deciles for earnings overall, throughout the period from 1984-1997, the inequality of wages for both males and females narrowed. In contrast, the other measures of inequality widened especially between the higher and lower deciles. In terms of groups, males experienced more significant changes in wage inequality compared to females. Over the 1984-1997 period, for example, male wage inequality between the top ten and bottom ten percent increased by 78 percent, six times more than females, which increased by just 11 percent.

We will now discuss wage inequality between the median average and the bottom ten percent in further detail. Female wage inequality increased by 22 percent during the 1984-1997 period. This number marks two different patterns in two different periods. In the first pattern and period one (1984-1989), wage inequality of females decreased by 13 percent but male inequality showed an upward trend; although the change was less than 1 percent. This situation is in contrast to the second pattern. In the second pattern and in period two (1989-1992), wage inequality for females increased by 5 percent and male wage inequality decreased by 0.9 percent. Between 1995 and 1997, female wage inequality increased by 40 percent but the wage inequality for males widened, significantly with a 96 percent increase. The widening wage gap between the median average and the bottom ten percent was partly due to a drastic decrease in wages for the bottom ten percent, and an increase in wages at the median average level.

The inequality of wages between the top ten percent and the median average shows a narrowing pattern for both males and females. The inequality of wages decreased by 8 percent and 6 percent for females and males, respectively. Inequality of wages between the top ten percent and the bottom ten percent widened in the male group. Between 1984 and 1997, males showed an increase of almost 78 percent in wage inequality. In contrast, females only saw an 11 percent increase in wage inequality during the same period. The discussion above shows that wage inequality has widened between the top ten percent and the bottom ten percent, and also between the median and the bottom ten percent - especially for male groups. Over the 1984-1997 period, the real wages for males in the bottom ten percent fell by 37 percent. A large decrease in the real wages for the bottom ten percent widened the gap between the bottom ten percent and the median as well as between the median and the top ten percent. This situation did not occur for the female group, for whom the real wages for the bottom ten percent increased by 25 percent during the 1984-1997 period.

Table 6.36 Real Wages by gender, 1984-1997

		1984	**1989**	**1992**	**1995**	**1997**
Females	Mean	5489	5999	6421	7442	7941
	Median	4161	4421	4851	5626	6393
	Percentile					
	10	1506	1835	1917	2338	1888
	50	4161	4421	4851	5626	6393
	90	10724	11808	12237	14082	14990
	Measure of inequality					
	50-10	2.76	2.40	2.53	2.40	3.38
	90-50	2.57	2.67	2.52	2.50	2.34
	90-10	7.12	6.43	6.38	6.02	7.93
Males	Mean	8617	8768	9372	10411	9490
	Median	5924	6167	6518	7370	7061
	Percentile					
	10	2606	2699	2875	3324	1624
	50	5924	6167	6518	7370	7061
	90	15583	15777	16726	18637	17324
	Measure of inequality					
	50-10	2.27	2.28	2.26	2.21	4.34
	90-50	2.63	2.55	2.56	2.52	2.45
	90-10	5.97	5.84	5.81	5.60	10.66

Table 6.37 reports the average real wage by education level between 1984 and 1997. Generally, there were four groups, as follows: those with no schooling, those with primary education, secondary education, and finally those with tertiary education. Over the period (1984-1997), the average real wage increased by 19 percent for workers with no schooling, 9.5 percent for those with primary schooling and 9.2 percent for those with secondary schooling. The average real wage for workers with tertiary education, surprisingly, decreased by 14 percent during the same period.

Regarding wage inequality between the three percentiles of wages being considered, in the top ten percent, workers with lower educational backgrounds faced a large increase in real wages. The real income for workers with no schooling increased by 19 percent, and that for workers with primary education increased by 16 percent. This percentage is high compared to the changes for those with secondary education which increased by 8 percent. A fall in real wages occurred at tertiary education level. The real wage for workers with tertiary education decreased by 21 percent during the sample period. Interestingly, in the bottom ten percent, the real wage faced a decreasing trend in all categories of educational groups. The largest decreases occurred for those with a tertiary level of education, with 42 percent; followed by those in the primary education (38 percent), secondary education (18 percent) and no schooling (15 percent) categories. At median level, the real wage for no schooling, primary and secondary education show increasing changes. However, the real wage at median level for those with a tertiary level of education decreased by 13 percent during the sample period.

Over the 1984-1997 period, workers at the tertiary level of education showed a widening gap especially between the top ten percent and the bottom ten percent. In the bottom ten percent, the real wage for workers with tertiary education decreased by 42 percent and the real wage for the top ten percent decreased by 21 percent. In 1997, for example, wage inequality for workers between the top ten percent and the bottom ten percent was 9.35; reflecting higher inequality compared to other educational groups. Regarding the changes in the no schooling groups, real wages in the bottom ten percent decreased by 15.8 percent over the period 1984-1997. This percentage is small compared to the change for the top ten percent which increased by 19.5 percent. The fall in real wages in the bottom ten percent and the increase in the top ten percent constitute widening wage inequality between the top and bottom ten percent in 1997. The wage inequality between the top ten percent and median narrowed from 20.5 in 1984 to 1.95 in 1997. The narrowing gaps between these two percentiles were due to an increase in the wage at median level.

In the primary education group, real wages in the bottom ten percent decreased by 38 percent over the period 1984-1997. On the other hand, the real wages for the top ten percent increased by 16 percent. The real wage at the median level increased by 11 percent during the period, thus slightly increasing the gap between the top ten percent and median level by 5 percent. A similar trend occurred among those with secondary-level education. The real wage at the bottom ten percent decreased by 18 percent and the real wage at the top ten percent and at the median increased during the sample period by 8 percent and 20 percent respectively. The changes in wage inequality between the top and bottom ten percent is around 33 percent during the sample period. For example, in 1984, the wage inequality between the top and bottom ten percent is 5.64, and the wage inequality increased to 7.55 in 1997. This result indicates that the wage differential at secondary education level widened in 1997 but that the changes were quite small compared to other educational groups - especially primary education groups.

In terms of the percentage change in wage inequality, workers with primary education faced large changes. Over the period between 1984 and 1997, the changes in wage inequality between the top ten percent and the bottom ten percent was 89 percent, compared to changes of around 39 percent at the tertiary level of education, 33 percent at secondary level, and 41 percent among those with no school education. The real wage for the tertiary education group decreased in the top, median and bottom ten percent. In conclusion, the real wages among the highly-educated (skilled) workers decreased. The wider wage inequality was due to the decrease in the bottom ten percent being double that in the top ten percent, indicating that real- wage growth for skilled workers in the bottom ten percent was sluggish when compared with those skilled workers in the top ten percent throughout the sample period.

Table 6.37 Real Wages by Education Level

		1984	1989	1992	1995	1997
No schooling	Mean	3787	3751	3882	4390	4510.
	Median	3325	3243	3278	3726	4176
	Percentile					
	10	1158	1391	1437	1726	974
	50	3325	3243	3278	3726	4176
	90	6844	6477	6715	7742	8176
	Measure of inequality					
	50-10	2.87	2.33	2.28	2.15	4.28
	90-50	2.05	1.99	2.04	2.07	1.95
	90-10	5.91	4.65	4.67	4.48	8.39
Primary	Mean	5279	5306	5530	6067	5782
	Median	4530	4593	4786	5180	5020
	Percentile					
	10	1929	2137	2068	2390	1191
	50	4530	4593	4786	5180	5020
	90	9230	9121	9594	10389	10772
	Measure of inequality					
	50-10	2.34	2.14	2.31	2.16	4.21
	90-50	2.03	1.98	2.00	2.00	2.14
	90-10	4.78	4.26	4.63	4.34	9.04
Secondary	Mean	7487	7392	7666	8561	8178
	Median	5816	5930	6150	6943	6986
	Percentile					
	10	2413	2492	2875	3243	1959
	50	5816	5930	6150	6943	6986
	90	13619	13064	13443	14999	14801
	Measure of inequality					
	50-10	2.41	2.37	2.13	2.14	3.56
	90-50	2.34	2.20	2.18	2.16	2.11
	90-10	5.64	5.24	4.67	4.62	7.55
Tertiary	Mean	19710	17896	18795	19911	16903
	Median	13497	12858	12768	13813	11719
	Percentile					
	10	5821	4859	5192	5638	3351
	50	13497	12858	12768	13813	11719
	90	39936	35839	36470	39053	31357
	Measure of inequality					
	50-10	2.31	2.64	2.45	2.44	3.49
	90-50	2.95	2.78	2.85	2.82	2.67
	90-10	6.86	7.35	7.02	6.92	9.35

In Table 6.38, we can see that the decrease in the average real wage at the tertiary level of education includes those with high-school qualifications at 18 percent, diploma-level qualifications at 7 percent and those with degrees at 17 percent. The increase in average real wages at the secondary level of education is reflected in the fact that the wages of workers with no qualifications increased by 13 percent, compared to workers with primary qualifications, whose wages increased by just 2 percent. The limitation here is that we cannot determine the percentages of workers with secondary, primary or no schooling who contribute to the 'no qualification' group. Focusing on the groups at tertiary education level, the wage inequality widened for those workers having a degree qualification compared to the wage inequality of those with a diploma and a high-school qualification. The widening in wage inequality at degree level was due to the decrease in the bottom ten percent being 83 percent more than the decrease in the top ten percent. Wage inequality among the 'no qualification' group also widened in 1997, however this was due to an increase in the top ten percent of around 22 percent and a decrease in the bottom ten percent of 35 percent.

As seen in Table 6.38, during the sample period, the real- wage at the low-educated level – that is those with no qualifications and those having primary qualifications-increased for the highest earners. However at the middle and high levels of education, the changes in real wages amongst the better paid shows a decreasing trend, except for those with a diploma qualification. Although the real wage for the top ten percent slightly increased by 6 percent, wage inequality between the top ten percent and the bottom ten percent was still large, due to an increase in the real wage of 53 percent for the bottom ten percent.

Table 6.38: Average wage by qualification

		1984	1989	1992	1995	1997
No Qualification	Mean	5355	5378	5612	6245	6068
	Median	4560	4603	4792	5194	5280
	Percentile					
	10	1901	2136	2089	2446	1218
	50	4560	4603	4792	5194	5280
	90	9268	9321	9748	10827	11318
	Measure of inequality					
	50-10	2.39	2.15	2.29	2.12	4.33
	90-50	2.03	2.02	2.03	2.08	2.14
	90-10	4.87	4.36	4.66	4.42	9.29
LCE	Mean	7144	7143	7057	7678	7315
	Median	5792	5997	5804	6305	6369
	Percentile					
	10	2664	2698	2875	3142	1692
	50	5792	5997	5804	6305	6369
	90	12456	12136	11914	13121	13158
	Measure of inequality					
	50-10	2.17	2.22	2.01	2.00	3.76
	90-50	2.15	2.02	2.05	2.08	2.06
	90-10	4.67	4.49	4.14	4.17	7.77
MCE	Mean	9283	8873	8961	9671	9186
	Median	7154	7192	7317	7958	7916
	Percentile					
	10	3364	3013	3412	3868	2437
	50	7154	7192	7317	7958	7918
	90	16590	15507	15527	16515	16162
	Measure of inequality					
	50-10	2.12	2.38	2.14	2.05	3.24
	90-50	2.31	2.15	2.12	2.07	2.04
	90-10	4.93	5.14	4.55	4.26	6.63
HSCE	Mean	13449	12123	11434	12716	10953
	Median	9994	8637	8637	9880	9334
	Percentile					
	10	4254	3563	3740	4368	2457
	50	9994	8637	8637	9880	9334
	90	25741	23986	21361	22909	20551
	Measure of inequality					
	50-10	2.34	2.42	2.30	2.26	3.79
	90-50	2.57	2.77	2.47	2.31	2.20
	90-10	6.05	6.73	5.71	5.24	8.36

Table 6.38: Average wage by qualification (continued)

		1984	1989	1992	1995	1997
Diploma	Mean	15099	13817	14664	16390	14052
	Median	12346	11843	11688	12608	11511
	Percentile					
	10	7472	6431	7230	7481	3471
	50	12346	11843	11688	12608	11511
	90	23167	21151	23513	29255	24571
	Measure of inequality					
	50-10	1.65	1.84	1.61	1.68	3.31
	90-50	1.87	1.78	2.01	2.32	2.13
	90-10	3.10	3.28	3.25	3.91	7.07
Degree	Mean	31659	29621	32199	33383	26416
	Median	23774	22946	23005	23657	18190
	Percentile					
	10	11922	10868	11637	12243	4753
	50	23774	22946	23005	23657	18190
	90	57659	54012	59544	60761	51450
	Measure of inequality					
	50-10	1.99	2.11	1.97	1.93	3.82
	90-50	2.42	2.35	2.58	2.56	2.82
	90-10	4.83	4.96	5.11	4.96	10.82

Table 6.39 shows the same wage data by occupation. As can be seen the increase in real wages during the 1984-1997 period was also evident in agricultural, animal husbandry and forestry workers, fisherman and hunters, at 23 percent. This is followed by production & related workers, transport equipment operators and labourers at 22 percent. In contrast, administrative and managerial workers saw a wage decrease of 21 percent during the same period. It is interesting to note that the average wage for the bottom ten percent decreased for all occupation groups; for administrative and managerial workers, wages decreased by 59 percent; and this was followed by professional, technical and related workers, with a decrease of 49 percent. Services workers and agricultural, animal husbandry and forestry workers, fisherman and hunters groups saw smaller decreases during the sample period, of

14 and 18 percent, respectively. This result shows that during the period 1984-1997, the real wages for educated workers in the bottom ten percent were more elastic compared to non-educated workers. During this period, the real wage at the bottom ten percent for administrative and managerial workers and professional, technical and related workers increased by 11 percent and 10 percent, respectively whilst for services and animal husbandry and forestry workers, fisherman and hunters, the average wage increased during the 1984-1995 period by 44 and 37 percent respectively.

Looking at the changes in wage inequality, the differences between the median and the bottom ten percent for professional, technical and related workers showed widening inequality compared to other occupational groups - especially in 1997. However, from 1984 to 1992, wage inequality among service workers was higher compared to other occupational groups. Wage inequality between the top ten percent and the bottom ten percent shows that sales workers experienced widening inequality - especially in 1992. However in 1997, wage inequality widened, especially for administrative and managerial workers.

Table 6.39: Average wage by occupation groups

		1984	1989	1992	1995	1997
Professional, Technical & Related workers	Mean	13919	13974.81	14820.68	15259.08	13612.07
	Median	10612	10978.70	11251.12	11707.66	10624.59
	Percentile					
	10	4518	4688.73	4802.42	4990.43	2301.34
	50	10612	10978.70	11251.17	11707.66	10624.59
	90	25249	24833.67	26073	26560.97	23766.67
	Measure of inequality					
	50-10	2.35	2.34	2.34	2.35	4.62
	90-50	2.38	2.26	2.32	2.27	2.24
	90-10	5.59	5.30	5.43	5.32	10.33
Administrative & Managerial workers	Mean	31337	31496.66	33724.9	34180.29	24649.32
	Median	23810	23972.10	25274.19	25021.24	16342.39
	Percentile					
	10	10252	10107.72	10640.08	11442.89	4196.22
	50	23810	23972.10	25274.19	25021.24	16342.39
	90	58779	60000.65	63763.81	62337.26	51156.15
	Measure of inequality					
	50-10	2.32	2.37	2.38	2.19	3.89
	90-50	2.47	2.50	2.52	2.49	3.13
	90-10	5.73	5.94	5.99	5.45	12.19

Table 6.39: Average wage by occupation groups (continued)

		1984	1989	1992	1995	1997
Clerical & Related workers	Mean	7994	8562.578	8687.099	9263.456	8976.401
	Median	6761	7227	7468.83	7865.55	8029.03
	Percentile					
	10	3499	3686.27	3955.69	4243.02	2504.84
	50	6761	7227	7468.83	7865.55	8029.03
	90	14018	14523.59	14523.87	15584.31	15678.95
	Measure of inequality					
	50-10	1.93	1.96	1.89	1.85	3.21
	90-50	2.07	2.01	1.94	1.98	1.95
	90-10	4.01	3.94	3.67	3.67	6.26
Sales workers	Mean	7502	6829.969	8087.156	9073.421	8413.376
	Median	4923	4791.25	5569.27	6075.44	6369.74
	Percentile					
	10	2027	2126.53	2253.91	2488.31	1625.44
	50	4923	4791.25	5569.27	6075.44	6369.74
	90	14846	13579.42	17123.82	18347.98	16733.96
	Measure of inequality					
	50-10	2.43	2.25	2.47	2.44	3.92
	90-50	3.02	2.83	3.07	3.02	2.63
	90-10	7.32	6.39	7.60	7.37	10.30

Table 6.39: Average wage by occupation groups (continued)

		1984	1989	1992	1995	1997
Service workers	Mean	5825	6061.306	6368.913	6998.106	6936.215
	Median	4842	5174.39	5358.38	5900.60	6022.45
	Percentile					
	10	1737	2151.73	2156.77	2518.24	1484.42
	50	4842	5174.39	5358.38	5900.60	6022.45
	90	10386	10600.44	11071.44	12105.83	12420.89
	Measure of inequality					
	50-10	2.79	2.40	2.48	2.34	4.06
	90-50	2.14	2.05	2.07	2.05	2.06
	90-10	5.98	4.93	5.13	4.81	8.37
Agricultural, Animal Husbandry & Forestry Workers, Fishermen & Hunters	Mean	3799	4100.346	4318.809	4613.396	4696.139
	Median	3244	3290.78	3364.57	3868.02	3930.57
	Percentile					
	10	1286	1619.94	1677.49	1762.77	1047.97
	50	3244	3290.78	3364.57	3868.02	3930.57
	90	6141	6479.69	7046.42	7603.94	8432.78
	Measure of inequality					
	50-10	2.52	2.03	2.01	2.19	3.75
	90-50	1.89	1.97	2.09	1.97	2.15
	90-10	4.78	4.00	4.20	4.31	8.05

Table 6.39: Average wage by occupation groups (continued)

		1984	1989	1992	1995	1997
Production & Related workers, Transport Equipment Operators & Labourers	Mean	5801.432	5798.064	6296.069	7071.898	7086.596
	Median	5212	4947.91	5320.04	6017.88	6233.67
	Percentile					
	10	2108	2213.85	2543.40	3006.13	1656.85
	50	5012	4947.91	5320.04	6017.88	6233.67
	90	9847	9890.88	10787.54	12399.82	12998.09
	Measure of inequality					
	50-10	2.38	2.23	2.09	2.00	3.76
	90-50	1.96	2.00	2.03	2.06	2.09
	90-10	4.67	4.47	4.24	4.12	7.85

The change in average real wages by sector is shown in Table 6.40. During the period 1984-1997, the average real wage for all sectors increased significantly, but this is especially in the construction sector. This sector recorded an increase in the real wage of 35 percent. It is surprising to note that the changes in average real wages in the agricultural sector were higher than those of the manufacturing sector. The agricultural sector recorded a 24 percent increase compared to the manufacturing sector, where wages increased by 18 percent. The mining and quarrying sector, however, showed only minor changes in the average real wage, at just below 4 percent. Regarding changes amongst the lowest paid, the real wage in the mining and quarrying sector went down by 71 percent during the sample period. Wages in the electrical, gas and water sector also decreased by 78 percent. On the other hand, the manufacturing sector was the only sector to record an increase amongst the lower paid, although this change was less than 4 percent. The manufacturing sector also recorded a large change at the median level. During the whole period (1984-1997) the median real wage in the sector increased significantly, by 36 percent, compared to the electrical, gas and water sectors (29 percent), construction (30 percent) and the restaurant and hotel sector (32 percent). Amongst the higher paid, the construction sector showed an increase of 48 percent, widening the gap in wage inequality between the top and the bottom ten percent in this sector.

These tables also reveal that wage inequality in 1997 showed an abnormal trend compared to other years. Looking at the wage inequality between the top ten percent and the bottom ten percent, there was a widening trend, especially in the mining and quarrying and the electricity, gas and water sectors. Wage inequality between these groups was 38.53 for mining and quarrying and 23.27 for the electrical, gas and water sector, respectively. These results indicate that the real wages for skilled workers in these sectors grew much more rapidly than the wages for unskilled workers. In contrast to the trend for other sectors, the real wages at bottom ten percent in the manufacturing sector increased by 3 percent. In the top ten percent, the real-wage in the manufacturing sector increased by 19 percent. This result indicates that the wage inequality in the manufacturing sector was not as wide as the wage differential in other sectors especially in mining and quarrying, and the electrical, gas and water sector.

Table 6.40: Average wage by sector

		1984	1989	1992	1995	1997
Mining and Quarrying	Mean	14681	15065.61	20284.23	17834.64	15173
	Median	7530	8643	9325	10110	8374
	Percentile					
	10	3521	3595	3834	4472	1998
	50	7530	8643	9325	10110	8374
	90	28103	36429	43323	44144	38479
	Measure of inequality					
	50-10	2.13	2.40	2.43	2.26	3.19
	90-50	3.73	4.21	4.64	4.36	4.59
	90-10	7.98	10.13	11.29	9.87	18.25
	Mean	6792	6976	7321	8409	8056
Manufacturing	Median	4634	4754	5116	5861	6304
	Percentile					
	10	1930	2159	2425	2901	2005
	50	4634	4754	5116	5861	6304
	90	12278	12157	12375	14588	14668
	Measure of inequality					
	50-10	2.39	2.20	2.10	2.02	3.14
	90-50	2.64	2.55	2.41	2.48	2.32
	90-10	6.35	5.62	5.10	5.02	7.31

Table 6.40: Average wage by sector (continued)

		1984	1989	1992	1995	1997
Electricity, Gas and Water	Mean	10659	9583	10428	12650	13568
	Median	6864	7645	8492	9995	8863
	Percentile					
	10	4263	4867	4879	5262	1934
	50	6864	7645	8492	9995	8863
	90	20369	15738	16546	21234	21746
	Measure of inequality					
	50-10	1.61	1.57	1.74	1.89	3.58
	90-50	2.96	2.05	1.94	2.12	2.45
	90-10	4.77	3.23	3.39	4.03	10.2
Construction	Mean	6969	6735	7457	9620	9467
	Median	5225	5074	5751	6864	6824
	Percentile					
	10	2322	2645	2875	3237	1624
	50	5225	5074	5751	6864	6824
	90	11006	10531	12816	16656	16391
	Measure of inequality					
	50-10	2.25	1.91	2.00	2.12	4.20
	90-50	2.10	2.07	2.22	2.42	2.40
	90-10	4.74	3.98	4.45	5.14	10.08

Table 6.40: Average wage by sector (continued)

		1984	1989	1992	1995	1997
Wholesale & Retail Trade	Mean	7884	7708	8604	9694	8929
	Median	5322	5156	5798	6475	6698
	Percentile					
	10	2317	2250	2636	2626	1952
	50	5322	5156	5798	6475	6698
	90	15171	14680	16603	18606	16866
	Measure of inequality					
	50-10	2.29	2.29	2.19	2.46	3.43
	90-50	2.85	2.84	2.86	2.87	2.51
	90-10	6.54	6.52	6.29	7.08	8.63
Restaurants and Hotels	Mean	5309	5257	5930	6641	6949
	Median	4255	4359	4792	5180	5659
	Percentile					
	10	1737	1943	1995	2158	1479
	50	4255	4359	4792	5180	5659
	90	9857	9196	10584	11852	12412
	Measure of inequality					
	50-10	2.44	2.24	2.40	2.40	3.82
	90-50	2.31	2.10	2.20	2.28	2.19
	90-10	5.67	4.73	5.30	5.49	8.39

Table 6.40: Average wage by sector (continued)

		1984	1989	1992	1995	1997
Transport, Storage and						
	Mean	8064	8781	9656	10884	9676
Communication	Median	6372	6920	7448	8311	7820
	Percentile					
	10	3244	3239	3527	4236	2007
	50	6372	6920	7448	8311	7820
	90	13265	14402	15824	18529	17327
	Measure of inequality					
	50-10	1.96	2.13	2.11	1.96	3.89
	90-50	2.08	2.08	2.12	2.22	2.21
	90-10	4.08	4.44	4.48	4.37	8.62
Finance, Insurance,						
	Mean	12701	12760	14961	16229	13795
Real Estate	Median	7621	7979	9458	10573	9485
&Business Services	Percentile					
	10	3379	3595	4230	4835	2640
	50	7621	7979	9458	10573	9485
	90	26599	26246	31901	32247	26720
	Measure of inequality					
	50-10	2.25	2.21	2.23	2.18	3.59
	90-50	3.48	3.28	3.37	3.05	2.81
	90-10	7.87	7.29	7.54	6.66	10.12

Table 6.40: Average wage by sector (continued)

		1984	1989	1992	1995	1997
Community, Social and Personal Services	Mean	8594	8929	9408	9847	9310
	Median	6661	7295	7735	8327	7926
	Percentile					
	10	2801	2979	3192	3591	1624
	50	6661	7295	7735	8327	7926
	90	15084	15600	16381	16769	16619
	Measure of inequality					
	50-10	2.37	2.44	2.42	2.31	4.87
	90-50	2.26	2.13	2.11	2.01	2.09
	90-10	5.38	5.23	5.13	4.66	10.22
Agriculture. Forestry, Livestock and Fishing	Mean	4050	4336	4870	5248	5030
	Median	3232	3239	3355	3868	3899
	Percentile					
	10	1286	1619	1677	1762	1218
	50	3232	3239	3355	3868	3899
	90	6912	7418	8405	9369	9371
	Measure of inequality					
	50-10	2.51	1.99	2.00	2.19	3.20
	90-50	2.13	2.29	2.50	2.42	2.40
	90-10	5.37	4.58	5.01	5.31	7.69

6.5 Conclusions

The discussion presented in the chapter indicates some interesting trends in the Malaysian labour market. In terms of employment participation rates, those for both males and females increased across all sectors. However, there is a large and persistent gap between male and female participation rates in the labour force. Males were 40 percent more likely to be employed than females. Generally, the manufacturing sector contributed most to employment growth in Malaysia during the 1990s reflecting the effects of economic structural change. Associated with this change, the demand for production workers also increased drastically. Although the growth in production workers amongst males is higher than for females, females workers were still affected by the structural change of the economy from agriculture to an industrialized economy. The majority of females in fact are as production workers especially in the electrical and the electronic sector.

In terms of education levels amongst production workers, we found that production workers in Malaysian manufacturing have low to medium levels of education. Most production workers in Malaysia are those with secondary and no qualification levels. It was also evident that females are also concentrated in labour-intensive operations, especially as clerical workers. In the mid 1990s, the data shows that the trend is for female workers to be employed in sales and service sector jobs. At the administrative and managerial levels, the participation of men was three time that of women (3.2 percent compared to 1.0 percent).

Overall, the average number of years of schooling in formal education increased from 8 years in 1984 to 9.2 years in 1997. This means that in 1997, schooling was completed at an average age of 15 years old. This change occurred primarily through a greater percentage of people in the secondary and tertiary levels of education, and a decreasing proportion of people leaving after primary education. Despite the massive expansion of education and improvement in educational attainment, the average return decreased in 1997. During the 1995-1997 periods, the average wage for those with tertiary education saw a massive reduction of 17 percent, compared to other education levels. For those with secondary and primary education, the corresponding figures were both at 4 percent.

Not unexpectedly, education is strongly linked to occupation levels, so that those with tertiary education work as professional and managerial workers and those with secondary education levels work in production and clerical jobs. However, those employees with secondary qualification levels (MCE) are more likely to be found in the professional, managerial and clerical groups. Workers with primary and no qualification education tend to enter production and agricultural work. This situation implies that employees in the labour force in Malaysia on average operate at low and middle levels of education.

As far as the inequality of wages is concerned, during the sample period, there was a significant increase in wage inequality amongst males compared to female workers. This situation arose because at the bottom ten percent, real wages for males significantly fell in contrast to what happened to females. Interestingly, at the top ten percent, real wages for female workers continued to increase during the sample period whereas, the real wage for males workers fell in 1997.

It is interesting to note that, the movement in real wages is very dependent on economic situations. During the 1984-1989 period, average income increased by just 3 percent. This situation was probably due to the 1985-1986 recession. However, in the 1989-1995 period, real income increased by 16 percent, despite a decrease in the average real wage in the period during 1995 to 1997 - mostly because of the 1997 recession. Professional and technical, administrative and managerial positions saw a marked growth in the number of educated workers who also commanded higher wages. In fact, agricultural workers earned 80 percent less than workers in the managerial category. The gap between the two groups widened during the 1984-1995 period, but narrowed slightly in 1997. Overall, an examination of wage inequality across sectors allows us to conclude that workers in finance, insurance, real estate and business services, electricity, gas and water and mining and quarrying earn wages that are, on average, more than double those earned in the agriculture, forestry, livestock and fishing sectors.

Overall, this chapter has provided a descriptive analysis of trends in the labour market in Malaysia and thus set the scene for the analysis presented in the next chapter. As noted earlier, the availability of micro data from the Household Income Surveys presents us with an opportunity to undertake a detailed analysis of changing wage inequality in Malaysia using a variety of different empirical approaches, including some additional to those used in Chapter 5. This analysis, which we report in Chapter 7, therefore complements that presented in Chapter 5 though the focus remains that of examining how technology and trade have contributed to the changes in wage inequality in Malaysia.

CHAPTER 7

WAGE DIFFERENTIALS IN MALAYSIA, 1984-1997

7.1 Introduction

In the previous chapter, the way employment and wages changed during the 1980's and 1990's was documented. Two explanations for the observed changes were considered; the first was that technological progress, possibly associated with the computer revolution, had raised the relative demand for more skilled and educated labour and reduced the demand for less skilled and educated labour, as explained through the skill-biased technological change (SBTC) hypotheses.

The second explanation concerned the effects of globalisation on wage structures and employment. This explanation corresponds to the transition from an economy predominantly based on agriculture to one with a manufacturing base. This resulted from changes in the pattern of trade and led to a shift in employment towards sectors that were more skilled and education-intensive. As explained in Chapter 2, Malaysia has historically been a natural resource-based economy. However, in the 1980's and 1990's there was a major increase in the proportion of total exports made up of manufactured goods.

Overall, the results so far indicate that there has not been skill-biased technological change, but that changes in technology have resulted in a shift towards semi-skilled labour. This has been a consequence of the way in which technological change has impacted upon the Malaysian labour market, rather than of changes in the pattern of trade. Important sectoral differences are also evident.

This chapter will examine these hypotheses further, using micro data from the Malaysian Household Income Survey (HIS) 1984-1997, and focusing on the impact of technological change and trade flows on wage differentials in Malaysia over the period 1984 to 1997. The approach is therefore slightly different from that in Chapter 5, which focused on relative demand and wages for labour in the manufacturing sector only. This chapter will concentrate on the impact of technological change and trade on relative demand and wages for the whole economy, as well as for manufacturing only during the period 1984-1997. It will also present a picture of the educational achievements and qualifications held by workers in the Malaysian labour market during the sample period. The analyses presented involve three approaches: a decomposition analysis similar to that in Chapter 5; one using standard earning functions to estimate the effects of trade and technology on relative demand; and an analysis based on the mandated-wage model proposed by Haskel and Slaughter (2001).

The analysis will start with an extension of the work presented in Chapter 5. It estimates the changes in the relative demand for workers of different skill levels in the Malaysian labour market over the period 1984-1997. The advantage of this analysis over that of Chapter 5 is that education, age and gender can now also be considered. In fact, the HIS data allows us to use the supply-and-demand framework developed by Katz and Murphy (1992) and Blau and Khan (1996). This framework was chosen because it is well documented in the literature and has been widely applied to both developed and developing countries. For example, studies were conducted for developed countries by Blau and Khan, 1996; Berman, Bound and Griliches, 1994; and Bound and Johnson, 1992 as well as the work of Katz and Murphy. In developing countries, similar work was done by Chamarbagwala, 2006; and Liu, 2006.

Following Katz and Murphy, two approaches are used to measure the effects of trade on the demand for workers by skill type: the equal allocation and the production allocation methodologies. As noted in Chapter 4, changes in employment that result from changes in the pattern of trade may be of a similar magnitude to those that result from changes in domestic demand. This is the so–called equal allocation measure of the impact of trade and is captured by simply including net imports in the analysis. On the other hand, trade-induced changes may have very different effects to those associated with changes in domestic demand. This is labelled the production workers allocation effect. The assumption made by Katz and Murphy is that exports and domestic demand have similar effects on employment but that changes in imports are more likely to affect production workers than non-production workers. To capture these differential effects, export and imports are included separately.

In Section 7.3, we present basic facts concerning wage inequality in Malaysia over the 1984-1997 period based on the HIS data. This provides the background to the main empirical analysis of wage determination. In Section 7.4, we employ a two-stage estimation model to investigate the effect of trade on wages in the manufacturing industries. We follow Attanasio *et al.* (2003) and Pavcnik *et al.* (2004) for this purpose and estimate the log wage differentials relating to individual characteristics and industry affiliations in stage one. In stage two, we investigate the effects of trade and technological change on industrial wage structures by pooling estimated wage premiums calculated from employment-weighted average wages over time. A further two-stage analysis is undertaken by skill level.

In Section 7.5, we move the focus of the analysis to wage differentials by education level. Following Tsou (2002), we employ a similar two-stage model to that used in section 7.4 in which stage one analyses the relationship between wage differentials, education and other demographic controls such as age and marital status. The main focus in this section is on the movement in wage differentials, and there will be an examination of how the differential between skill groups has shifted over time. These are compared with the results presented in Chapter 5, although the focus here will be on the differential by qualification. The way in which the composition of the work has changed in terms of skills, and how these changes have differed across the years, will also be shown. Stage two is concerned with measuring the effects of technology and trade; in particular, we will estimate how the effects of technological change and trade differ by levels of education at an industry level. For each of the above factors, we will discuss the channels through which trade or technological changes are expected to have an effect, and then examine whether our expectations are confirmed.

In Section 7.6, a further analysis of trade and wage inequality in Malaysia is presented. This is concerned with examining the effects of trade on wage differentials in Malaysia by comparing traded and non-traded sectors of the economy. In order to define the traded and non-traded sectors, we follow Disney and Kiang's (1990) study of the open economy in Singapore and some studies of Asian economies (such as by Mazumdar (1993) and the Malaysian Economic Research Institute (2000)). This section provides an analysis of the changes in skill differentials across sectors between the two decades. Finally, in the last section of this chapter (Section 7.7) we will provide a summary of all the findings obtained from the different tests that have been carried out.

As noted earlier in this chapter, HIS data for 1984, 1989, 1992, 1995 and 1997 is used. There are several restrictions on this data. Firstly, all workers who are employed in the agricultural sector are excluded from the study[23]. This is because the wages in this sector are unreliable as a result of the largely informal nature of employment in Malaysian agriculture. Secondly, the analysis is restricted to employees of working age (15 to 64). Thirdly, we focus on employees; thus, the self-employed are excluded from the study. To investigate the impact of trade, information from HIS is supplemented by information on imports and exports taken from the Ministry of Trade.

7.2 Decomposition Analysis

As an extension to the previous analysis in Chapter 5, this section proposes a simple supply-and-demand framework to analyse the changes in the Malaysian wage structure from 1984 to 1997. We follow Katz and Murphy (1992) for this purpose, and utilise their framework to test the hypotheses of SBTC and trade on the relative demand for labour. This analysis mirrors the decomposition approach used in Chapter 5. Again, between-industry effects represent the impact of trade, while within-industry effects represent technological change. The availability of data on gender also enables us to compute the decomposition by gender. To estimate the labour supply equivalents of trade, we also follow Katz and Murphy (1992) by transforming trade flows into labour supply equivalents on the basis of the utilization of labour inputs in the domestic

[23] Agriculture is excluded from the analysis due to the fact that the data is unreliable (due to measurement error) and because there are significant numbers of unpaid family workers. Furthermore, the sector is very sensitive to economic fluctuations and high rates of turnover. As a result, wage inequality varies significantly over time. The decision to exclude agriculture also reflects the fact that what is happening to the sector in the process of economic development is a separate (though obviously linked) story to what is happening in the rest of the economy. The exclusion of the self-employed is again based on the fact that income data for this group is subject to significant measurement error due mainly to under-reporting. There is also definitional problems, again relating to family members working (often unpaid) in family businesses who may be classed as self-employed.

manufacturing industries. The analysis considers the direct labour supply embodied in trade under two approaches the equal allocation and the production allocation measures.

7.2.1 Measured Demand Shifts, 1984-1997

Using the supply-and-demand framework suggested by Katz and Murphy (1992) this study measures both within and between-sector components of relative factor demands to explain wage changes.

We measure the overall changes for group k (gender) during the 1984-1997 period as follows:

$$\Delta X_k^d = \frac{\Delta D_k}{E_k} = \sum_j \left(\frac{E_{jk}}{E_k}\right)\left(\frac{\Delta E_j}{E_j}\right) = \frac{\sum_j \alpha_{jk} \Delta E_j}{E_k} \qquad \text{(Equation 7.1)}$$

where j indexes sector and refers to the 60 occupation-industry cells, and α_{jk} is group k's share of total employment in sector j in the base year. In this study, the base year is the average share of total employment in sector j of group k over the 1984-1997 period. ΔE_j refers to the differences between the 1984 and 1997 shares of total labour input employed in sector j, and E_k is the 1984 share of the total labour input of group k. The demand index thus calculates the percentage change in demand for group k as a weighted average of the percentage changes in sector employment, in which the weights are group-specific employment distributions. We have again decomposed the overall index into between-sector and within-sector components. The between-sector demand shift index for group k, ΔX_k^b, is given by the index in panel 1 of Table 7.1 when j refers to 10 sectors. We define the within-sector demand shift index for k, ΔX_k^w as the difference between the overall demand shift index and the between-sector demand shift index: $\Delta X_k^w = \Delta X_k^d - \Delta X_k^b$. These within-sector demand shifts reflect shifts in employment among occupations within sectors.

In order to explain the relative demand shift, this study begins by examining the results by type of education. As noted in Chapter 6, four levels of schooling are used, namely no schooling, primary, secondary and tertiary level education. The results are reported in Table 7.1, which shows the relative demand shifts in labour for the overall period 1984-1997 and for four sub-periods, (1984-1989), (1989-1992), (1992-1995) and (1995-1997). Table 7.1 consist of three different panels: panel 1 shows the between-sector demand shift; panel 2 presents the within-sector demand shift; and panel 3 presents the overall (occupation-industry) demand shift. The between-sector component represents the shifts in employment among sectors caused by changes in the demand for workers as a result of changes in patterns of trade. The within-sector element represents the relative demand for labour shift within sectors because of the effects of technological change.

As mentioned earlier, the overall measure (occupation-industry) of the demand shift index for group k is considered when j indexes 60 occupation-sector cells. Ten sectors and six occupations are considered in this measurement. The industry groups are: mining, manufacturing, electrical and gas, construction, the wholesale trade, hotels and restaurants, transportation, finance, community social and personal services and other industries. The six occupations are: professional, managerial, clerical, sales, service workers and production workers.

Table7.1: Sector and Occupation Based Demand Shift Measures, 1984-1997

1

Between Industry j=10

	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No school	-2.961	3.175	-0.188	2.636	2.663
Primary	-1.672	1.799	-0.331	1.578	1.373
Secondary	0.555	0.032	0.004	0.077	0.667
Tertiary	0.432	-0.152	-0.001	-0.769	-0.490
Female					
No school	-1.878	0.737	-1.522	-0.521	-3.184
Primary	1.744	4.454	-2.410	-2.282	1.506
Secondary	0.072	0.454	0.410	-0.381	0.555
Tertiary	-2.270	-7.671	1.318	3.373	-5.251

2

Within-Industries

	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No school	-3.303	3.582	-7.245	0.045	-6.921
Primary	0.735	-1.855	0.086	-1.619	-2.652
Secondary	0.881	0.117	0.248	-0.277	0.969
Tertiary	3.456	-5.092	-0.474	-1.537	-3.648
Female					
No school	-0.386	-0.011	0.862	0.796	1.262
Primary	-1.807	-4.449	2.383	2.250	-1.622
Secondary	0.108	-0.030	0.163	0.158	0.400
Tertiary	0.214	-0.407	0.069	0.032	-0.092

3

Overall Industry j =60

	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No school	-6.264	6.757	-7.433	2.682	-4.258
	(1730)*	(1138)	(1101)	(632)	(1730)
Primary	-0.937	-0.056	-0.245	-0.041	-1.279
	(13172)	(10980)	(9985)	(6203)	(13172)
Secondary	1.436	0.148	0.252	-0.200	1.636
	(19766)	(21351)	(23124)	(17164)	(19766)
Tertiary	3.888	-5.244	-0.475	-2.307	-4.138
	(2080)	(4751)	(5372)_	(2617)	(2080)
Female					
	-2.264	0.726	-0.660	0.274	-1.923
No school	(1316)	(1010)	(920)	(764)	(1316)
	-0.063	0.005	-0.026	-0.032	-0.116
Primary	(4075)_	(3875)	(3879)	(2516)	(4075)
	0.180	0.425	0.573	-0.222	0.955
Secondary	(10183)	(11810)	(13067)	(9340)	(10183)
	-2.057	-8.078	1.387	3.405	-5.343
Tertiary	(3870)	(2988)	(3531)	(4034)	(3870)

Note: *The number in parentheses are base year totals.

The results for the period 1984-1997 and the overall changes in relative demand, as shown in panel 3 of Table 7.1, will be examined first. The relative demand for males is positive for employees with a secondary education. Similarly, the shifts in the relative demand for females clearly favours those workers with a secondary education. The relative demand for male and female workers are quite similar. As the table shows, there is a strong decline in the demand for those males having no-schooling followed by those having tertiary and primary education levels, whereas the relative demand for females is away from those with tertiary education, no schooling and primary education levels. These results support our findings in Chapter 5, that the relative demand for labour was away from skilled and unskilled workers towards semi-skilled workers.

Focusing on the results for male employees, Table 7.1 also shows that overall shifts in relative demand are predominantly due to changes taking place within industries which arises because of technological change. Between–industry shifts (that represent the changes in pattern of international trade) are, in general, smaller than within-industry shifts, and this is especially the case for those having tertiary and no schooling education levels. It is also interesting to note that there was a clear shift away from male employees with tertiary levels of education, and that this resulted both from the shift brought about by changes in technology and also as a result of changes in the pattern of trade away from higher skilled and educated workers. There is also a positive relationship between the relative demand for workers with a secondary level education and changes in technology.

As regards the changes in the relative demand for female workers, overall changes were towards those females with a secondary education. Interestingly, in contrast to the findings for male employees, the overall shift in the demand for female workers was caused largely by between-sector changes. This result indicates that changes in the pattern of trade have increased the relative demand for female workers with a secondary education. Trade is also responsible for the fall in the relative demand for female workers with a tertiary education. These findings provide support for the hypothesis that trade liberalization has raised the demand for, and return to, the abundant factor of production and away from a return to the sparse factor of production.

If we consider the results by sub-period, we see some interesting differences. First, looking at male employees, it can be seen that the shift towards employees with a secondary level of education continued from 1984 through to 1995, but then there was a shift in favour of the least educated between 1995 and 1997. Changes that were taking place in favour of this latter group began in the mid-1990s, following a decline in employment share throughout the 1980s. It is also worth noting that the decline in the other less educated group (primary schooling) continued through the whole period under study, whereas there was an increase in the relative demand for the most skilled through the 1980s, but a shift away from them thereafter. During the period 1984-1989, the shift in relative demand was mainly caused by within-sector effects especially for those with secondary and tertiary education, indicating a relative shift away from workers with the lowest level of education and towards better educated workers. This suggests that skill-biased technological change occurred during this period. Trade effects were, generally, in favour of those with secondary and tertiary education, though these effects were relatively small.

For female employees, the general trend is one of falling demand for unskilled and skilled workers (those with no schooling and tertiary levels of education) in favour of the semi-skilled (secondary education level). Interestingly, employment shifted away from female employees with higher levels of education through the 1980s, but in favour of them during the 1990s. During the period 1984-1989, the shifts in the relative demand for female workers with a secondary education were mainly due to within-sector shifts. There were also significant technology-related, within-sector shifts away from those with no schooling and/or primary schooling. Within-sector shifts also resulted in an increase in the demand for females educated at tertiary level, though here the effect was not as strong as the trade-induced between-sector shift away from the group.

The results indicate a continued shift in employment for both males and females with moderate levels of education at the start of the 1990s, though the reasons are different. Male employment was increasing in relative terms due to changes in technology. For female employees, the overall impact was the result of changes in trade patterns. In the mid-to late 1990s, a similar pattern was evident: in the case of male employees, technological change was biased towards the semi-skilled and against the more educated. In contrast, changes in female employment were affected by changes in the pattern of trade.

Relative Demand for Different Types of Qualification

It is interesting to explore the demand for labour by types of qualification achieved. The results of the decomposition analysis by educational attainment categories are presented in Table 7.2. The divisions in Table 7.2 are similar to those used in Table 7.1.

Not unexpectedly, the results are similar to those presented above. During the sample period (1984-1997) the shifts in relative demand favoured male workers with no qualifications, those with other qualifications and those with primary and secondary qualifications. For female workers, the shifts in demand favoured those females having no qualifications. The shifts in the relative demand for males are dominated by within-sector effects at medium levels (secondary qualifications) and high levels of education (degree and diploma holders). On the other hand, between-sector effects are more important than within-sector effects at low levels of education (no qualification and other qualification). These results again indicate that changes in technology are the main cause of the shifts in relative demand for male workers in Malaysia. The effects of technological change have increased the relative demand for males with secondary education qualifications and decreased the relative demand for male workers at high levels of education. Trade, on the other hand, is responsible for the increasing relative demand for males at low levels of education.

On the other hand, the shift in the relative demand for female workers during the sample period was dominated by between-sector effects. Trade has moved in favour of female workers with secondary qualifications and those with no qualifications. Changes in the pattern of trade, however, also decreased the relative demand for females with higher levels of education. Technology appeared to be in favour of increased relative demand for female workers with higher levels of education, though the effects of this were not strong enough to contribute significantly to the overall changes in relative demand.

To sum up the above discussion, the findings in Chapter 5 indicate that the relative demand for labour favoured semi-skilled workers. We also found that technological change (the within-industries effect) was responsible for these changes, and for the shift away from skilled and unskilled employment. In this chapter, a similar pattern is found, but here it is those with secondary levels of education which have seen the biggest relative gains. Interestingly, the change in the demand for male workers is explained primarily by changes in technology as found in Chapter 5. However, trade is a more dominant effect in explaining changes in the relative labour demand for female workers.

Table 7.2: Industry and Occupation Based Demand Shift Measures 1984-1997

Between Industry j=10					
	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No-Qualification	-2.382	2.731	-0.077	1.410	1.682
Other Qualification	-6.591	4.960	-0.153	2.632	0.848
Primary Qualification	0.076	-0.096	0.029	0.078	0.085
Secondary Qualification	0.060	-0.012	0.033	0.044	0.126
High school Qualification	-0.077	-0.005	0.055	0.054	0.026
Diploma	-0.036	-0.069	-0.042	-0.013	-0.160
Degree	-0.035	0.006	-0.018	0.005	-0.042
Female					
No-Qualification	2.047	4.797	-2.056	-2.470	2.319
Other Qualification	-2.021	0.782	-1.521	-0.521	-3.280
Primary Qualification	0.069	1.878	-0.946	-1.960	-0.960
Secondary Qualification	-1.273	-2.211	1.470	2.175	0.161
High school Qualification	-3.016	-4.569	2.172	3.340	-2.073
Diploma	-2.272	-9.646	0.623	3.184	-8.111
Degree	-2.628	-8.982	1.594	4.093	-5.923

Within-Industries					
	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No-Qualification	0.001	0.031	0.001	0.036	0.069
Other Qualification	0.011	0.039	-0.012	0.140	0.178
Primary Qualification	1.991	-0.535	0.142	-0.100	1.499
Secondary Qualification	3.304	-2.363	0.291	-1.045	0.188
High school Qualification	5.374	-4.859	0.114	-1.554	-0.925
Diploma	4.194	-6.828	-1.094	-1.964	-5.692
Degree	2.848	-5.629	-0.521	-1.271	-4.573
Female					
No-Qualification	-0.138	0.011	-0.071	-0.008	-0.205
Other Qualification	-0.234	0.410	-0.147	0.065	0.095
Primary Qualification	-0.260	0.322	0.073	0.006	0.141
Secondary Qualification	0.150	-0.043	-0.017	-1.425	-1.336
High school Qualification	0.813	-0.260	0.125	0.098	0.775
Diploma	-0.031	-0.092	0.034	0.013	-0.076
Degree	-0.038	-0.129	0.013	0.011	-0.143

Table 7.2: Industry and Occupation Based Demand Shift Measures 1984-1997(Continued)

	Overall Industry j =60				
	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No-Qualification	-2.381 (20352)*	2.762 (18829)	-0.075 (16161)	1.446 (10159)	1.751 (20352)
Other Qualification	-6.579 (1684)	4.999 (1116)	-0.165 (1101)	2.771 (764)	1.026 (1684)
Primary Qualification	2.067 (5392)	-0.631 (4625)	0.171 (6330)	-0.022 (4667)	1.584 (5392)
Secondary Qualification	3.365 (7464)	-2.374 (9117)	0.324 (10796)	-1.001 (8565)	0.313 (7464)
High school Qualification	5.297 (750)	-4.864 (1185)	0.169 (1493)	-1.501 (1151)	-0.899 (750)
Diploma	4.158 (1313)	-6.897 (1644)	-1.136 (1783)	-1.977 (1404)	-5.852 (1313)
Degree	2.813 (1537)	-5.624 (1685)	-0.539 (1917	-1.266 (1389)	-4.616 (1537)
Female					
No-Qualification	1.910 (6807)	4.809 (7202)	-2.127 (6545)	-2.477 (4017)	2.114 (6807)
Other Qualification	-2.255 (1296)	1.192 (998)	-1.668 (920)	-0.455 (632)	-3.185 (1296)
Primary Qualification	-0.192 (2348)	2.200 (2013)	-0.873 (2963)	-1.954 (2084)	-0.819 (2348)
Secondary Qualification	-1.123 (5291)	-2.254 (6615)	1.453 (7539)	0.750 (5787)	-1.174 (5291)
High school Qualification	-2.203 (416)	-4.829 (795)	2.296 (1178)	3.438 (832)	-1.298 (416)
Diploma	-2.303 (988)	-9.738 (1282)	0.657 (1399)	3.197 (1105)	-8.187 (988)
Degree	-2.666 (488)	-9.111 (768)	1.607 (852)	4.104 (647)	-6.066 (488)

Note: *The number in parentheses are base year totals.

7.2.2 Measuring Demand Shifts Arising from Changes in International Trade in the Manufacturing Sector.

In the previous section we concluded that the shift between sectors increased the relative demand for female workers with medium levels of education though trade effects appear small in terms of changes in the demand for male employees. In the next two sections (7.2.2.1 and 7.2.2.2) the direct impact of international trade on employment in the manufacturing sector in Malaysia will be investigated. These analyses consider the arguments put forward in Katz and Murphy (1992) that changes in the pattern of exports and imports may have different impacts on employment, especially for production workers. They suggest that whilst production for export markets and for domestic consumption may affect employment patterns in a similar fashion this may not be the case for imports. Specifically, they suggest that an increase in imports will be more likely to displace the local employment of production workers but not necessarily of non-production workers employed in activities such as sales. This argument has received some support in the study by Jansen and Lee (2007) in which they find that export and import-competing sectors both employ different types of labour and/or employ them in different proportions. Similarly, Fu and Balasubramanyam (2005) found that the labour demand elasticity of exports is similar to that domestic production. In contrast, Bentivoli and Pagano (1999), who analysed the effects of trade between developed countries (Germany, France, Italy and United Kingdom) and newly industrialised Asian countries, found that problems in European labour markets such as unemployment could not be explained by increased imports of manufactured goods from Asian countries.

For this reason, Section 7.2.2.1 deals with the effects of trade on all workers (production and non-production) and assumes that the employment effects of export levels and import penetration are the same as those that arise from changes in domestic demand. This approach is called the equal allocation approach. In Section 7.2.2.2 the analysis assumes that exports have the same impact as domestic demand but imports only affect production workers. This approach is known as production allocation.

7.2.2.1 Equal Allocation

Following Katz and Murphy (1992), we begin by defining the implicit labour supply of demographic group k, embodied in trade as

$$L_t^k = \sum_i \left[e_i^k E_{it} \left(\frac{I_{it}}{Y_{it}} \right) \right]$$

where k represents the demographic groups by different levels of education. i denotes 29 manufacturing industries and E^k is the average share of total employment of group k for the 1984-1997 period. The average proportion of employment in industry i is denoted by e_i^k. E_{it} is the share of total employment in industry i in the year t. I_{it} and Y_{it} are net imports and domestic output in industry i in year t respectively.

The effect of trade on relative demand for demographic group k in year t can then be computed as follows:

$$T_t^k = -\left(\frac{1}{E^k}\right)\sum_i\left[e_i^k E_{it}\left(\frac{I_{it}}{Y_{it}}\right)\right] + \sum_i E_{it}\left(\frac{I_{it}}{Y_{it}}\right), \qquad \text{(Equation 7.2)}$$

The first term of Equation 7.2 denotes the supply of the labour of group k contained in trade, normalized by the base year employment of k, with the negative sign indicating that the supply shift measure is converted into a demand shift measure. The second term adjusts the demand shift measure so that trade affects only relative demand for labour and not wage inequality.

Data on imports and exports from the Government of Malaysia Trade Department for the years 1984, 1989, 1992, 1995 and 1997 are used in this section. These data cover the 5-digit Standard International Trade Classification (SITC) of manufacturing industries which is aggregated into 29 industry groups. The aggregation process is similar to that in Chapter 5. Output data by industry is used for the above years from the Survey in Manufacturing Industries conducted by the Department of Statistics (DOS) the government statistical body in Malaysia.

The changes in relative labour demand predicted by the changes in international trade in manufacturing from 1984 to 1997 are presented in Tables 7.3 and 7.4. Both tables explain the changes during the four sub-periods, namely 1984-1989, 1989-1992, 1992-1995 and 1995-1997. Workers are classified into the four levels of education used in the earlier section. The results for these demographic groups are presented in Table 7.3. In Table 7.4, workers are considered by different levels of qualification.

Table 7.3 presents the shifts in relative labour demand in manufacturing the sector due to changes in international trade for the periods 1984-1989, 1989-1992, 1992-1995 and

1984-1997. Before we discuss the results, it is worth noting that the figures presented in Tables 7.3 and 7.4 are not comparable with those presented in Tables 7.1 and 7.2 because the samples are different (here, only manufacturing is being considered).

First, in the previous section, the results of the decomposition analysis show that the relative demand for both males and females decreased at the tertiary level of education during 1984-1997. However, the direct impact of trade on the manufacturing sector suggests that international trade has increased the relative demand for both groups. Second, even though the overall demand for males with no schooling increased during the sample period, international trade reduced the relative demand for these workers. Third, consistent with the findings of the decomposition analysis, trade has increased the relative demand for female workers with a secondary level of education and decreased the relative demand for females with a primary education.

Throughout the sub-periods, in the period 1984-1989, the increase in the relative demand for female workers with a secondary level of education was largest when compared to what was happening to male workers. As clearly seen in Table 7.3, the relative demand for female and male workers at all levels of education increased during the period 1984-1989, whilst trade reduced the relative demand for both groups during the period 1992-1995. This result implies that trade has decreased the relative demand for female workers for all category of education level during the early and mid 1990s. Focusing on the relative demand for male workers, Table 7.3 also shows that during the period 1989-1992, trade also had a negative impact on the relative demand for male production workers with primary and secondary levels of education. However, the relative demand for those with secondary and tertiary level increased. The trend changed drastically, however, during the period 1992-1995 when the demand for male workers fell at all levels of education.

During the period 1995-1997, trade had a similar, though smaller, impact on the relative demand for both male and female workers to that during the period of 1989-1992. The one exception is that at the tertiary level of education trade decreased the relative demand for males. In contrast, the relative demand for the female workers with a tertiary level of education again increased. In contrast to earlier periods the relative demand favoured to those male workers rather than female workers. During these years, it can also seen that the increase in relative demand for female workers with secondary and tertiary education is less than that found in the other sub-periods.

Table 7.3: Changes in Relative Labour Demand Predicted by Changes in International Trade In Manufacturing Industries, 1984-1997, under the Equal Allocation Approach

	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No schooling	0.0029	-0.0130	-0.0851	0.0035	-0.0917
Primary	0.0168	-0.0020	-0.0511	0.0150	-0.0213
Secondary	0.0088	0.0087	-0.0171	0.0206	0.0211
Tertiary	0.0331	0.0104	-0.0147	0.0220	0.0507
Female					
No schooling	0.0014	-0.0076	-0.0231	0.0040	-0.0252
Primary	0.0318	-0.0093	-0.0202	0.0031	0.0054
Secondary	0.0734	-0.0027	-0.0230	0.0054	0.0530
Tertiary	0.0273	-0.0014	-0.0204	0.0092	0.0146

The results in Table 7.4 show the changes in relative labour demand predicted by the changes in international trade, classified by highest educational qualifications. It can be seen that changes in the relative demand for labour were favourable to workers with higher levels of qualifications. Interestingly, however, it is workers possessing high school qualifications (compared to those workers with diploma or degree qualifications) who were the most affected by trade.

Table 7.4: Changes in Relative Labour Demand Predicted by Changes in International Trade in Manufacturing Industries, 1984-1997, under the Equal Allocation Approach

	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No-Qualification	0.0204	0.0009	-0.0439	0.0159	-0.0067
Other Qualification	0.0026	-0.0132	-0.0851	0.0031	-0.0926
Primary Qualification	0.0279	0.0105	-0.0158	0.0150	0.0377
Secondary Qualification	0.0278	0.0129	-0.0110	0.0177	0.0475
High school Qualification	0.0346	0.0117	-0.0156	0.0135	0.0442
Diploma	0.0506	0.0158	-0.0061	0.0253	0.0856
Degree	0.0245	0.0026	-0.0234	0.0318	0.0353
Female					
No-Qualification	0.0385	-0.0504	-0.0645	0.0024	-0.0741
Other Qualification	0.0011	-0.0078	-0.0231	0.0040	-0.0258
Primary Qualification	0.0861	-0.0026	-0.0230	0.0052	0.0657
Secondary Qualification	0.0855	-0.0011	-0.0243	0.0062	0.0663
High school Qualification	0.0275	-0.0012	-0.0248	0.0080	0.0095
Diploma	0.0053	0.0001	-0.0034	0.0148	0.0168
Degree	0.0082	0.0001	-0.0039	0.0103	0.0147

7.2.2.2 Production Allocation

The second approach considered is known as production allocation. This approach assumes that the effects of changes in imports impacts on production workers only and exports are assumed to affect all workers. It can be computed by modifying the first term in the Equation 7.2 as follows; the effects of changes in exports are captured by $\left[e_i^k E_{it}\left(\frac{X_{it}}{Y_{it}}\right)\right]$ and those of imports are calculated by $\left[p_i^k E_{it}\left(\frac{M_{it}}{Y_{it}}\right)\right]$ as shown in Equation 7.3.

Under the second approach, this study considers 17 groups of production workers: production supervisory workers, miners, wood workers, chemical workers, spinners, food workers, tobacco workers, tailors, machine workers, electrical workers, plumbers, glass makers, rubber workers, photo and paper workers, construction workers, transportation workers and unknown workers. The production allocation equation can therefore be written as follows:

$$T_t^k = -\left(\frac{1}{E^k}\right)\sum_i \left\{\left[e_i^k E_{it}\left(\frac{X_{it}}{Y_{it}}\right)\right] - \left[p_i^k E_{it}\left(\frac{M_{it}}{Y_{it}}\right)\right]\right\}, \qquad \text{(Equation 7.3)}$$

Where X measures exports, M measures imports and p_i^k represents group k's average share of production worker employment in industry i over the 1984-1997 period. Again, T_t^k measures the effect of trade on relative demand for demographic group k in year t.

To begin with this discussion will focus on the changes in the overall period from 1984-1997. Generally, Table 7.5 shows that the changes in relative demand for both male and female workers are similar and that they favour those with no schooling and those with primary level of education. Overall, Table 7.5 suggests that female workers, who have traditionally been employed most intensively as production workers, especially in the tailoring and electrical industries (Chapter 6), were the groups most adversely affected by trade; the adverse effects on relative labour demand were concentrated on female workers especially those with secondary and tertiary levels of education.

Similarly, the adverse effects of trade on the relative demand for male production workers also impacted most on those with tertiary and secondary levels of education. Trade reduced the relative demand for male production workers with higher levels of education, but increased the demand for males with no schooling and those with a primary level of education. It is interesting to note that there are differences in the trends during the sub-periods, especially for female production workers. Between 1984 and 1989, the adverse effects of trade on relative demand were concentrated on female workers at higher levels of education (especially those with secondary and tertiary levels of education). For male production workers, however, reductions were concentrated on those with primary and tertiary educations, and trade increased the relative demand for those with a secondary education level. During the periods 1992-1995, changes in the pattern of trade increased the relative demand for both male and female production workers across all types of education. A slightly different pattern occurred during the period 1995-1997, when trade reduced the relative demand for both male and female production workers across all types of education except those male with no schooling education.

There is an interesting pattern shown by the changes in the relative demand for male and female production workers. Trade seems to have increased the relative demand for educated male and female production workers in the mid 1990s, but seems to have decreased the relative demand for this group during the mid 1980s and late 1990s. These results imply that economic recessions have a strong relationship with the impact of trade. When economic growth is strong, for example during the period 1992-1995, trade seems to increase the relative demand for workers across all types of education. However, during recessions, trade decreased the relative demand for workers especially at higher levels of education.

Table 7.5: Changes in Relative Labour Demand Predicted by Changes in International Trade in Manufacturing, 1984-1997, under the Production Allocation Approach

	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No schooling	-0.002	0.014	0.087	0.001	0.101
Primary	-0.016	0.002	0.052	-0.015	0.022
Secondary	0.001	-0.019	0.017	-0.021	-0.022
Tertiary	-0.029	-0.012	0.017	-0.041	-0.066
Female					
No schooling	0.002	0.012	0.027	-0.001	0.040
Primary	-0.018	0.013	0.019	-0.004	0.010
Secondary	-0.087	-0.010	0.011	-0.023	-0.109
Tertiary	-0.126	-0.083	0.048	-0.012	-0.172

The effects of trade on the relative demand for production workers with different levels of qualification is examined next, though the pattern does not differ greatly from the results presented in Table 7.5. Looking first at changes in female relative over the period, it can be seen that trade decreased the relative demand for labour, especially in the case of female production workers with diploma qualifications. Trade produced a marked negative effect on the relative labour demand for female production workers with high school, diploma and degree qualifications. Trade also decreased the relative demand for those female production workers with primary qualifications throughout the sub-periods, except for the period 1992-1995.

Turning to the male group, the table shows that throughout the overall period (1984-1997) changes in relative demand for males across the different qualification groups were quite small for all qualification categories except the other qualifications group. In terms of the direction of trade, other qualifications and no qualification groups experienced a positive increase in relative demand compared to all other qualification groups. However, these results indicate that the direction of trade in Malaysian manufacturing industry is not able to explain the changes in the increasing relative demand for educated male production workers except during the period 1992-1995.

Comparison across sub-periods indicates that the period 1984-1989 saw a large adverse impact on relative labour demand due to changes in the patterns of trade. During this period, the adverse effects of trade on relative demand were concentrated on female production workers with high school qualifications, followed by degree and diploma qualifications. The pattern changed during the third sub-period (1992-1995). During this period, the relative demand for males increased when trade increased. However, the relative demand for female production workers decreased especially for those having a degree and diploma qualification. The relative demand for those females with no qualification was favourable, compared to females with primary qualifications. During the fourth sub–period (1995-1997), the pattern for those males and females with degree and diploma qualifications remained unchanged; they suffered a fall in relative demand when trade increased. This result suggests, perhaps, that the impact of trade on production workers is not relevant to those workers having high levels of qualification.

Table 7.6: Changes in Relative Labour Demand Predicted by Changes in International Trade in Manufacturing, 1984-1997, under the Production Allocation Approach

	1984-1989	1989-1992	1992-1995	1995-1997	1984-1997
Male					
No-Qualification	-0.017	0.002	0.043	-0.025	0.004
Other Qualification	-0.001	0.015	0.087	0.001	0.101
Primary Qualification	-0.032	-0.014	0.015	-0.023	-0.053
Secondary Qualification	-0.039	-0.015	0.011	-0.018	-0.061
High school Qualification	-0.022	-0.007	0.018	-0.019	-0.031
Diploma	-0.034	-0.021	0.003	-0.018	-0.070
Degree	-0.017	0.006	0.041	-0.034	-0.004
Female					
No-Qualification	-0.041	0.087	0.148	0.040	0.234
Other Qualification	0.000	0.011	0.027	-0.001	0.037
Primary Qualification	-0.099	-0.007	0.016	-0.015	-0.105
Secondary Qualification	-0.120	-0.027	-0.001	-0.042	-0.189
High school Qualification	-0.160	-0.031	0.001	-0.048	-0.238
Diploma	-0.101	-0.174	-0.088	-0.067	-0.429
Degree	-0.012	-0.046	-0.101	-0.081	-0.241

In conclusion, although we have found that the effects of trade are relatively small compared to the impact of technological change, the investigation involving the direct impact of trade on the relative demand for males shows that the impact of net trade on employment under the equal allocation approach has brought an increase in the relative demand for males workers with high levels of education. Further investigation, using the production allocation approach, shows that trade (allowing for the different impacts of exports and imports) explains the fall in the relative demand for male production workers with higher levels of education. These results indicate that net imports (exports) were able to increase the relative demand for male workers with high levels of education during the period 1984-1997.

For female workers, the discussion also concluded that using the decomposition approach, trade (shown by between-industry effects) has dominated the changes in the relative demand for female workers during the sample period. This has resulted in an increase in relative demand at medium levels of education and a decrease at tertiary levels. Under the equal allocation approach, further investigation of the direct impact of trade in the manufacturing sector shows that net imports increased the relative demand for females with a tertiary level of education. On the other hand, as female workers are traditionally employed as production workers, using the production allocation approach we find a decrease in the relative demand for female production workers at higher education levels, especially at the tertiary level. These results indicate that changes in the pattern of trade have brought about a fall in the relative demand for female production workers.

These results for both males and females are due to the fact that the Malaysian manufacturing sector operates at medium levels of production skills and generally produces intermediate goods. The demand for more educated workers, on the other hand, is not necessary on the production line. These results also indicate that trade is dominant in explaining the decrease in the relative demand for both male and female production workers, rather than that for other workers. These results are consistent with the economic developments in Malaysia noted in Chapter 2.

7.3 Changes in Wage Inequality.

The aim of this section is to present a picture of the wage structure in Malaysia over the period from 1984 to 1997 based standard earnings equations. The model is estimated separately for each survey year and is of the form:

$$\ln W_{kit} = \beta_0 + \beta_1 Q_{kit} + \beta_2 Occ_{kit} + \beta_3 AGE_{kit} + \beta_4 AGE_{kit}^{\ 2} + \beta_5 MALE_{kit} + \beta_6 MAR_{kit} + \beta_7 Ind_{kit} + \varepsilon_{kit} \quad \text{(Equation 7.4)}$$

where W_{kit} is the wage of individual k working in sector i at time t; Q_{kit} is a vector of dummy variables measuring the individual's level of education in sector i at time t and

Occ_{kit} is a vector of six occupation dummies. AGE_{kit} and AGE_{kit}^2 refer to age and age squared respectively. $MALE_{kit}$ is a dummy variable, indicating the gender of individual k working at sector i in period t. MAR_{kit} is a dummy variable if the worker is married. I_{kit} represents nine sector dummies. ε_{kit} is the error term. The dependent variable is the logarithm of the monthly total labour market income or earnings, and includes wages, bonuses, allowances and overtime[24]. As in the earlier analysis, we have considered two measures of education, namely qualifications and type of education. For the qualification groups, we chose no qualification as the reference group and no schooling was chosen as the control variable for education level. Occupation groups refer to professional, managerial clerical, sales, service workers and production workers. In this context, production workers is the occupational reference group, as we are interested in knowing the changes in wage differentials for occupational groups relative to production workers. Finally, the sector groups are mining and quarrying, manufacturing, electricity, gas and water, construction, the wholesale and retail trade, restaurants and hotels, transport, storage and communications, finance and business services and community and personal services. The manufacturing sector was chosen as a reference group, as the study was interested in investigating the wage differentials for other sectors relative to the manufacturing sector.

The estimates presented in Equation 7.4 (and subsequent earning functions) are estimated using ordinary least squares (OLS). This raises a number of estimation issues. First, because the equation is estimated across employees only there may be sample selection bias. Clearly, one solution would be to correct for potential bias using the standard Heckman correction model. However, this is not possible in the present context due to the fact that there are not sufficient instruments to allow estimation of the model and because Malaysian data on self-employment is very inaccurate due to the misreporting of self-employment status. Second, to identify the role of unobserved heterogeneity in the data, we have used the Breasch-Pagan/ Cook-Weisberg tests. In fact, all the regression results show that the error terms are homoscedastic.

[24] In fact, bonuses and allowances are not significant in labour market earning in the data. However overtime earning represent around 36.8 percent of earnings for production workers but only 0.7 percent for those in professional jobs.

Table 7.7 reports the parameter estimates of the earnings function for each sample year between 1984 and 1997. It should be noted that, in addition to the independent variables presented in Table 7.7, all regressions include sector indicators. The estimates of earnings equations in Table 7.7 indicate the standard result that earnings have a quadratic relationship with age, though the results suggest that the age-earning profile became flatter over the 13-year period[25].

Equally, education is generally positively associated with earnings. The exception is that the return for "other qualifications" is lower than the return to "no qualifications". However, generally, income increases monotonically with the level of qualification. Over the sample period, the return for a primary qualification decreased from 0.214 in 1984 to 0.164 in 1997. This result was consistent with the description of wage inequality, which, for the lowest ten percent, was worse in 1997. Interestingly, the return for a medium level qualification, such as a secondary qualification, increased over the period, from 0.294 in 1984 to 0.394 in 1997. These results are consistent with the descriptive analysis in Chapter 6, which reported that the position of the medium level earner improved in 1997. They are also consistent with the finding that there has been an increase in the demand for labour at the semi-skilled level. As far as employees with secondary and high school qualifications are concerned, the results show that the demand for this group is buoyant in the Malaysian labour market. It is important to note that this group of employees is classified as having medium level qualifications and generally belongs to the semi-skilled group. The favourable demand for semi-skilled workers over skilled workers has already been discussed.

At the higher levels of qualification, the return for having a degree fell, from 1.152 in 1984 to 0.931 in 1997; for diploma holders, the return decreased from 0.688 in 1984 to 0.631 in 1997. The trend between 1989 and 1995, however, showed a general level of stability in the returns to higher level qualifications. These results are consistent with the Malaysian Economic Report for 2002, which noted that the demand for workers in

25 The results presented here assume the standard quadratic (in age) model first proposed by Mincer (1974). However, as Murphy and Welch (1990) point out, including higher order polynomials may actually provide a more robust estimating equation - their data suggest a quartic specification. We did experiment with some alternative (cubic and quartic) specifications but to little effect. More importantly, the focus here is on the rates of return to education (and not life cycle earnings patterns) and the quadratic specification is simply used as a control for life cycle effects.

Malaysia generally favoured workers with medium level qualifications. Chung (2003) also reported that the private returns for Malaysians in 1997 were positive, especially at secondary and higher levels of qualification. There are a number of factors that may explain the generally poorer situation found for 1997; one important factor is the influence of the 1997 recession. This recession resulted in a major retrenchment in the labour market, with 50,000 workers losing their jobs in early 1997 and further losses of 100,000 workers by early 1999 (Malaysia, Economic Report 2002).

Turning now to the returns associated with different occupations, these show that managers have the highest returns relative to production workers. In terms of trends, the results show that the returns to all occupations decreased during the sample period relative to production workers, even holding education constant. Managers, for example, experienced the largest decrease in returns (around 38 percent) during the sample period. During the period from 1984-1995, however, this occupation group showed an increasing trend, with returns for managers undergoing a steady increase of 5.2 percent. People in professional and clerical occupations experienced an upward turn during the 1984-1989 period, with a peak return in 1989. The premia associated with these occupations fell in 1992 and continued to decrease until 1997. The return for workers in sales occupations fluctuated during the 1984-1997 period; the premia fell in 1989 and increased in 1992, before dropping back in 1995 and 1997. Workers in the service occupations encountered the smallest fall, accounting for just 1 percent during the 1984-1997 period. This trend was consistent throughout 1984-1989, before falling in 1992.

Of course, the relationship between occupation and education are likely to be strongly correlated and this may affect the patterns we observe in terms of rates of return to education. A series of regressions were therefore estimated to examine the effects of excluding the occupation variables on the rates of return to education. We present the results of these regressions in an appendix 7.7. As will be seen, the return to different education levels significantly increase when occupation is excluded. However, this does not alter the general conclusions we have made regarding the nature of the changes in rates of return to education over time.

As can be seen in Table 7.7, wage premia relative to working in manufacturing vary widely across sectors. The estimates in 1984, for example, range from 0.28 in the mining sector to -0.024 in the restaurant sector. Table 7.7 also suggests that employment in manufacturing is associated with higher wages when compared to those in the communications, wholesale and restaurant sectors. In 1984, wages in the transportation sector were also lower compared with those in manufacturing, but the trend changed in 1989. The premium associated with working in this sector increased from 0.03 in 1989 to 0.075 in 1997. The highest wage premia are to be found in the mining sector, although they fell over the time period. In contrast, the wage advantage faced by employees in the electrical and finance sectors significantly increased over the period.

Table 7.7: Estimates of Earning Equations

	1984	1989	1992	1995	1997
Constant	6.105	6.235	6.629	6.975	7.361
	(223.9)*	(247.67)	(263.18)	(230.96)	(191.25)
Age	.110	.107	.095	.087	.077
	(65.49)	(69.764)	(61.605)	(47.709)	(33.651)
Age squared	-.001	-.001	-.001	-.001	-.001
	(-57.97)	(-60.485)	(-52.425)	(-40.290)	(-29.196)
Male	.351	.315	.306	.288	.174
	(59.52)	(61.964)	(59.553)	(48.376)	(22.953)
Married	.145	.156	.094	.069	.000
	(22.461)	(27.096)	(15.844)	(10.003)	(.033)
Other Qualifications	-.341	-.3841	-.0332	-.297	-.234
	(-28.893)	(-31.003)	(-25.339)	(-18.978)	(-10.744)
Primary qualification	.214	.184	.210	.198	.164
	(26.989)	(24.551)	(29.996)	(23.878)	(15.084)
Secondary	.294	.337	.366	.368	.394
qualification	(51.813)	(54.181)	(58.212)	(49.959)	(37.304)
High school	.464	.470	.475	.491	.497
qualification	(32.033)	(35.754)	(38.744)	(34.830)	(24.384)
Diploma	.688	.586	.652	.683	.631
	(45.141)	(47.290)	(52.465)	(49.503)	(37.825)
Degree	1.152	1.092	1.125	1.126	.931
	(72.263)	(82.779)	(84.279)	(74.721)	(49.856)
Professional	.279	.292	.269	.252	.160
	(24.520)	(28.813)	(26.473)	(23.343)	(11.370)
Manager	.803	.819	.835	.855	.419
	(47.599)	(56.005)	(57.338)	(51.123)	(21.411)
Clerical	.200	.206	.166	.126	.120
	(21.677)	(25.066)	(19.829)	(13.126)	(9.878)
Sales	.076	.051	.094	.071	.037
	(5.937)	(4.552)	(7.662)	(5.292)	(2.083)
Services	.023	.023	.001	.010	.013
	(2.452)	(2.736)	(-.011)	(.909)	(.926)
Mining	.285	.252	.272	.244	.173
	(13.241)	(10.643)	(10.994)	(7.523)	(3.950)
Electrical	.084	.007	.070	.132	.097
	(3.690)	(.343)	(3.114)	(4.780)	(2.704)
Construction	.006	-.095	-.029	.025	.063
	(.711)	(-10.977)	(-3.416)	(2.546)	(5.266)
Wholesale	.005	-.046	-.062	-.051	.012
	(.445)	(-4.628)	(-5.922)	(-4.433)	(.799)
Restaurant	-.024	-.052	-.059	-.126	-.025
	(-1.613)	(-4.027)	(-4.401)	(-8.102)	(-1.302)
Transportation	-.011	.003	.031	.074	.075
	(-.969)	(.285)	(2.945)	(6.098)	(4.842)
Finance	.064	.047	.091	.155	.100
	(5.116)	(4.396)	(8.010)	(12.093)	(6.362)
Communication	-.068	-.060	-.084	-.106	-.054
	(-8.021)	(-7820)	(-10.754)	(-12.122)	(-4.847)
Number of observations	56191	57902	60978	44010	42196
F test	2035	2116	2742	2443	593
Breusch-Pagan / Cook-Weisberg test for constant variance					
Chi2 (1)	16.14	18.09	13.95	20.15	27.14
Prob>chi2	0.82	0.75	0.92	0.69	0.25
R squared	.474	.521	.480	.462	.247

Note: * indicates the figures in parentheses are t-statistics.

Before the way in which trade and technological change affected the wage differentials is explored in the next section, it is interesting to consider gender differentials in more detail. The results in Table 7.7 indicate a significant gender differential but also that this has fallen over time. In order to examine the impact of gender we ran separate regressions for males and females. The results are presented in Table 7.8. In general, they indicate that the return to education for females is higher than the returns obtained by males, except for those with secondary and high school qualifications. On the whole, the results show that the return for each level of qualification declined between 1984 and 1997, especially at the higher levels (diploma and degree). In 1984, the return for females with a primary qualification was 0.23, compared to a return for males of 0.19. At primary qualification level, female returns decreased in 1989 and stabilised during the period between 1992 and 1995 at 0.23, before decreasing in 1997 to 0.19. The return to males with primary qualifications shows a decreasing trend during the sample period. The return decreased from 0.19 in 1984 to 0.16 in 1989, before increasing to 0.19 in 1992. It then fell in 1995 and 1997 to 0.17 and 0.14 respectively.

It is interesting to note that the return for males with a medium level of qualification (secondary and high school) is higher than that for females. The return to secondary qualifications for males seems to have undergone a slight change; the range runs from 0.39 percentage points to 0.44 percentage points during the sample period. The return decreased from 0.39 percentage points in 1984 to 0.33 percentage points in 1989, and slightly increased to 0.34 percentage points in 1992 and 1995. The return to males with a secondary qualification, however, increased to 0.44 percentage points in 1997. The return to females with secondary qualifications decreased between 1984 and 1989 and increased between 1989 and 1995. In 1984, the return was 0.36 percent, reducing to 0.29 percentage points in 1989. However, the figure increased to 0.37 percentage points in 1992 and 0.41 percentage points in 1995, before dropping to 0.37 percentage points again in 1997. Typically, the return to higher levels of qualification (degree and diploma) is greater for males than for females over the period 1984-1997. On the other hand, the return to primary qualifications for females is higher than that for males. This lower return on education at higher levels for females is reflected in their lower enrolment in tertiary education. An historical perspective can explain this situation: women in Malaysia have distinct religious values and norms about many issues, especially concerning the commonly held belief that they are ideally suited to housework, clerical jobs, teaching and similar 'female' occupations, rather than as engineers and doctors. Furthermore, the large size of families in Malaysia, which averages six children per family, is one of the factors influencing parents who choose their sons rather than their daughters to enter higher levels of education.

The impact of occupation affiliation is now considered. The coefficient estimates show that females in certain occupations face higher premiums over production workers than males. The except is for managerial and service occupations which have a zero premium for men but a negative wage premium for women. However, in some groups, for example professional, technical and related fields, the trend in premia has favoured male workers with the returns increasing. In contrast, they have fallen for women. Looking at professional, technical and related field occupations, during the period 1984 to 1992, the female return was higher than the male return, but this trend changed in 1995 and 1997. The return for females in 1995 was 0.24 percentage points, compared to a male return of 0.26 percent. In 1997 the return for these occupation groups decreased for females and males to 0.16 and 0.17 respectively. These results show that the return for females in professional, technical and related occupations was higher than the return faced by males during the 1980s and early 1990s. However, the trend changed in the mid-1990s, when the return for males became more than that for females. This situation was due to changes in the way the professional, technical and related occupations category is defined. This category originally included teachers and nurses, where more than 70 percent were women (Malaysia, Kementerian Sumber Manusia, 1991). In 1991, for the first time a 'Women in Development' chapter was included in the Sixth Malaysia Plan (1991-1995). Alongside this, the classification of the category was upgraded to include lecturers, doctors, lawyers, accountants and engineers. As mentioned above, the stereotypical job for a female was a clerical job. Clerical occupation groups showed that the return for females was higher than that for males; however, the returns for both show a constantly decreasing trend during the sample period.

Sector wage differences between males and females show that the return for both was lower in the construction, wholesale, restaurant and communications sectors relative to the manufacturing sector. During the first two periods, 1984 and 1989, the return for males in the transportation sector was also lower relative to the manufacturing sector. In some cases, for example in the electrical sector, females received a higher pay premium than men relative to their reference groups as they did in the mining sector. The return was equal in 1989 and during the 1990s males were paid higher than females. The return for female workers continued to fall during the period 1992 to 1997.

Table 7.8: Estimates of Earning Equations by Gender

	1984		1989		1992		1995		1997	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Constant	6.228	6.372	6.401	6.434	6.753	6.792	7.064	7.154	7.44	7.49
	(118.49)	(196.49)	(143.06)	(205.05)	(149.79)	(216.80)	(132.01)	(189.19)	(119.43)	(148.48)
Age	0.103	0.115	0.099	0.113	0.091	0.103	0.083	0.094	0.069	0.082
	(30.43)	(58.29)	(34.74)	(60.32)	(31.19)	(54.38)	(24.28)	(41.48)	(17.74)	(27.30)
Age squared	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.01	-0.01
	(-25.79)	(-53.06)	(-28.82)	(-53.94)	(-25.73)	(-47.80)	(-19.72)	(-36.34)	(-14.07)	(-24.49)
Married	0.026	0.190	0.054	0.198	-0.001	0.134	-0.003	0.105	0.021	-0.016
	(2.29)	(23.65)	(5.90)	(26.50)	(-0.14)	(17.51)	(-0.285)	(11.44)	(1.68)	(-1.35)
Other	-0.350	-0.273	-0.393	-0.314	-0.361	-0.263	-0.223	-0.313	-0.177	-0.264
qualifications	-16.67)	(-18.78)	(-20.05)	(-19.54)	(-16.45)	(-15.65)	(-8.95)	(-15.40)	(-5.56)	(-8.90)
Primary	0.238	0.197	0.196	0.167	0.235	0.195	0.236	0.178	0.199	0.143
qualification	(14.66)	(22.09)	(13.67)	(19.25)	(17.85)	(23.94)	(15.03)	(18.36)	(10.45)	(10.78)
Secondary Qualification	0.361	0.394	0.295	0.338	0.370	0.349	0.413	0.333	0.372	0.448
	(23.72)	(44.97)	(25.85)	(45.59)	(31.79)	(46.80)	(30.13)	(37.95)	(21.01)	(29.38
High school Qualification	0.528	0.609	0.357	0.518	0.413	0.489	0.490	0.485	0.431	0.468
	(15.66)	(27.94)	(16.22)	(31.85)	(20.57)	(31.95)	(20.73)	(27.42)	(15.59)	(18.26)
Diploma	0.635	0.758	0.536	0.638	0.584	0.737	0.632	0.757	0.559	0.708
	(28.65)	(33.76)	(31.02)	(34.85)	(35.62)	(37.50)	(33.01)	(36.27)	(27.51)	(25.28)
Degree	1.146	1.177	1.049	1.17	1.078	1.196	1.079	1.197	0.896	0.977
	(34.96)	(64.42)	(48.12)	(67.59)	(48.84)	(68.61)	(43.67)	(60.17)	(32.10)	(37.83)
Professional	0.382	0.251	0362	0.268	0.319	0.265	0.249	0.261	0.161	0.172
	(14.33)	(19.30)	(16.20)	(22.84)	(14.53)	(22.35)	(10.53)	(20.78)	(5.88)	(9.94)
Manager	0.789	0.838	0.815	0.781	0.834	0.867	0.790	0.821	0.397	0.439
	(16.04)	(45.02)	(19.48)	(52.18)	(24.44)	(52.56)	(23.29)	(45.35)	(10.12)	(18.88)

Table 7.8: Estimates of Earning Equations by Gender (continued)

	1984		1989		1992		1995		1997	
	Female	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**
Clerical	0.336	0.121	0.331	0.126	0.281	0.076	0.200	0.043	0.207	0.024
	(15.61)	(11.36)	(18.57)	(12.82)	(16.05)	(7.45)	(10.50)	(3.55)	(9.29)	(1.48)
Sales	0.130	0.073	0.085	0.051	0.079	0.124	0.076	0.080	0.042	0.054
	(4.54)	(5.04)	(3.60)	(3.87)	(3.10)	(8.87)	(2.86)	(5.011)	(1.33)	(2.37)
Services	-0.004	0.055	-0.022	0.050	-0.026	0.020	-0.035	0.025	0.017	0.011
	(-0.16)	(5.19)	(-1.08)	(5.11)	(-1.26)	(1.91)	(-1.49)	(2.04)	(0.66)	(0.61)
Mining	0.283	0.251	0.233	0.233	0.159	0.262	0.185	0.232	0.024	0.179
	(3.84)	(11.48)	(3.38)	(9.16)	(2.29)	(10.16)	(2.06)	(6.75)	(0.19)	(3.73)
Electrical	0.337	0.040	0.064	-0.023	0.096	0.052	0.200	0.105	0.025	0.072
	(3.86)	(1.72)	(0.92)	(-1.10)	(1.16)	(2.29)	(2.36)	(3.66)	(2.73)	(1.79)
Construction	-0.003	-0.025	-0.052	-0.131	0.013	-0.059	0.091	-0.008	0.161	0.036
	(-0.10)	(-2.64)	(-1.48)	(-14.32)	(0.38)	(-6.73)	(2.69)	(-0.73)	(4.28)	(2.64)
Wholesale	-0.030	-0.015	-0.071	-0.066	-0.091	-0.081	-0.074	-0.059	0.024	-0.15
	(-1.24)	(-1.13)	(-3.50)	(-5.69)	(-4.24)	(-6.74)	(-3.24)	(-4.31)	(0.90)	(-0.78
Restaurant	0.053	-0.068	0.038	-0.104	-0.040	-0.050	-0.088	-0.116	-0.119	0.055
	(1.88)	(-3.58)	(1.62)	(-6.28)	(-1.63)	(-2.92)	(-3.20)	(-5.84)	(-3.90)	(2.069
Transportation	0.50	-0.052	0.131	-0.046	0.092	0.001	0.164	0.039	0.072	0.069
	(1.37)	(-4.28)	(4.65)	(-4.28)	(2.86)	(0.132)	(4.95)	(2.98)	(1.91)	(3.90)
Finance	0.122	0.006	0.116	-0.007	0.119	0.047	0.200	0.117	0.149	0.048
	(4.91)	(0.39)	(5.54)	(-0.57)	(5.47)	(3.46)	(8.51)	(7.48)	(5.80)	(2.31)
Communications	-0.021	-0.103	-0.019	-0.088	-0.077	-0.094	-0.072	-0.121	-0.059	-0.049
	(-0.99)	(-0.06)	(-1.08)	(-10.05)	(-4.27)	(-10.52)	(-3.68)	(-11.84)	(-2.71)	(-3.57)
Number of observations	17653	38537	19682	38219	21396	39581	15105	28166	15151	26401
F test	570	1557	987	2056	735	1652	503	1079	329	421
Breusch-Pagan / Cook-Weisberg test for constant variance										
Chi2 (1)	25.04	26.85	28.61	29.71	27.13	28.03	22.15	25.31	32.92	36.14
Prob>chi2	0.42	0.22	0.22	0.21	0.25	0.21	0.49	0.27	0.08	0.09
R squared	0.416	0.471	0.486	0.514	0.431	0.479	0.423	0.458	0.279	0.225

Note: * indicates the figures in parentheses are t-statistics,

7.4 The Effects of Trade and Technological Change on Wage Differentials: Manufacturing Industries

The previous section shows a general picture of wage differentials for different skill levels and across sectors and occupations. In this section, we estimate the impact of trade and technological change on industrial wage differentials. We chose manufacturing industries because these industries contributed 37 percent of the GDP growth in the 1990s, and are the focus of our earlier analysis. Data limitations also mean that we must focus on manufacturing[26]. Looking back, the link between trade and the changes in sector wage differentials is provided by the Heckscher-Ohlin- Samuelson (HOS) model presented in Chapter 3. Following Pavcnik *et al.* (2004) we estimate a two stage regression model described in Chapter 4. The first stage regression involves the estimating in the following equation:

$$\ln W_{kit} = \beta_0 + \beta_1 Q_{kit} + \beta_2 Occ_{kit} + \beta_3 AGE_{kit} + \beta_4 AGE_{kit}^2 + \beta_5 MALE_{kit} + \beta_6 MAR_{kit} + Ind_{kit} + \varepsilon_{kit} \qquad \text{(Equation 7.5)}$$

where k denotes the individual. W_{kit} is the wage of individual k working in industry i in the manufacturing sector at time t. Q_{kit} is a vector of dummy variables measuring the individual's level of education in the manufacturing sector at time t, Occ_{kit} is a vector of six occupation dummies. AGE_{kit} and AGE_{kit}^2 refer to age and age squared respectively. $MALE_{kit}$ is a dummy variable indicating the gender of individual k working in the industry i at time t. MAR_{kit} is a dummy variable indicating that the worker is married. I_{kit} represents twenty nine sector dummies. ε_{kit} is the error term for individual k working in industry i at time t. The dependent variable is the logarithm of monthly total labour market income or earnings, including wages, bonuses, allowances and overtime. As mentioned earlier, we describe the change in wage inequality based on two measures of education, namely qualifications and type of education. Occupation groups refer to professional, managerial, clerical, sales, service workers and production workers. In this context, production worker is the occupation

[26] Trade data is only available for the agriculture (which we have excluded because of other data limitations) and the manufacturing sector. There is no trade information for the service sector.

reference group. Finally, the industry groups are: food, beverages (tea, coffee), beverages (wines and liquors), tobacco products, textiles, apparel, leather, footwear, wood products, furniture, paper products, printing and publishing, chemicals, other chemical products, petroleum, rubber, plastic, pottery or ceramic products, glass products, non-metallic products, basic iron and steel products, non-ferrous metals, fabricated metal, machinery, electrical machinery, instrument and appliances equipment, medical and surgical equipment, and other manufacturing.

In the second stage, we estimate Equation 7.6. Following Kruger and Summers (1988) and Pavcnik *et al.* (2004) the estimated wage premiums are expressed as deviations from the employment-weighted average wage premium and is a normalised wage premium. According to Pavcnik *et al.* (2004) the normalised wage premium can be interpreted as the proportional difference in wages for a worker in a given industry relative to an average worker in all industries with the same observable characteristics. For this purpose, we pool the industry wage differentials over time and regress them on a vector of trade and technology characteristics as below:

$$W_{it} = \gamma_0 + \gamma_1 TX_{it} + \gamma_2 TM_{it} + \gamma_3 TFP_{it} + \gamma_4 YEAR_t + \gamma_5 I_{it} * w_{it} + \varepsilon_{it}$$

(Equation 7.6)

where W_{it} are the estimated sector wage deviations from the employment-weighted average wage. As Pavcnik *et al* (2004) argue, these normalised wage deviations are the proportional difference in wages for each employee relative to the average wage for workers with the same observable attributes. TX_{it} and TM_{it} refer to industry trade flows (exports and imports respectively), TFP_{it} measures technological change[27], $YEAR_t$ refers to the set of year dummies, $I_{it} * w_{it}$ refers to industry dummies and ε_{it} is the error term. We regress Equation 7.6 using weighted least squares (WLS) with the inverse of the variance of the wage premium estimates from the first stage as weights. According to Pavcnik *et al.* (2004), this procedure puts more weight on industries with

[27] As in Chapter 5, we use Total Factor Productivity as the measure of technological change. TFP is calculated using data envelopment analysis as explained in Chapter 5.

smaller variance in industry premiums and the sum of the employment-weighted normalized wage premia will be zero.

To explain the specification of the employment weighted average let first consider Equation 7.6. We re-parameter Equation 7.6 as

$$W_{it} = \gamma_0' + \gamma_1 TX_{it} + \gamma_2 TM_{it} + \gamma_3 TFP_{it} + \gamma_4 YEAR_t + \gamma_5 I_{it}^{'} * w_{it}^{i} + \varepsilon_{it}$$

(Equation 7.6')

Where $I_{it}^{'}$ is now a $(K \times 1)$ vector of industry variables. This represents industry affiliation $(K+1)$. The intercept $\gamma_0^{'}$ represents the mean of the log wage for employees in the $(K+1)^{th}$ industry.

Given the estimates $\hat{I}_{it}'$ in Equation 7.6', the employment weighted average industry coefficient is

$$\hat{WA} = \frac{\sum_{i=1}^{K} n_i \hat{I}_{it}'}{N} = e' \hat{I}_{it}'$$ (Equation 7.6'')

And the estimated intercept in Equation 7.6' is defined as

$$\hat{\gamma}_0 = \hat{\gamma}_0' + \hat{WA} = \hat{\gamma}_0' + e' \hat{I}_{it}'$$ (Equation 7.6''')

Where $N = \sum_{k=1} n_k$ is the proportion of employees belonging to the i^{th} industry in the observed sample. Expressed in matrix form, e is a $(K \times 1)$ vector with elements $e_i = n_i / N$ representing the employment shares of each of the industries.

The results of the first stage regression are shown in Table 7.9. Generally, these indicate that the age-earning profile in the manufacturing sector does not show much difference from the age earning profile for the whole economy presented in Table 7.7. The same is true for the return to educational qualifications, though these are slightly lower for low level qualifications and higher for diplomas and degrees.

Turning now to the wage differentials between industries in the manufacturing sector, (the food industries group is used as the control in these regressions). Generally, petroleum, electrical machinery, machinery, chemicals, plastics, rubber, printing, beverages (wine) and furniture are among the industries that pay relatively high premiums, compared to the food industries. On the other hand, in particular years the textile, pottery and tobacco industries paid a lower premium compared to the food industries. The results from Table 7.9 show a fluctuating trend between years; for example, the tobacco industry paid a lower premium relative to the food industries for all years except 1989, when the pay premium was relatively high at 0.36. In contrast, the leather industry normally paid a higher premium relative to the food industry, but paid a lower premium in 1989. The petroleum industries appeared to pay the highest premium relative to the food industry, with the premium ranging between 0.84 and 1.04 from 1984 to 1995, but the premium dropped dramatically to 0.55 in 1997. Other chemical industries consistently paid a higher premium (around 0.2) than the food industries between 1992 and 1997. Wider differentials were shown by some industries. For example, miscellaneous products of petroleum and coal ranged between -0.7 in 1984 to 0.4 in 1992. Electrical machinery and machinery industries showed an increasing premium over time, from 0.24 and 0.32 in 1984 to 0.47 and 0.37 in 1992 respectively. However, the returns dropped in 1995 to 0.36 and 0.29 respectively. Comparison across the years also showed that most of the industries paid a higher premium in 1992. The exception was the chemical industry, which paid the highest premium in 1989. It is interesting to note that these results are consistent with the literature on economic growth in Malaysia as presented in Chapter 2, where the achievement in the early 1990s of the economic plan to move industry to a manufacturing basis improved investment and economic activity in Malaysian manufacturing.

Table 7.9: Estimates of Earning Equations for the Manufacturing Sector

	1984	1989	1992	1995	1997
Constant	5.974 (104.21)*	6.132 (124.28)	6.551 (141.11)	6.933 (120.54)	7.238 (100.27)
Age	0.110 (31.75)	0.104 (35.64)	0.087 (31.32)	0.073 (22.85)	0.071 (17.31)
Age squared	-0.001 (-27.49)	-0.001 (-29.79)	-0.01 (25.01)	-0.001 (-18.20)	-0.001 (-14.32)
Male	0.423 (32.55)	0.384 (36.01)	0.350 (37.59)	0.341 (32.63)	0.239 (17.29)
Married	0.138 (9.85)	0.138 (11.97)	0.073 (0.048)	0.051 (4.38)	0.020 (1.33)
Other qualifications	-0.375 (-14.85)	-0.433 (-17.92)	-0.373 (15.72)	-0.283 (-11.13)	-0.182 (-5.02)
Primary qualification	0.168 (10.04)	0.109 (7.41)	0.150 (12.70)	0.157 (11.43)	0.114 (6.19)
Secondary qualification	0.274 (16.61)	0.284 (15.37)	0.337 (21.76)	0.343 (19.49)	0.357 (15.86)
High school qualification	0.424 (8.41)	0.403 (10.14)	0.422 (12.97)	0.482 (13.05)	0.436 (8.14)
Diploma	0.747 (12.49)	0.491) (11.45)	0.557 (16.18)	0.550 (16.35)	0.471 (12.49)
Degree	0.972 (20.39)	0.848 (21.98)	0.950 (27.04)	0.985 (28.49)	0.808 (18.28)
Professional	0.370 (10.70)	0.485 (16.60)	0.371 (15.14)	0.370 (17.35)	0.233 (8.61)
Manager	0.867 (23.24)	1.031 (33.44)	1.019 (35.62)	1.022 (33.37)	0.498 (13.05)
Clerical	0.246 (12.13)	0.270 (15.71)	0.224 (13.77)	0.244 (13.52)	0.150 (6.52)
Sales	0.318 (7.34)	0.376 (8.65)	0.356 (8.62)	0.397 (10.15)	0.252 (4.45)
Services	-0.107 (-3.16)	-1.40 (-4.72)	-0.148 (-4.96)	-0.202 (-6.34)	-0.162 (-4.32)

Note: * The figures in parentheses are t-statistics.

Table 7.9: Estimates of Earning Equations for the Manufacturing Sector (Continued)

	1984	1989	1992	1995	1997
Beverages	-0.028 (-0.726)*	-0.192 (-5.24)	0.002 (0.059)	-0.003 (-0.063)	0.088 (1.68)
Wine	0.172 (3.52)	0.273 (6.07)	0.303 (6.18)	0.164 (2.400)	0.206 (3.00)
Tobacco	-0.072 (-1.15)	0.361 (5.88)	-0.266 (-3.90)	-0.192 (-2.385)	-0.011 (-0.098)
Textiles	-0.078 (-2.42)	-0.083 (-3.02)	0.086 (3.01)	-0.078 (-2.311)	-0.024 (-0.529)
Apparel	0.028 (1.140)	0.102 (4.751)	0.252 (11.94)	0.149 (5.44)	0.206 (5.65)
Leather	0.020 (0.157)	-0.058 (-0.622)	0.377 (5.387)	0.031 (0.281)	0.308 (3.04)
Food	0.103 (1.850)	-0.050 (-9.53)	0.136 (2.97)	0.093 (1.522)	0.178 (2.18)
Wood	-0.033 (-1.389)	0.029 (1.460)	0.082 (4.22)	0.036 (1.566)	0.007 (0.226)
Furniture	0.125 (4.098)	0.057 (2.15)	0.182 (7.46)	0.086 (2.97)	0.174 (4.675)
Paper	-0.079 (-1.55)	0.289 (7.67)	0.289 (8.32)	0.184 (4.42)	0.155 (2.84)
Printing	0.133 (4.57)	0.163 (6.15)	0.333 (12.03)	0.226 (6.52)	0.282 (6.33)
Chemicals	0.173 (3.52)	0.445 (11.21)	0.285 (6.03)	0.303 (6.28)	0.189 (2.93)
Other Chemical Products	0.089 (2.21)	0.163 (4.54)	0.281 (8.06)	0.244 (6.19)	0.211 (3.85)
Petroleum	0.842 (13.78)	0.973 (17.58)	1.045 (20.71)	0.933 (15.64)	0.551 (6.63)
Miscellaneous of Petroleum and Coal	-0.728 (-1.733)	0.3980 (1.796)	0.437 (2.075)	0.225 (1.10)	0.009 (0.013)
Rubber	0.008 (0.258)	0.050 (2.099)	0.171 (7.08)	0.109 (3.61)	0.107 (2.74)

Note: * The figures in parentheses are t-statistics.

Table 7.9: Estimates of Earning Equations for the Manufacturing Sector (Continued)

	1984	1989	1992	1995	1997
Plastic	0.066 (1.61)	0.150 (5.16)	0.285 (10.16)	0.255 (7.85)	0.261 (6.12)
Pottery	-0.051 (-0.431)	0.049 (0.674)	0.160 (2.76)	-0.123 (-1.687)	-0.041 (-0.399)
Glass	0.183 (2.31)	0.173 (3.17)	0.274 (4.91)	0.249 (3.73)	0.380 (4.48)
Non-Metal	0.056 (1.79)	0.033 (1.10)	0.128 (4.50)	0.122 (3.62)	0.055 (1.27)
Iron	0.166 (4.00)	0.212 (5.595)	0.301 (9.27)	0.266 (7.77)	0.364 (7.97)
Non-Ferrous	0.181 (1.827)	0.303 (4.51)	0.360 (4.36)	0.104 (0.954)	0.241 (1.96)
Fabric Metal	0.171 (6.50)	0.164 (6.71)	0.309 (13.58)	0.246 (8.43)	0.222 (6.28)
Machinery Electrical	0.246 (6.46)	0.344 (11.08)	0.471 (15.60)	0.368 (11.15)	0.353 (9.28)
Machinery	0.320 (14.10)	0.357 (18.24)	0.373 (20.67)	0.296 (13.72)	0.323 (11.70)
Technical Equipment	0.361 (12.14)	0.337 (12.86)	0.405 (14.86)	0.277 (9.10)	0.340 (9.06)
Professional, Scientific and Measuring Controlling Equipment	0.167 (2.41)	0.398 (7.54)	0.471 (12.37)	0.308 (6.52)	0.269 (4.01)
Other Manufacturing	0.19 (4.22)	0.160 (4.98)	0.125 (4.01)	0.113 (3.05)	0.210 (3.99)
Number of observations	12268	14463	18587	13408	12497
F test	877	860	565	545	595
Breusch-Pagan / Cook-Weisberg test for constant variance					
Chi2 (1)	41.04	27.5	35.15	25.03	21.14
Prob >chi2	0.30	0.92	0.72	0.96	0.99
R squared	0.488	0.527	0.457	0.460	0.242

Note: * *The figures in parentheses are t-statistics.*

The results of the second stage estimation are presented in Table 7.10. As can be seen, exports contributed significantly and positively to the level of industry wage differentials in the manufacturing sector between 1984 and 1997. Thus an increase in exports increases the demand for labour in a particular industry thus increasing industry wage differentials. In terms of policy implementation, we can conclude that the Export Orientation 2 Plan (EO2) during the period (1985-2000) aimed at increasing exports, also increased industrial wage differentials in the manufacturing sector. On the other hand, the effects of imports had a negative relationship with industry wage differentials. Furthermore, during the period 1984-1997, the amount of Foreign Direct Investment (FDI) coming into the country (especially in the mid-1980s) increased dramatically. As mentioned in Chapter 2, foreign firms accounted for over 45 percent of total manufacturing value added by the mid-1990s.

Table 7.10 also shows the effects of technological change, as measured by Total Factor Productivity (*TFP*). The results indicate that during the sample period, technological change has led to a reduction in wage differentials across manufacturing industries. These results seem to suggest a different story from that reported in other studies, especially for developed countries. One of the factors that might affect the wage differential here is skill premiums. Therefore, the next two sections will present analyses dealing with this subject where we investigate how technological change affects industry skill premiums at different levels of education and qualifications.

Table 7.10 The Effects of Trade and Technological Change on Industries' Wage Premiums During the Period 1984-1997

Model	Coefficient
Constant	-0.167
	(-113.33)*
Exports (TX)	0.020
	(50.72)
Imports (TM)	-0.040
	(-64.76)
TFP	-0.015
	(-14.34)
R^2	0.119
Number of Observation	57234
F test	116
Breusch-Pagan / Cook-Weisberg test for constant variance	
Chi2 (1)	2.20
Prob> chi2	0.13

* t-statistic in parentheses

7.4.1 Skill Specific Industry Wage Premiums

It has been well-documented in previous literature (for example, in Pavcnik *et al,* 2004) and Robbins and Minowa (1996)) that the effects of trade policy may vary for workers with different levels of education. Since the aim of this study is to look at the effects of trade and technological change on relative wages, we now consider whether trade affects industry wage premia by levels of education. Thus in this section we attempt to examine the effects of trade and technological change on those workers with tertiary education levels using weighted least square (WLS). The following sub-Section (7.4.1.2) will repeat the same task for secondary levels of education. These analyses will provide us with information about the relationship between industry-specific skill premiums and trade policy differences amongst two groups of workers. They show specific information about the return to schooling across industries in the manufacturing sector. In order to determine the relationship between industry-specific skill premiums and trade policy, we will again follow Pavcnik *et al.* (2004) to compute skill-specific industry wage premiums by employing a modified version of Equation 7.5. This allows industry wage premiums to differ for tertiary and secondary levels of education.

$$\ln Wt_{kit} = \beta_0 + \beta_1 AGE_{kit} + \beta_2 AGE^2_{kit} + \beta_3 MALE_{kit} + \beta_5 MAR_{kit} + \beta_5 Ind_{kit} + \varepsilon_{kit} \quad \text{(Equation 7.7)}$$

$$\ln Ws_{kit} = \beta_0 + \beta_1 AGE_{kit} + \beta_2 AGE^2_{kit} + \beta_3 MALE_{kit} + \beta_4 MAR_{kit} + \beta_5 Ind_{kit} + \varepsilon_{kit} \quad \text{(Equation 7.8)}$$

where Wt_{kit} and Ws_{kit} are the wages of individual k in industry i in the manufacturing sector, having tertiary and secondary education levels respectively at time t. Applying the same procedure as in Section 7.4, the first stage deals with the earnings regressions. In the second stage, we pool the industry wage premium, using weighted least squares (WLS) with the inverse of standard error of wage premium estimates from the first stage as weights. In the second stage, the industry wage premium for those having tertiary and secondary levels of education can be written respectively as;

$$Wt_{it} = \gamma_0 + \gamma_1 TX_{it} + \gamma_2 TM_{it} + \gamma_3 TFP_{it} + \gamma_4 YEAR_t + \varepsilon_{it} \quad \text{(Equation 7.9)}$$

and

$$Ws_{it} = \gamma_0 + \gamma_1 TX_{it} + \gamma_2 TM_{it} + \gamma_3 TFP_{it} + \gamma_4 YEAR_t + \varepsilon_{it} \qquad \text{(Equation 7.10)}$$

where Wt_{it} and Ws_{it} are the estimated sector wages for tertiary and secondary groups respectively, expressed as deviations from the employment-weighted average wage premium.

7.4.1.1 Industry Wage Premiums for Tertiary -Educated Workers

Table 7.11 reports the industry specific skill premia for those workers with tertiary levels of education. The first stage results give us information about how the proportion of differences in relative wages varies between industries with the same observable characteristics. The positive or negative industry-specific skill premiums suggest that certain industries paid higher or lower industry-specific skill premiums than others. Generally, Table 7.11 shows that the industry-specific skill premium for a tertiary level of education decreased during the sample period from 9.78 percentage points in 1984 to 9.51 percentage points in 1997. Those workers with a tertiary education level in the petroleum industry consistently had the largest skill premium during the sample period. In the non-ferrous industry, workers with a tertiary level of education had higher pay rates during the mid-1980s and early 1990s. By 1995, this had changed to their having the lowest skill premium after the pottery and textile industries. The wood and textiles industries were associated with the smallest wage premium during the sample period.

Table 7.11: Industry-Specific Skill Premiums for the Tertiary Education Level

	1984	1989	1992	1995	1997
Constant	2.949	3.892	5.023	5.020	6.879
	(6.174)*	(10.413)	(15.96)	(14.031)	(16.212)
Age2	-0.004	-0.003	-0.002	-0.002	-0.001
	(-9.473)	(-8.379)	(-9.531)	(-7.991)	(-2.957)
Age	0.317	0.253	0.060	0.216	0.111
	(11.401)	(11.513)	(17.757)	(10.782)	(4.624)
Male	0.417	0.367	0.452	0.307	0.190
	(5.3)	(6.382)	(9.853)	(5.877)	(3.308)
Married	0.202	0.068	0.315	0.164	-0.003
	(2.575)	(1.057)	(5.918)	(2.875)	(-0.044)
Beverages	-0.008	-0.368	0.201	-0.187	-0.010
	(-0.36	(-1.687)	(0.829)	(-0.774)	(-0.042)
Wine	-0.154	0.474	0.482	0.515	0.117
	(-0.547	(2.389)	(2.528)	(1.896)	(0.478)
Tobacco	0.358	0.467	0.173	-0.395	0.380
	(1.424)	(1.914)	(0.653)	(-1.126)	(1.059)
Textiles	-0.191	-0.316	-0.056	-0.522	-0.039
	(-0.914)	(-1.936)	(-0.331)	(-2.513)	(-0.175)
Apparel	-0.299	-0.222	0.170	-0.435	0.034
	(-1.374)	(-1.639)	(1.252)	(-2.360)	(0.150)
Leather	0.331	-0.300	na	-0.307	0.580
	(0.655)	(-0.867)		(-0.694)	(1.163)
Footwear	-0.360	-2.285	-0.360	0.309	0.177
	(-1.945)	(-4.740)	(-0.818)	(0.577)	(0.411)
Wood	0.020	-0.117	-0.285	-0.285	-0.611
	(0.087)	(-0.797)	(-2.351)	(-2.056)	(-3.458)
Furniture	0.020	-0.266	-0.227	-0.680	-0.098
	(0.087)	(-1.347)	(-1.213)	(-3.503)	(-0.523)
Paper	0.547	0.445	0.218	0.073	0.374
	(1.315)	(2.603)	(1.144)	(0.353)	(1.599)
Printing	0.097	-0.164	0.248	0.048	0.481
	(0.7)	(-1.343)	(1.976)	(0.307)	(2.950)
Chemicals	0.221	0.413	0.638	0.398	0.483
	(1.165)	(2.977)	(3.917)	(2.053)	(2.502)
Other Chemical	-0.183	0.349	0.435	0.247	0.371
Products	(-1.199)	(2.563)	(2.922)	(1.496)	(1.958)
Petroleum	0.651	0.879	1.239	0.916	0.773
	(4.274)	(5.945)	(9.039)	(5.222)	(3.871)
Miscellaneous of	na	-0.995	1.107	0.820	na
Petroleum and		(-1.469)	(2.070)	(1.093)	
Coal					
Rubber	-0.004	0.051	0.213	0.219	0.331
	(-0.022)	(0.404)	(1.591)	(1.311)	(1.657)
Plastic	0.082	0.332	0.490	0.090	0.333
	(0.292)	(1.982)	(3.356)	(0.470)	(1.887)
Pottery	-0.369	0.273	0.287	-0.532	0.332
	(-0.521)	(1.022)	(0.970)	(-1.370)	(0.548)
Glass	-0.523	-0.005	0.081	0.306	0.330
	(-1.255)	(-0.013)	(0.304)	(1.015)	(0.765)
Non-Metal	-0.002	0.127	0.374	-0.009	0.264
	(-0.011)	(0.656)	(1.997)	(-0.054)	(1.339)
Iron	-0.412	0.235	0.157	0.271	0.513
	(-1.917)	(1.320)	(0.870)	(1.608)	(2.598)

Note: * The figures in parentheses are t-statistics

Table 7.11: Industry-Specific Skill Premiums for the Tertiary Education Level (Continued)

	1984	1989	1992	1995	1997
Non-Ferrous	0.214	0.758	0.296	-0.495	0.739
	(0.422)	(1.911)	(0.394)	(-1.112)	(1.501)
Fabric Metal	0.004	-0.064	0.192	0.117	0.200
	(0.021)	(-0.471)	(1.333)	(0.715)	(1.131)
Machinery	0.346	0.008	0.574	0.446	0.307
Electrical	(1.933)	(0.059)	(4.015)	(2.931)	(2.107)
Machinery	0.186	0.211	0.373	0.211	0.439
	(1.645)	(2.239)	(3.728)	(1.768)	(3.449)
Technical	0.410	0.393	0.453	0.301	0.201
Equipment	(2.967)	(3.087)	(3.380)	(1.976)	(1.266)
Professional,	-0.051	-0.134	0.524	0.167	0.288
Scientific and Measuring Controlling Equipment	(-0.156)	(-0.676)	(2.936)	(0.585)	(1.254)
Other	-0.036	-0.128	0.091	-0.046	0.172
Manufacturing	(-0.134)	(-0.610)	(0.477)	(-0.222)	(0.662)
Number of observations	559	887	1347	1098	1154
R squared	0.577	0. 644	0.542	0.494	0.225
F test	355	273	323	295	539
Breusch-Pagan / Cook-Weisberg test for constant variance Chi2 (1)	32.00	40.10	52.1	51.2	51.7
Prob>chi2	0.10	0.62	0.32	0.09	0.06

Note: * The figures in parentheses are t-statistics.
Food industry is the omitted category.
Na- no information.

Following this, we need to ascertain the changes in the pattern of trade and technological change associated with changes in industry-specific premiums. The two stage regression results for the tertiary education level are reported in Table 7.12. These results show that increases in the pattern of trade within an industry (both from exports and imports) are associated with increases in the tertiary premium in the manufacturing sector. This result is consistent with the previous literature. This is seen, for example, in Pavcnik *et al.* (2004) who found that in Brazil export exposure within industries increased the sector-specific skill premium. On the other hand, changes in technology significantly decreased the tertiary premium in the manufacturing sector. Interestingly, even though the results for technological change do not support previous work in this area, especially for developed countries, this result confirms our findings in Chapter 5, where an inverse relationship between the changes in technology and the demand for skilled workers was found. These results indicate that there was no skilled–biased technical change in the Malaysian manufacturing sector during the sample period.

Table 7.12: The Effects of Trade and Technological Change on Industries' Wage Premiums for Tertiary Education Levels During the Period 1984-1997

Model	Coefficient
Constant	-0.168 (-53.77)*
Exports (TX)	0.078 (35.60)
Imports (TM)	0.070 (53.71)
TFP	-0.031 (-64.41)
Number of Observations	64517
R^2	0.135
F test	256
Breusch-Pagan / Cook-Weisberg test for constant variance	
Chi2 (1)	0.21
Prob>chi2	0.64

* t-statistic in parentheses

7.4.1.2 Industry Wage Premiums for Secondary-Educated Workers

Table 7.13 reports the first stage wage premium for secondary-educated workers. It shows that the industry-specific wage premium for secondary- educated workers increased during the sample period. Secondary educated workers in iron, non-metal, other chemical products, chemical, non-ferrous, technical equipment and petroleum consistently had a positive wage premium during the sample period. The largest skill premium occurred in the petroleum industry. On the other hand, secondary-educated workers in the pottery, footwear, apparel and textiles industries were associated with the smallest wage premium during the sample period.

Table 7.13: Industry-Specific Skill Premiums for the Secondary Education Level

	1984	1989	1992	1995	1997
Constant	5.566	6.167	6.642	7.155	7.177
	(62.654)	(83.063)	(98.97)	(91.657)	(73.285)
Age2	-0.002	-0.001	-0.001	-0.001	-0.001
	(-18.098)	(-15.190)	(-11.87)	(-10.887)	(-12.541)
Age	0.149	0.113	0.36	0.080	0.094
	(25.561)	(23.462)	(41.568)	(16.551)	(15.809)
Male	0.308	0.293	0.274	0.302	0.221
	(18.112)	(22.018)	(23.874)	(23.426)	(13.194)
Married	0.150	0.161	0.112	0.065	0.019
	(7.689)	(10.615)	(8.41)	(4.356)	(1.029)
Beverages	-0.12	-0.261	0.125	0.073	0.038
	(-2.165)	(-4.959)	(2.4075)	(1.305)	(0.54)
Wine	0.127	0.257	0.313	0.079	0.114
	(1.950)	(4.166)	(5.052)	(0.761)	(1.327)
Tobacco	0.005	0.330	-0.078	0.191	0.125
	(0.056)	(4.192)	(-0.786)	(1.761)	(0.848)
Textiles	-0.175	-0.105	0.071	-0.064	-0.131
	(-3.892)	(-2.908)	(1.983)	(-1.463)	(-2.279)
Apparel	-0.173	-0.068	0.113	0.011	0.011
	(-4.779)	(-2.361)	(4.025)	(0.288)	(0.222)
Leather	-0.029	0.015	0.302	-0.032	0.116
	(-0.145)	(0.112)	(3.757)	(-0.247)	(0.868)
Footwear	-0.017	-0.117	0.106	-0.058	-0.031
	(-0.219)	(-1.633)	(1.731)	(-0.743)	(-0.310)
Wood	-0.067	-0.045	0.028	-0.060	-0.111
	(-1.831)	(-1.536)	(1.015)	(-1.793)	(-2.61)
Furniture	-0.007	-0.103	0.116	0.011	0.042
	(-0.151)	(-2.822)	(3.558)	(0.269)	(0.825)
Paper	0.034	0.216	0.309	0.105	0.072
	(0.508)	(4.553)	(6.877)	(1.964)	(1.095)
Printing	0.132	0.149	0.374	0.272	0.240
	(3.567)	(4.505)	(10.882)	(6.194)	(4.388)
Chemicals	0.154	0.489	0.321	0.313	0.232
	(2.395)	(9.557)	(4.784)	(4.849)	(2.561)
Other Chemical	0.124	0.090	0.259	0.308	0.198
Products	(2.204)	(1.889)	(5.901)	(5.965)	(2.762)
Petroleum	0.935	0.873	0.926	0.733	0.411
	(11.436)	(11.791)	(13.985)	(9.282)	(3.681)
Miscellaneous of	-0.895	0.719	0.419	0.257	-0.299
Petroleum and	(-1.504)	(2.681)	(0.750)	(0.935)	(-0.442)
Coal					
Rubber	0.012	-0.046	0.116	0.029	-0.023
	(0.253)	(-1.429)	(3.652)	(0.714)	(-0.438)
Plastic	-0.023	0.051	0.241	0.253	0.188
	(-0.440)	(1.354)	(6.758)	(5.959)	(3.511)
Pottery	-0.260	-0.045	0.127	-0.272	-0.300
	(-1.616)	(-0.457)	(1.759)	(-2.753)	(-2.074)
Glass	0.114	0.042	0.205	0.188	0.319
	(1.152)	(0.680)	(3.045)	(2.28)	(3.041)
Non-Metal	0.052	-0.047	0.034	0.111	-0.018
	(1.050)	(-1.104)	(0.865)	(2.353)	(-0.307)
Iron	0.094	0.145	0.217	0.201	0.248
	(1.660)	(2.983)	(5.304)	(4.509)	(4.383)

Note: * The figures in parentheses are t-statistics.

Table 7.13: Industry-Specific Skill Premiums for the Secondary Education Level (Continued)

	1984	1989	1992	1995	1997
Non-Ferrous	0.148	0.152	0.249	0.110	0.248
	(1.122)	(1.727)	(2.506)	(0.840)	(1.782)
Fabric Metal	0.059	0.044	0.226	0.124	0.077
	(1.606)	(1.355)	(7.616)	(3.282)	(1.698)
Machinery	0.177	0.250	0.456	0.365	0.301
Electrical	(3.633)	(6.628)	(12.534)	(8.891)	(6.273)
Machinery	0.235	0.243	0.318	0.262	0.232
	(7.807)	(9.631)	(13.543)	(9.129)	(6.393)
Technical	0.289	0.286	0.367	0.252	0.302
Equipment	(7.226)	(8.271)	(10.598)	(6.511)	(6.439)
Professional,	0.073	0.296	0.393	0.281	0.205
Scientific and Measuring Controlling Equipment	(0.900)	(4.784)	(8.878)	(5.165)	(2.634)
Other	0.071	0.035	0.045	0.132	0.113
Manufacturing	(-1.275)	(0.909)	(1.181)	(2.815)	(1.779)
Number of observations	6658	8853	12081	8751	8087
R squared	0.427	0.448	0.309	0.271	0.139
F test	295	315	331	278	455
Breusch-Pagan / Cook-Weisberg test for constant variance Chi2 (1)	22.5	36.6	42.3	43.6	40.15
Prob >chi 2	0.82	0.62	0.42	0.39	0.10

Note: * The figures in parentheses are t-statistics.
Food industry is the omitted category.

The regression results for the second stage are reported in Table 7.14. It is interesting to note here that even though the skill premium for secondary-educated workers increased throughout the sample period, increases in export exposure within an industry are associated with a decrease in the skill premium for secondary-educated workers. This situation could arise for two reasons. First, the definition of the secondary group is very large. Bear in mind, as mentioned in Chapter 6, the group includes those having other qualifications, primary qualifications and secondary qualifications. Second, the effects of trade may differ by qualification within the secondary group, for example, those workers having primary and other qualifications may have different effects to those having secondary qualification. Thus the next section (Section 7.5) will provide an answer to this issue by using inter-industry wage differentials by level of qualification.

In an analysis of the impact of technological change, the second stage regression results show that the changes in technological change are associated with increases in the skill premium for secondary-educated workers. This result supports our finding in Chapter 5, where we found that changes in technological change had a positive relationship with the relative demand for semi-skilled workers during the period 1984-1997.

Table 7.14: The Effects of Trade and Technological Change on Industries' Wage Premiums for Secondary Education Levels during the Period 1984-1997

Model	Coefficient
Constant	0.034 (18.712)
Exports (*TX*)	-0.012 (-24.07)
Imports (*TM*)	-0.052 (-67.33)
TFP	0.008 (6.301)
Number of observations	64712
R^2	0.088
F test	1804
Breusch-Pagan / Cook-Weisberg test for constant variance	
Chi2 (1)	0.82
Prob > Chi2	0.36

* t-statistic in parentheses

7.5 The Effects of Trade and Technological Change on Skill Wage Differentials: Manufacturing Industries

In this section, we again focus on the overall movements in skills wage differentials for the Malaysian manufacturing sector, and the impact of technology and trade flows. As in the previous section, this section also utilises a two stage estimation process, but this time the focus is on earnings differentials by skill levels rather than on industry wage premia. Skills are classified by groups of qualifications: degree, diploma, high school, secondary qualification, primary qualification and other qualifications.

In the first stage, to obtain the experience-adjusted differentials, the present analysis begins by estimating the simple human capital model for each survey year in the following form:

$$\ln W_k = \beta_0 + \beta_1 Q1_k + \beta_2 Q2_k + \beta_3 Q3_k + \beta_4 Q4_k + \beta_5 Q5_k + \beta_6 Q6_k + \beta_7 Occ_k + \beta_8 AGE_k + \beta_9 AGE_k^{\,2} + \beta_{10} MALE_k + \beta_{11} MAR_k + \varepsilon_k \quad \text{(Equation 7.11)}$$

where $\ln W_k$ is the natural logarithm of the wage for worker k; Six dummies of qualification level are indicated by $Q1$ to $Q6$, namely other qualifications (Q1) primary (Q2) secondary (Q3) high school (Q4) diploma (Q5) and degree level (Q6). Occ_k refers to occupation in manufacturing, AGE_k and $AGE_k^{\,2}$ represent the worker's age and age squared respectively, $MALE_k$ is a dummy variable equal to 1 if the worker is male, MAR_k is dummy variable if the worker is married and ε_k is the error term.

In the second stage, we use the information on estimated wage differentials by level of qualification to examine how technology and trade have impacted on these. A set of estimated wage differentials in stage one is used as dependent variables, with industry measures of technological change and trade flows capturing the technology and trade effects. This estimation considers the following model:

$$W_i = \gamma_0 + \gamma_1 TX_i + \gamma_2 TM_i + \gamma_3 TFP_i + \gamma_4 YEAR + \varepsilon_i \quad \text{(Equation 7.12)}$$

where W_i represents the log-wage differentials between degree and other qualifications (primary, secondary, high school and diploma) in industry i; TX_i represents the exports output ratio, TM_i is the imports output ratio and TFP_i represents the industry rate of technological change measured by Total Factor Productivity.

Table 7.15 shows the overall trends in the wage differentials between degree and other levels of qualifications (other qualifications, primary, secondary, high school and diploma) over time. As Table 7.15 shows, during the sample period the wage differentials between degree and other levels of qualification narrowed, with the exception of the differential between degree and diploma qualifications. However, it is interesting to note that many of the wage differentials grew wider during the period 1992 and 1995 but become narrower again in 1997. The wage differentials between degree and high school qualifications narrowed throughout the period because of the increase in the return for high school qualifications (see Table 7.9). The wage differentials between degree and secondary qualifications become wider during the periods to 1989 and 1992, although the returns for both secondary and degree qualifications increased by 18 percent and 13 percent respectively. It is noteworthy that the increase in the return for the medium qualifications group (secondary qualifications) was higher than the increase in the return to degree qualifications. These results are consistent with Raziah (2002) who found that employment and real wages grew faster for semi-skilled than for skilled workers, so that the labour market inequality for those two groups declined.

Table 7.15: Changes in Education Premiums and Wage Differentials Between Degree Level of Education and Other Qualifications, Primary, Secondary, High School and Diploma Workers

	Degree and Other Qualification	Degree and Primary	Degree and Secondary	Degree and High School	Degree and Diploma
1984	1.347	0.804	0.698	0.548	0.225
1989	1.281	0.739	0.564	0.445	0.357
1992	1.323	0.800	0.613	0.528	0.393
1995	1.268	0.828	0.642	0.503	0.435
1997	0.991	0.694	0.452	0.372	0.337

Before we consider how trade and technological change impact on skill differentials in the second stage estimations, the skill differentials by industry will be presented. In the estimation of wage differentials by industry for each year, the estimated wage premia are expressed as the differences of industry coefficients from the first stage regression. As presented in Tables 7.16 to 7.20 these tables show the estimated log-wage differentials between workers with degrees and primary, secondary, high school, diploma and other qualifications for each industry from 1984 to 1997.

Table 7.16: Log Wage Differentials between Degree and Other Qualifications, Based on Industry Specific Wage Premia

Industry	1984	1989	1992	1995	1997
Food	2.307	1.862	1.503	2.315	1.338
Beverages	1.961	1.628	1.066	1.211	0.754
Wines and Liquors	1.61	2.214	1.059	2.327	0.228
Tobacco products	3.189	4.697	na	3.336	3.137
Textiles	2.511	2.875	1.475	1.630	2.416
Apparel	1.966	1.627	1.939	2.098	1.023
Leather	3.007	na	na	na	3.369
Footwear	-0.070	na	na	1.579	na
Wood products	1.913	1.765	0.209	1.708	0.413
Furniture	2.051	0.958	1.225	0.084	0.512
Paper products	3.247	2.041	0.763	1.610	1.492
Printing and Publishing	1.347	1.326	0.760	2.102	1.119
Chemicals	1.716	2.802	1.448	1.437	2.110
Other Chemical products	2.249	2.543	1.014	2.180	1.287
Petroleum	na	3.140	1.123	2.426	1.527
Rubber	2.337	1.756	1.166	2.034	1.448
Plastic	2.173	2.036	1.022	2.052	1.215
Pottery or Ceramic Products	2.020	1.765	1.529	0.668	3.073
Glass products	1.143	2.053	1.153	2.851	1.325
Non-Metallic	2.096	2.596	1.633	1.667	1.115
Basic Iron and Steel Products	1.484	1.627	0.975	1.750	1.530
Non Ferrous Metal	na	1.595	na	na	na
Fabricated Metal	1.223	1.811	1.325	1.406	1.350
Machinery	1.151	1.383	1.038	2.063	1.280
Electrical Machinery	1.827	1.633	1.244	1.711	1.090
Instrument and Appliances Equipment	1.742	2.073	1.254	1.450	1.253
Medical and Surgical Equipment	na	na	1.313	1.072	na
Other Manufacturing	2.016	2.174	1.427	1.843	0.362
Mean	1.929	2.079	1.194	1.793	1.431

Table 7.16 consists of information for a comparison of the wage differentials between degree and other qualifications. It indicates that the differentials between these groups display large differences, averaging more than 100 percent throughout the sample period 1984-1997. In this period, pottery or ceramic products has large differences in wage inequality, especially in 1997. This industry shows an increase in wage differentials from 202 percent in 1984 to 307 percent in 1997. Beverages, on the other hand, shows a consistent decrease from 196 percent in 1984 to 162 percent in 1989, and

a continued drop to 75 percent in 1997, the smallest differential among the industries. The wage differential between degree and other qualifications is approximately 95 percent in 1984; it drops to 69 percent in 1997. The trend across the years is for more than half of the industries to show a decreasing trend in wage differentials between 1984 and 1997. Only 21 percent of the industries had increasing wage differentials. Pottery and ceramic products was among the industries that had the highest increases in wage differentials over the sample period. This table also demonstrates that some industries had large fluctuations. In the wines and liquors industry, for example, the wage differential in 1984 was 161 percent, and this figure increased to 220 percent in 1989. The trend continued to 232 percent in 1995, before dropping to just 22 percent in 1997. Similarly, wage differentials in furniture and wood products fluctuated throughout the sample period 1984-1997. In wood products, the wage differential was over 170 percent between 1984 and 1989. However, the trend narrowed to 20 percent in 1992 before a large difference (170 percent) again in 1995. Surprisingly, in 1997 the wage differential between degree and other qualifications in this industry narrowed to 41 percent. In the furniture industry, the wage differential dropped from 200 percent in 1984 to 95 percent in 1989; it then increased to 122 percent in 1992, and narrowed dramatically to 8 percent in 1995 and 51 percent in 1997. The wage differentials in fabricated metal, machinery and electrical machinery remained consistently over 100 percent every year. During the sample period, the tobacco products industry appeared to have the highest wage differential, showing consistent differences of over 300 percent, with the largest differential in 1989 at 400 percent. The average industry wage differential, however, was 192 percent in 1984 and 143 percent in 1997.

Comparison across the years also shows that in 1984 the widest wage differential gap was in the paper industry, with a 324 percent difference. The narrowest gap occurred in the footwear industry, with a difference of approximately 7 percent. In 1989, the highest wage differential was found in tobacco products; the difference between degree holders and other qualifications was 469 percent. The furniture industry appeared to be the industry with the smallest gap, with a difference of 95 percent. Although the apparel industry had a regular trend during the sample period, this industry had the highest wage differential in 1992; the difference between degree and other qualifications was 193 percent. Wood products, however, had the smallest gap between degree and other qualifications with a difference of 20 percent. In 1995, the widest gap belonged to tobacco products at 336 percent, and the furniture industry had the smallest gap. In 1997, the tobacco industry again showed the widest wage differential at 313 percent, and the wage differential in wood products was the smallest at 41 percent.

Table 7.17: Log Wage Differentials between Degree and Primary Qualification, Based on Industry Wage Premia

Industry	1984	1989	1992	1995	1997
Food	1.389	1.199	1.630	1.800	0.776
Beverages	1.360	0.473	1.385	0.489	0.710
Wines and Liquors	0.728	1.456	1.417	2.096	0.439
Tobacco products	1.941	2.215	na	1.894	1.867
Textiles	1.683	1.609	1.628	1.188	1.645
Apparel	1.705	1.508	1.909	2.051	1.029
Leather	2.167	0.734	na	na	3.312
Footwear	-0.201	na	na	0.757	na
Wood products	1.376	1.364	0.364	1.268	0.037
Furniture	1.748	0.691	1.353	-0.136	0.381
Paper products	1.461	1.232	1.029	1.256	1.343
Printing and Publishing	0.955	0.782	0.975	1.298	0.694
Chemicals	1.404	1.183	2.230	1.256	1.078
Other Chemical products	1.348	1.594	1.350	1.433	0.776
Petroleum	0.816	1.326	1.472	1.064	1.635
Rubber	1.950	1.258	2.984	1.440	1.187
Plastic	1.363	1.403	1.421	1.437	1.164
Pottery or Ceramic products	1.075	1.443	1.238	na	3.466
Glass products	1.126	1.974	1.692	2.945	0.923
Non-Metallic	1.467	1.667	1.269	0.800	0.625
Basic Iron and Steel products	1.063	1.108	1.773	1.183	1.351
Non-Ferrous metal	na	2.909	1.125	na	0.840
Fabricated Metal	0.786	1.316	1.480	1.316	0.970
Machinery	0.924	1.408	1.071	1.360	0.903
Electrical Machinery	1.351	1.056	1.394	1.327	1.001
Instrument and Appliances equipment	1.093	1.270	1.345	1.306	0.810
Medical and Surgical equipment	1.500	1.509	1.672	0.842	0.868
Other Manufacturing	1.237	1.702	1.380	0.813	0.164
Mean	1.256	1.385	1.463	1.166	1.108

Table 7.17 presents the log wage differential between degree and primary qualifications. On average, during the sample period the overall trend showed that the wage differential between degree and primary education decreased from 125 percent in 1984 to 110 percent in 1997. Only 17 percent of industries saw an increasing trend in wage

differentials; the leather, petroleum, fabricated metal, pottery and ceramic products, and basic iron and steel industries experienced increasing trends during the period 1984-1997. Pottery and ceramic products appeared to be the industry with the highest increase in wage differentials, showing an increase from 106 percent in 1984 to 346 percent in 1997. The differential in fabricated metal, however, increased to 148 percent from 1989 to 1992, but decreased to 131 and 97 percent during 1995 and 1997 respectively. The beverages industry saw a fluctuating trend in wage differentials between degree and primary qualification. The wage differential was around 136 percent in 1984. It decreased to 47 percent in 1989 and increased to 138 percent in 1992, before falling back by 48 percent in 1995. Table 7.17 clearly shows that in 1997 there was a narrowing wage differential compared to other years. However, this year is characterised by a large range in wage inequality between industries, with the highest differential occurring in pottery and ceramic products (346 percent) and the lowest in wood products (3 percent).

Table 7.18: Log Wage Differentials between Degree and Secondary Qualifications, Based on Industry Wage Premia

Industry	1984	1989	1992	1995	1997
Food	1.193	0.927	1.503	1.526	0.486
Beverages	1.194	0.542	1.066	0.001	0.366
Wines and Liquors	0.457	0.962	1.059	1.656	0.003
Tobacco products	1.485	1.608	na	1.599	0.983
Textiles	1.552	1.436	1.475	0.910	1.537
Apparel	1.664	1.387	1.939	1.928	0.870
Leather	2.052	1.227	na	na	3.138
Footwear	-0.325	na	na	0.849	na
Wood products	1.161	1.175	0.209	1.065	0.188
Furniture	1.676	0.531	1.225	0.374	0.096
Paper products	1.128	1.138	0.763	0.959	1.113
Printing and Publishing	0.751	0.627	0.760	1.136	0.679
Chemicals	1.030	0.983	1.448	0.737	0.837
Other Chemical products	1.089	1.345	1.014	1.158	0.811
Petroleum	0.570	0.987	1.123	1.255	1.325
Rubber	1.471	1.102	1.166	1.322	1.031
Plastic	1.165	1.308	1.022	1.294	0.863
Pottery or Ceramic products	1.592	1.528	1.529	1.267	3.090
Glass products	0.940	2.208	1.153	2.896	1.022
Non-Metallic	1.248	1.547	1.633	0.716	0.349
Basic Iron and Steel products	0.858	0.963	0.975	1.094	1.063
Non-Ferrous Metal	na	1.750	na	na	1.116
Fabricated Metal	0.767	1.215	1.325	1.187	0.815
Machinery	0.750	1.321	1.038	1.214	0.801
Electrical Machinery	1.185	0.993	1.244	1.198	0.825
Instrument and Appliances equipment	0.855	1.045	1.254	1.129	0.626
Medical and Surgical equipment	1.280	1.077	1.313	0.795	0.585
Other Manufacturing	1.100	1.642	1.427	0.792	-0.037
Mean	1.107	1.207	1.194	0.993	0.896

Table 7.18 presents the log wage differential between degree and secondary qualifications between 1984 and 1997. Generally, during the sample period, more than half of the industries had decreasing trends in wage differentials between degree holders and workers with secondary qualifications. Interestingly, the wage differential for fabricated metal and machinery in 1997 was higher than it was in 1984; however, this differential was lower compared to 1989, 1992 and 1995. The leather industry saw a widening wage differential between holders of degrees and secondary qualifications.

The gap was almost 300 percent in 1997. In the footwear industry, the wages of workers with secondary qualifications were higher than those of workers with degree qualifications. This situation arose in 1984, but there is no information for this particular industry for 1989, 1992 and 1997. In 1995, the wage differential between degree and secondary qualifications became positive, which meant that the wages for workers with degrees were higher than those of workers with secondary qualifications. The rubber and pottery and ceramics industries were among those that paid degree holders at a higher rate. Most of the differentials were between 110 and 309 percent.

Table 7.19: Log Wage Differentials between Degree and High School, Based on Industry Wage Premia

Industry	1984	1989	1992	1995	1997
Food	0.777	0.856	1.275	1.320	0.298
Beverages	0.466	-0.005	0.959	-0.617	0.143
Wines and Liquors	0.720	0.078	0.933	1.456	-0.497
Tobacco products	1.390	1.372	na	2.326	1.934
Textiles	0.629	1.369	1.651	1.289	1.392
Apparel	0.927	1.074	1.690	1.797	0.847
Leather	2.632	0.770	na	Na	2.495
Footwear	na	na	na	0.028	na
Wood products	0.881	1.114	-0.073	0.904	0.346
Furniture	0.885	0.328	1.055	-0.803	0.210
Paper products	0.582	1.073	0.755	0.603	0.845
Printing and Publishing	0.503	0.495	0.511	0.978	0.276
Chemicals	0.611	1.056	1.555	0.214	0.499
Other Chemical products	1.054	0.865	0.821	0.684	1.425
Petroleum	0.586	1.171	0.726	0.641	0.414
Rubber	1.539	0.687	1.063	0.592	0.598
Plastic	0.248	0.912	0.667	0.985	0.702
Pottery or Ceramic products	na	0.669	1.399	1.227	2.546
Glass products	na	na	1.227	2.707	0.793
Non-Metallic	1.489	1.767	1.229	0.311	0.062
Basic Iron and Steel products	0.795	0.728	0.968	1.215	0.882
Non-Ferrous Metals					
Fabricated Metals	0.192	0.905	1.023	0.726	0.750
Machinery	0.193	1.064	0.637	0.927	0.780
Electrical Machinery	1.008	0.791	1.167	1.024	0.706
Instrument and Appliances equipment	0.450	0.755	1.212	0.966	0.855
Medical and Surgical equipment	0.782	1.118	1.019	0.399	0.312
Other Manufacturing	0.952	1.718	1.533	0.687	0.090
Mean	0.845	0.910	1.042	0.741	0.731

Table 7.19 presents the log wage differential between degree and high school qualifications. This differential narrows when compared to the wage differential between degree and primary and secondary qualifications. As shown in Table 7.19, 55 percent of the industries had decreasing wage differentials between degree and high school qualifications over the sample period. Forty percent of the industries had an increasing trend and 3 percent had no complete information. It is interesting to note that certain industries, for example the food industry, had decreasing trends for the period 1984-1997. But this industry had a constantly increasing trend during the period 1984 to 1995. In the beverages industry, the trend of wage differentials fluctuated, which made the gap across the years larger. In 1984, this industry had a 46 percent wage differential between degree and high school qualifications; the percentage turned negative in 1989, but is small. In 1992, the return to degrees improved and the wage differential between the two groups was 95 percent. The trend, however, returned to negative differences in 1995, and in 1997 the wage differential was 14 percent, which was the smallest gap after that of other manufacturing industries.

Comparisons across the years show that in 1984 the leather industry had the largest wage differential between degree and high school qualifications (263 percent). The smallest wage differential was in fabricated metals, with a difference between degree and high school earnings of 19 percent. In 1989, the range of wage differentials was between -5 percent and 171 percent, with the lowest belonging to the beverages industry and the highest to other manufacturing. In 1992, the textiles industry had the largest wage differential, with a difference of 169 percent between degree and high school qualifications; the smallest differential was minus 7 percent in wood products. Overall, the differences between industries in 1992 were small compared to other years. In 1995, the largest wage differential was in the tobacco industry and the smallest was in the furniture industry. In 1997, the largest wage differential was in pottery or ceramic products and the smallest in wines and liquors.

Table 7.20: Log Wage Differentials between Degree and Diploma, Based on Industry Wage Premia

Industry	1984	1989	1992	1995	1997
Food	0.458	0.173	0.824	0.709	0.424
Beverages	-0.296	0.150	0.293	-0.369	-0.032
Wines and Liquors	na	0.679	0.357	1.150	-0.730
Tobacco products	na	2.356	na	1.318	1.344
Textiles	1.361	0.321	na	0.651	0.180
Apparel	0.570	1.258	1.029	1.15	0.397
Leather	1.341	na	na	Na	na
Wood products	-0.142	0.745	-0.663	0.404	0.486
Furniture	1.726	-0.835	1.552	-0.792	0.029
Paper products	-0.417	0.234	0.040	-0.135	0.880
Printing and Publishing	-0.330	0.246	0.219	0.818	-0.031
Chemicals	-0.046	0.602	0.628	-0.194	0.759
Other Chemical products	0.880	0.243	0.732	0.580	0.315
Petroleum	0.090	0.561	0.702	0.352	1.236
Rubber	0.478	0.589	0.539	0.489	0.413
Plastic	0.958	0.353	0.176	0.424	0.265
Pottery or Ceramic products	na	na	1.825	-0.506	na
Glass products	na	na	0.438	2.303	na
Non-Metallic	0.729	0.917	0.995	0.161	-0.233
Basic Iron and Steel products	1.003	na	0.304	0.426	0.822
Non-Ferrous metal					1.511
Fabricated Metal	-0.043	0.153	0.983	0.713	0.127
Machinery	-0.576	1.150	0.702	0.940	0.711
Electrical Machinery	0.544	0.586	0.733	0.591	0.362
Instrument and Appliances equipment	-0.096	0.582	0.627	0.273	0.299
Medical and Surgical equipment	0.266	2.130	0.247	0.542	0.317
Other Manufacturing	-0.168	1.088	1.462	0.374	-0.992
Mean	0.377	0.649	0.641	0.535	0.369

Table 7.20 presents the log wage differential between degree and diploma holders between 1984 and 1997. In 1984, the leather, furniture and textile industries showed widening wage differentials compared to other industries. On average, the wage differential for these industries was more than 130 percent. On the other hand, some industries, such as beverages, wood products, paper products, printing and publishing, chemicals, fabricated metal, instrument and appliances equipment and other

manufacturing had negative differentials between holders of degrees and diploma qualifications. This result indicates that the return on diploma qualifications was higher than the return on degree qualifications. In a different situation, the footwear industry had no return to a degree, so that all qualification differentials remained negative. Some industries, such as wine and liquors, tobacco, pottery and ceramic products, glass products and footwear, were excluded from the analysis this year because they did not give detailed information about the levels of qualifications among their workers to support the information about wage differentials. The leather industry showed a slightly higher premium for degree holders than other industries, but this industry did not provide information on workers with primary qualifications only.

In 1989, the average wage differential was 64.9 percent. Some of the more obvious differentials showed that the return for degree qualifications rose in certain industries, such as tobacco products and medical and surgical equipment. A large gap also occurred in apparel, machinery and other manufacturing industries. In 1992, the wage differential between degree and diploma qualifications averaged 64.1 percent. Pottery or ceramic products had a large difference (182 percent) compared to that of paper products (only 4 percent). The wood products industry appeared to be the only industry paying a higher return for diploma qualifications than for degree qualifications. This is seen for the difference of minus 66 percent between degree and diploma qualifications. In 1995, 5 of 29 industries had a decrease in degree returns. This is shown in the minus sign in the differences between degree and diploma qualification in beverages, furniture, paper products, chemicals and pottery and ceramic products.

The log wage differentials for 1997 are presented in the last column of Table 7.20. The overall trend shows that the beverages industry continued to have a small return on degree qualifications compared to diploma qualifications. Compared to 1995, the log wage differential became negative in the wine and liquor industries. This figure also indicates that the returns for degree qualifications were smaller than the returns for diploma qualifications. There is no information on leather, pottery and ceramic, and glass products. Surprisingly, in the non-ferrous metal industry there was no information between 1984 and 1995; however, the wage differential between degree and diploma qualifications was relatively high at 151 percent. In conclusion, the wage differential between degree and diploma qualifications is not particularly high compared to the differentials between degree and primary and secondary qualifications, especially in 1984 and 1997. The average wage differential for this category was only 37 percent in 1984, increasing to 64 percent in 1989 and 1992, and decreasing to 53 percent and 36 percent in 1995 and 1997 respectively.

This discussion now turns to the second stage estimation of Equation 7.12. To address this, continuing from the previous section, this section aims to examine the impact of technological change and trade flows on skills wage differentials in Malaysian manufacturing industries between 1984 and 1997. The sets of inter-industry wage differentials, estimated in the first regression, are used as dependent variables. This estimation is similar to those conducted in Section 7.4, but here we are using industry wage differentials rather than wage premia as the dependent variable. This analysis is also different from that in Section 7.4 in term of groups of workers. Section 7.4 deals with different levels of education whilst this section looks further into how the workers are differentiated by qualifications. This section is also similar to the analysis on cost functions presented in Chapter 5, but here we are using a different data set (HIS data) and the dependent variable is the wage differential associated with qualifications. The purpose of this analysis is to obtain detailed information on how the inequality of wages can be explained by changes in trade and technology. In Chapter 5, we only provided information on workers differentiated by skill groups (skilled, semi-skilled and unskilled) but in this chapter we analyse detailed information relating to workers qualifications.

The results are shown in Table 7.21. They indicate that there is a positive correlation between wage differentials and exports at medium and high levels of qualification. However, the growth in exports tends to decease the wage differentials between degree and primary qualifications and degree and other qualifications. In the context of the HOS hypothesis, the results support the hypotheses, where trade has tended to increase wage differentials at higher levels of qualification and decrease them at low levels of qualification. In terms of economic policy, these results indicate that export exposure in Malaysian manufacturing was positively related to inequality in wage at higher levels of education.

Imports, however, work in the opposite direction. Increasing imports decreases the wage differential between degree and other qualifications and with primary, secondary and high school qualifications, but increases the wage differentials between degree and diploma qualifications in Malaysian manufacturing. These results are consistent with our analysis based on Katz and Murphy (1992) under the equal allocation approach; net imports have increased the relative demand for more educated workers. This result also suggests that the inverse relationship between import penetration and inter-industry earnings as presented in Table 7.10 had a big impact upon workers with low and medium levels of education. Since imports also decreased the skill premium for those secondary-educated workers as reported in Table 7.14, we conclude that the effects of imports are correlated with reductions in these two groups (low and medium levels of educated workers.

The coefficient on total factor productivity growth is positive for workers with medium levels of education and is negative for the differentials between less educated workers. There is no relationship for the degree and diploma differential. This result reveals that technological change does not play an important role in explaining the wage differential between degree and diploma levels. These results support our findings in Chapter 5 where we found that technological changes explain the relative demand for semiskilled workers.

Table 7.21: Regression of Wage Differentials on Technological Change and Trade

	Degree-Other Qualification	Degree-Primary	Degree-Secondary	Degree-High School	Degree-Diploma
Constant	0.718	1.501	0.301	1.679	-15.367
	(79.21)	(124.19)	(18.37)	(104.86)	(-4.22)
TFP	-0.171	0.274	0.178	0.590	-3.150
	(-19.3)	(23.32)	(11.19)	(37.88)	(-0.891)
Imports	-0.017	-0.079	-0.120	-0.244	36.19
	(-6.32)	(-21.76)	(-24.24)	(-50.53)	(32.98)
Exports	-0.017	-0.86	0.073	0.051	14.17
	(-2.99)	(-11.44)	(7.18)	(5.16)	(6.27)
R^2	0.031	0.078	0.050	0.215	0.093
Ftest	1739	1307	969	1537	3291
Breusch-Pagan / Cook-Weisberg test for constant variance					
Chi2 (1)	11.34	3.9	2.56	6.21	11.34
Prob>chi2	0.01	0.24	0.47	0.11	0.01

Note: * in parentheses are t-statistics

7.6 Trade and Wage Distributions in Malaysia

The previous section emphasized the effects of trade and technological change across manufacturing industries; in this section we further investigate the effects of trade on the relative demand for labour across traded and non-traded sectors. The aim of this section is to present a view of how trade has affected the level and structure of wages in Malaysia through different sectors and different levels of education. In addition, this section aims to assess the prediction of the Hecksher Ohlin–Samuelson (HOS) theorem, as discussed in Chapter 3, as regards the different performances between traded and non-traded goods sectors.

This section will estimate earning equations in different sectors of traded and non-traded industries. The classification of traded and non-traded sectors is based on a report from the Malaysian Economic Research Institute, reported in Asia Pacific Series No.3 and other Asian studies, (for example, Disney and Kiang [1990]). Mazumdar (1993) also classified the manufacturing sector as a traded sector in Malaysia. The classification of traded and non-traded sectors in Malaysia is consistent with the classification by the Organization for Economic Co-operation and Development (OECD) and of the World Bank (2000). We utilise a simple regression model to estimate trade effects in traded and non-traded sectors as follows:

$$\ln W_k = \beta_0 + \beta_1 T_k + \beta_2 AGE_k + \beta_3 AGE_k^2 + \beta_4 MALE_k + \beta_5 MAR_k + \beta_6 Q_k + \varepsilon_k \quad \text{(Equation 7.13)}$$

$$\ln W_k = \beta_0 + \beta_1 AGE_k + \beta_2 AGE_k^2 + \beta_4 MALE_k + \beta_5 MAR_k + \beta_6 Q_k T + \varepsilon_i \quad \text{(Equation 7.14)}$$

$$\ln W_k = \beta_0 + \beta_1 AGE_k + \beta_2 AGE_k^2 + \beta_4 MALE_k + \beta_5 MAR_k + \beta_6 Q_k NT + \varepsilon_k \quad \text{(Equation 7.15)}$$

where W_k is the natural logarithm of monthly wages for workers k, T_k refers to the traded sector if the value of the dummy variable is 1 and the value of 0 refers to a non-traded sector. Equation 7.13 is estimated over the whole sample, and 7.14 and 7.15 are for the traded and non-traded sectors respectively. $Q_k T$ and $Q_k NT$ refers to the level of educational attainment for individual k in traded and non-traded sector respectively. AGE_k, $AGE_k{}^2$ and $MALE_k$ refer to the personal characteristics of the individual. MAR_k indicates whether a worker is married and ε_k denotes to the error term. These results are presented in Columns 2 and 3 in Table 7.23.

In Table 7.22, the qualification composition of employment between 1984 and 1997 and the differences between the traded and non-traded sectors are presented. Table 7.22 reveals that the non-traded sector is relatively highly educated compared to the traded sector. For example, at a high level of qualification, 4.5 percent of workers in the non-traded sector in the 1980s had a degree, compared to 1.8 percent of workers in the traded sector during the same period. During the 1990s, 5.9 percent of workers in the non-traded sector had a degree, compared to 2.3 percent in the traded sector. This finding is consistent with the trend in Brazil presented by Arbache *et al.* (2004); a comparison between the 1980s and 1990s shows that the 1990s experienced an increase in education levels in both sectors.

Table 7.22: Sectoral Composition of Employment: 1984-1997

	No Qualification	Other Qualification	Primary	Secondary	High School	Diploma	Degree
			Non-Traded				
Period 1980s	43.9	4.5	12.7	25.8	3.0	5.6	4.5
Period 1990s	47.2	3.0	14.2	31.8	5.0	7.4	5.9
Non-traded	37.8	3.7	13.5	29.1	4.1	6.6	5.3
			Traded				
Period 1980s	56.7	4.6	12.3	21.5	1.9	1.1	1.8
Period 1990s	40.2	3.4	17.4	31.2	2.9	2.4	2.3
Traded	46.4	3.9	15.5	27.6	2.5	1.9	2.1

Table 7.23 presents the estimated earnings equation 7.13, 7.14 and 7.15 which are shown in columns 1, 2 and 3 respectively. In column 1 of Table 7.23, the impact of being in the traded sector shows that employees in the traded sector earned less than employees in the non-traded sector during the sample period of study. Overall the results show that the skill premium for five categories of qualifications (primary, secondary, high school, diploma and degree) monotonically increase with education level, with the exception of the 'other qualifications' category. Workers with other qualifications earned 67 percent (45 percent) less than workers with no qualifications in the traded sector (non-traded sector). The return to education shows a positive return during the period 1984-1997.

Comparison between the two columns (2 and 3) shows that the returns to education at degree and diploma level are higher in the traded sector than in the non-traded sector. However, the return to high school qualifications in the traded sector is slightly lower than the return to high school qualification in the non-traded sector. Also, the return for secondary qualifications is lower in the traded sector compared to non-traded.

Table 7.23: Estimated Earnings Equation by Qualification in Traded and Non-Traded Sectors between 1984 and 1997

Estimation	1	2 Traded sector	3 Non-Traded Sector
Constant	6.612	6.23	6.562
	(478.64)*	(402.512)	(464.22)
Traded	-.013		
	(-4.611)		
Age	0.12	0.137	.106
	(121.66)	(145.89)	(122.74)
Age square	-0.001	-0.002	-0.001
	(100.93)	(-133.95)	(-107.61)
Male	0.282	0.215	0.265
	(107.55)	(72.12)	(96.73)
Married	0.100	0.145	0.093
	(31.74)	(40.17)	(28.02)
Other Qualifications	-0.379	-0.677	-0.455
	(-57.14)	(-49.58)	(-56.43)
Primary qualification	.282	0.029	0.140
	(75.10)	(4.088)	(31.87)
Secondary qualification	0.528	0.217	0.401
	(175.47)	(40.42)	(122.25)
High school	0.735	0.406	0.603
	(110.65)	(23.95)	(79.44)
Diploma	0.923	0.808	0.772
	(163.37)	(41.55)	(126.47)
Degree	1.466	1.340	1.313
	(240.41)	(73.09)	(19465)
R^2	0.408	0.215	0.344
F test	1566	959	579
Breusch-Pagan / Cook-Weisberg test for constant variance			
Chi2 (1)	3.94	10.24	7.58
Prob> Chi2	0.95	0.49	0.75
N	265845	265845	265845

Note: * t-statistic in the parentheses

The above discussion will be concluded by presenting the regression in Table 7.24, below. Here, we will focus on the impact of trade on wages for different levels of qualification for two periods. The purpose of this estimation is to identify the strength of the effect of trade on workers in different sectors across two sub periods. Column 1 of Table 7.24 splits the samples in the traded and non-traded sectors into two periods: the 1980s and 1990s.

On comparison of the two periods, there is clearly a different trend for different qualification groups. The return for 'other qualifications' in the 1990s is lower than the return for other qualifications during the 1980s. Workers with primary qualifications in the 1990s earned more than workers with the same qualifications in the 1980s. Similarly, at the secondary qualification level, the return in the 1990s was 0.50 percentage points. However, this return was slightly lower (0.474 percentage points) in the 1980s. The trend was similar for people with high school qualifications. They earned less in the 1980s compared to the 1990s. Nevertheless, those workers with diploma and degree qualifications earned more in the 1980s.

To identify the effects of trade in the two different sectors over two different periods, Column 2 of Table 7.24 allows for the returns to be additionally differentiated. Comparing the traded and non-traded sectors across decades, the results show that the returns to education in the 1990s for the traded sector are significantly higher than for the non-traded sector in the same period, especially for diploma and degree qualifications. A similar trend was discerned in the 1980s, when the returns for education at higher levels was higher in the traded sector. The return for degrees in the 1980s in the traded sector was 162 percent, whilst the return for degrees in the non-traded sector in the 1980s was 147 percent. This result reflects the fact that pay is higher in the manufacturing sector (ie the traded sector) than in the non-traded sector at higher levels of qualifications.

Comparisons across decades in similar sectors show that the non-traded sector in the 1990s yielded a greater return to qualifications than it did in the 1980s. The exception here was for those with degree qualifications. In the traded sector, wages were higher in the 1990s than in the 1980s. These results lead us to conclude that the expansion in the manufacturing sector resulted in higher pay levels in 1990s compared to 1980s. This result also implies that the increased trade in the 1990s is helpful when explaining the increase in relative wages in the traded sector.

Table 7.24: Estimated Earnings Equation by Qualification in Traded and Non-Traded Sectors between 1984 and 1997

	(1)		(2)			
			Non-traded		Traded	
	Period 80s	Period 90s	Period 80s	Period 90s	Period 80s	Period 90s
Age	.098	.129	.128	.100	.130	.091
	(98.39)	(123.33)	(107.09)	(83.44)	(58.89)	(49.15)
Age squared	-.332	-.001	-.001	-001	-.002	-.001
	(-34.58)	(-101.15)	(-88.54)	(68.28)	(-47.03)	(-37.71)
Male	.265	.329	.299	.243	.413	.307
	(76.88)	(88.09)	(69.16)	(57.46)	(53.56)	(50.04)
Other qualification	-.332 (-34.58)	-.415 (-47.94)	-.383 (-39.30)	-.307 (.26.45)	-.518 (-27.98)	-.385 (-22.50)
Primary qualification	.230 (46.001)	.267 (49.19)	.232 (45.02)	.276 (37.99)	.222 (20.27)	.236 (25.53)
Secondary qualification	.474 (117.13)	.505 (117.29)	.493 (108.02)	.526 (100.79)	.414 (43.91)	.490 (57.48)
High school qualification	.640 (77.41)	.739 (69.62)	.655 (65.09)	.746 (70.44)	.584 (25.49)	.695 (31.45)
Diploma	.885	.879	.863	.871	0.962	1.11
	121.78.008)	(104.15)	(99.39)	(109.9)	(30.93)	(48.00)
Degree	1.49	1.38	1.478	1. 36	1.566	1.625
	(121.78)	(165.13)	(155.31)	(158.03)	(58.26)	(75.32)
R^2	0.362	0.45	0.458	0.363	0.430	0.322
F test	425	458	521	569	691	685
Breusch-Pagan / Cook-Weisberg test for constant variance						
Chi2 (1)	4.16	4.97	8.34	10.21	12.59	12.01
Prob Chi2	0.90	0.82	0.50	0.26	0.05	0.10
Constant	6.743	5.843	5.875	6.707	5.807	6.848
	(404.65)	(338.09)	(292.91)	(325.88)	(164.69)	(228.35)
N	150716	115129	88396	105671	26733	45045

Note: * t-statistic in parentheses

7.7 Conclusion

The aims of this chapter were twofold: the first aim was to measure the change in relative demand for labour in the Malaysian economy during the period from 1984 to 1997. The second objective was to test the two main hypotheses being considered in the thesis: the effects of technological change and changes in the pattern of trade on relative demand and wage inequality. We employed a series of approaches that are well documented in studies of wage differentials and we present the summary of our findings in Table 7.25. The analysis started by presenting a decomposition analysis, as used in Chapter 5. As mentioned earlier, the advantage of this analysis of the HIS over that of Chapter 5 is that education, age and gender can now also be considered. In fact, the HIS data allows us to use the supply-and-demand framework developed by Katz and Murphy (1992). We found that the overall changes in the relative demand for male and female workers favour those workers with a secondary education. The relative demand moved away from those with a tertiary education, no schooling and a primary education. These results support our findings in Chapter 5 in which we showed that the relative demand for labour was away from skilled and unskilled workers, and towards semi-skilled workers.

It is important to note that during the period 1984 to 1997 male employment was increasing in relative terms due to changes in technology. For female employees, on the other hand, the nature of employment change was primarily the result of changes in the pattern of trade. In part, this is the result of the fact that education levels are, on average, higher for men than for women as shown in Chapter 6. According to the data reported in Chapter 6, the number of male workers at secondary and tertiary education levels is more than double that of female workers. Changes in technology have been seen to impact especially upon those with secondary education.

The second reason is based on the education system in Malaysia, and the differences in male and female interests and cultural socialization. In the National Curriculum System in Malaysia, students in secondary schools are allowed to choose technical or commercial subjects and courses based on their interests and potential. According to the Ministry of Education Malaysia (1998), a large number of females pursue home economics courses. The proportion was 97.2 percent,[28] compared to only 2.8 percent for males. On the other hand, males favour manual skilled courses, for example, over 80 those taking mechanical engineering, aeronautical, geology and zoology courses are male. At tertiary education levels, the share of males in mechanical engineering was

[28] The number of females was 14884, compared to a figure for males of 4567.

87.7 percent, compared to just 12.3 percent females. On the other hand, the percentage of females on commerce courses was 76.8 percent. This situation shows that males are involved significantly more in technology related areas. In addition, many women are employed in small businesses which are more affected by trade fluctuations (Aminah (1998)).

Although the contribution of trade is relatively small compared to that of technological change, further investigation under the assumption of equal allocation suggests that in the manufacturing sector trade has increased the demand for workers with higher levels of education. The results also suggest that increasing exports can explain, in part, the rising wages for more educated workers. The nature of export growth, however, has decreased the relative demand for workers at lower levels of education. We further explored the same relationship using the production allocation approach: here exports are assumed to affect all workers whereas; imports, in contrast, are assumed to affect only production workers. In contrast to the equal allocation approach, the results show that trade increased the relative demand for production workers for both males and females at low levels of education. This result is consistent with the findings of the Aminah (1998) which found that female workers in Malaysia tend to be employed in jobs such as clerical and production jobs that require relatively low levels of education.

As shown in Table 7.25, the effects of technological change and trade were also estimated using a two-stage technique. Focusing on the manufacturing sector, this analysis looked at the determinants of inter-industry wage premia and educational wage differentials. Using an employment weighted average wage premia we found that exports increased inter-industry wage premiums and imports and technological change decreased industry wage premia. Further analysis, using industry skill wage differentials by education level, indicated that exports and imports increased the industry skill wage premia at tertiary education levels. However, it decreased the industry skill wage premia at secondary levels of education. Technological change seemed to decrease the industry skill wage premium at tertiary levels of education and increase the industry skill wage premium at secondary levels of education. These analyses help us to identify the specific impact of changes in the pattern of trade and technological change on the industry skill wage premium.

In a further analysis we examined the effects of changes in the patterns of trade and technological change on skill differences, again for Malaysian manufacturing. Consistent with the results for inter-industry skill premia, we concluded that exports increased the skill differentials between higher and medium education levels and decreased the skill differentials at lower levels of education. Imports seem to have decreased skill differentials at medium and low qualification levels, but to have increased them at higher levels of qualification. Similarly, the effects of technological change seem to have decreased skill differentials for highly educated workers and increased them at medium levels of educations. These results are consistent with our analysis when the equal allocation approach is employed. The direct effects of trade seem to increase the relative demand at high and medium levels of education for both males and females. However as we noted above, these results differ markedly compared with those using the production allocation approach. This situation occurs because the requirement of production workers in Malaysia just needs low levels of education as they operates at middle and low levels of technology. This argument was based on a manufacturing survey that argued almost 67 percent of industry in the manufacturing sector in 1989 operated at the small medium enterprise (SMEs) level and employed unskilled workers in their operations (Malaysia, Manufacturing Survey 1990).

The final analysis compared earnings in traded and non-traded sectors. This analysis showed that the wage differential between traded and non traded sectors varied over time. This is an important issue as the traded sector is presented as one bringing higher wages and higher level jobs especially in 1990s. As Malaysia transferred its economic emphasis from the agricultural to the manufacturing sector, through the 1980s and 1990s wages rose. An important issue is to what extent this occurred in the traded sector. This analysis is especially important in terms of policy implementation in Malaysia. High wages are indicative of the success of the policies implemented by government, at a time when policies were linked to the process of globalization

However the results of the study suggest that the composition of employment in the non-traded sector is relatively more highly educated compared to that in the traded sector. However, it is interesting to note that the traded sector pays higher wages for higher levels of education compared to the non-traded sector. These results are consistent with the findings reported for Brazil by Arbache *et al.* (2004). The non-traded sector in contrast pays relatively higher wages at medium levels of educational attainment, such as secondary qualifications. Finally, a comparison between decades showed that in the 1990s workers in both traded and non-traded sectors were paid more highly in real terms compared to workers in the 1980s, except for those workers having degree qualifications working in the non-traded sectors. The return to this qualification was in decline in the 1990s in that sector.

Table 7.25 Summary of the Analyses of the Effects of Changes in the Pattern of Trade and Technological Change

Analyses	Focus/groups	Results
Analyses by gender Equal allocation Production allocation	Manufacturing Sector Non-production and production workers in Manufacturing sector	• Trade increased the relative demand for both males and females. • Trade decreased the relative demand for production workers for both males and females. • The dominant effects of trade are on females.
General analysis	Manufacturing sector	• Exports increased wage premia. • Imports decreased wage premia. • Technological change decreased wage premia.
Analyses by skill Wage Premium	Manufacturing sector using wage premia by education levels	• Exports and imports increased wage premium at tertiary levels of education. • Exports and imports decreased wage premia at secondary levels of education. • Technological change decreased wage premia at tertiary levels of education. • Technological change increased wage premia at secondary levels of education.
Wage Differentials	Manufacturing sector using wage differentials by qualification levels	• Exports increased the wage differentials for highly and medium educated workers. • Exports decreased the wage differentials for low educated workers. • Imports decreased the wage differentials at medium and low qualification levels . • Imports increased the wage differentials at high levels of qualification. • Technological change decreased the wage differentials for highly educated workers. • Technological change increased the wage differentials at medium levels of education.
Analysis by sector	All sectors	• Return in non-traded is higher than traded sector. • Non-traded in 1980s yielded a greater return compared to non-traded in 1990s.

CHAPTER 8

SUMMARY, POLICY IMPLICATIONS, RECOMMENDATIONS

8.1 Introduction

This final chapter aims to bring together the findings reported in the thesis and to put these in the context of the policies implemented by the government during the 1980s and 1990s. In the thesis we have documented the major changes that have taken place in employment and wages through the 1980s and 1990s in Malaysia. These changes were associated with the shift from an agriculturally-based economy to one with a strong and expanding manufacturing base. The major structural changes reported were the result of major government interventions in the form of a series of National Plans designed to lead the country to the status of a developed nation by the year 2020.

The impact of these structural changes on employment and wage inequality were described in Chapters 2 and 6. In summary, Malaysia has experienced a significant increase in employment, especially for employees, during the period. The growth in jobs is particularly marked for women. Especially significant here are the growth of jobs in electrical manufacturing and the manufacture of electrical machinery. Perhaps the most significant development within these industries, but which is evident in others within manufacturing, is the growth of production jobs and of professional and managerial occupations. The former is the key in understanding what has happened to the Malaysian economy during the period. Basically, the main source of new employment has been in semiskilled production jobs many of which have been taken up by women. However, it would seem that production jobs undertaken by men generally require more skills than those undertaken by women. Nevertheless, the growth of employment has been associated with increasing levels of education and training for both men and women and this is especially the case at the secondary education level, and to a lesser extent at the tertiary level as well. Thus, Malaysia now has more production workers, these are now undertaken by people with secondary levels of education and many women now work in production jobs.

When we considered the impact these changes have had on wage inequality a consistent pattern emerges (Chapter 6). Using simple measures of inequality, we find that the gap between the top decile and the median has fallen over time whereas there has been an increase in the gap between median earnings and those at the lowest decile. Consequently, people at the bottom end of the income distribution have become worse off whereas people on middle incomes have benefited from the structural changes taking place. This trend is evident generally but also across different education groups, occupations and sectors. Perhaps the one exception is that amongst managers and senior administrators, it is the top decile that has benefited from the changes taking place.

The structural changes that have taken place in Malaysia provide the basic data, the main purpose of the thesis is to then explain why these changes have taken place. The significant literature within which this thesis is placed suggests two possible explanations. First, that the changes were brought about by changes in the pattern of trade (linked to the various government plans that were introduced to encourage exports or trade generally or as a result of globalisation). Second, that they reflect changes in technology, which themselves may be associated with changes in the pattern of trade.

Both explanations can be considered within the theoretical context of a HOS model as presented in Chapter 3. In contrast to most studies in this area, the present analysis focuses on three skill groups, skilled, semiskilled and unskilled. A key feature of the North-South divide is that this has resulted in a growth in the number of semiskilled workers in developing countries and not of high wage skilled jobs. In Chapters 5 and 7 we provide a series of analyses to assess the relative strengths of these two hypotheses. In Chapter 5 we use aggregate industry data to address these issues whereas the analysis in Chapter 7 uses individual employee data taken from a number of Household Income Surveys.

More specifically the research has attempted to achieve six objectives. The first is to examine shifts in the relative demand for labour and in wage levels using two approaches: a decomposition approach and a cost functions approach. The second is to determine which factor (trade or technology) is dominant in affecting relative demand and wages. The third is to analyse the effects of trade and technology by education and gender. The fourth is to analyse inter-industry wage differentials. The fifth is to analyse the effects of changes in the pattern of trade and technology upon wage differentials by education level. The final objective is to analyse wage differentials in traded and non-traded sectors. In order to achieve these objectives, we have presented extensive analyses in Chapters 5, 6 and 7. An understanding of the changes reported and the role of technology and trade are essential to policy-makers, unions and economists. Such an understanding can explain what has happened to the Malaysian labour market following the changes in policy and structural change during the 1980s.

The following section discusses the main findings of the study. The main findings are then related to the policy implications and discussed in Section 8.2. In Section 8.3 we put forward recommendations based on our observations from the study.

8.2 Results

8.2.1 Aggregate Results

The analyses undertaken using aggregate data are based on two different approaches. The first is a series of decompositions based on the work of Katz and Murphy (1992) and Manasse (2004). The nature of these decompositions is to identify within-industry (group) changes and between-industry (group) changes, the former representing the impact of technology, the latter the effect of changes in the pattern of trade.

Much of the previous work using the decomposition approach has focused on either changes in employment shares or changes in wage-bill shares. As Machin (1998) notes, these are equivalent (though the results are not always exactly the same). The first two analyses are therefore decompositions based on employment and wage-bill data respectively. The third analysis is a more detailed decomposition that considers both employment and wages together. This has the advantage of enabling us to determine the sources of changes in the relative demand for different skill groups.

The principal result of these decompositions is that through the 1980s and 1990s relative demand shifted strongly in favour of semi-skilled employment and against both skilled and unskilled employment in roughly equal measure. This overall change, not unexpectedly, was associated with the performance of particular industries. In particular, the electronics and electrical machinery industry accounted for much of the change reported for semi-skilled workers. These results are consistent with the economic development of Malaysia, as Malaysian exports to trading partners like the U.S, Singapore and Japan are predominantly electrical machinery and machinery and are more generally in intermediate electronic equipment.

The second important finding is that this resulted from the effect of changes in technology on employment and not due to changes in the pattern of trade. It is interesting to note, however, that industries in which the employment of skilled workers also increased (electrical machinery, for example) had significant trade effects, at least for skilled workers. Of course, the strong technology effects, overall and in certain industries, does not mean that changes in trade patterns had no effect. Indeed, in some industries (eg. textiles) this effect was stronger than the impact of new technology. Moreover, the relative shift away from unskilled labour was as much down to trade as it was to changes in technology.

Overall, these results were taking place consistently through the 1980s and 1990s. However, further analysis by sub-period did identify some variation in patterns of change. For example, between 1987 and 1991, changes in both technology and trade actually favoured unskilled employment as well as semi-skilled employment. From the mid-1990s onwards, technology favoured skilled employment, though this was still less than the relative shift in favour of semi-skilled employment. Nevertheless, this resulted in a positive growth in the proportion of employment accounted for by skilled employees.

The results obtained using wage-bill data, on the whole, confirmed those using employment shares. However, the final decomposition analysis suggested some additional results. First, changes in employment are found to be more important than changes in wage premiums or shifts in relative demand to more highly paid industries. Not unexpectedly, the former is associated with changes in technology rather than changes in the pattern of trade. Second, the wage premiums associated with both skilled and semiskilled employment have increased, something that is associated with the changes in wage inequality reported in Chapter 6. Again, we find that what is happening in electrical machinery dominates the overall findings, again highlighting the significance of this sector for the Malaysian labour market, though the results for semi-skilled workers had a major dampening effect overall.

The second type of analysis is based on a series of regressions. These involve estimating cost functions and mandated wage regressions. The results, overall, follow the similar pattern already identified, namely, that technological change has been biased in favour of semi-skilled employment and wages.

8.2.2 Results Based on Individual Data

We turn now to the results of the analysis based on a number of household income surveys. Data on individual employees where taken from these and, as in Chapter 5, a series of decomposition and regression analyses were undertaken. The results of the decompositions are broadly in line with those found in Chapter 5 though the data enabled a more detailed analysis to be undertaken which produced some interesting differences to our earlier analysis. The decompositions produced in Chapter 7 are undertaken by gender and level of education, mirroring the earlier work of Katz and Murphy (1992). For both men and women, the results again highlight the shift in favour of employees with moderate (secondary) level of education and away from those with little or no education and those with higher levels of education. However, although the observed shifts in male employment reflect changes in technology, those for women show a more diverse pattern. The results suggest that changes in the pattern of trade have had a significant impact on people with low levels of education (acting against them) and those with moderate levels of education (increasing employment shares). Changes in employment as a result of trade-related factors seem to be especially important for women with higher levels of education during the 1990s. Indeed, whereas there has been a major shift in favour of women with higher levels of education during the 1990s, this is not the case for men with similar levels of education.

Again following Katz and Murphy (1992), a further decomposition analysis is undertaken but is now one that focuses only on the role of trade. However, unlike the previous analysis, this one introduces direct measures of imports and exports. Two such analyses are carried out under different assumptions about how imports affect employment. Overall, the effects are small, as one would expect given the limited impact trade seems to have on employment change in Malaysia. Although the results of this analysis do not completely mirror the earlier ones, they provide little basis for changing the general conclusion that we have so far drawn, that is, trade has had only limited effects on changes in the structure of employment. They are clearly stronger for women though even here technology is still an important consideration.

The first regression analysis undertaken looks at how rates of return to different levels of education have changed over time. Again, we find that returns to middle levels of educational qualifications have risen over time whereas other rates of return have fallen. This is consistent with the view that changes in employment have, more than anything else, favoured semiskilled workers employed in production jobs. Very little difference is observed when the analysis is broken down by gender.

These results run parallel to what was happening to the education system in Malaysia during the sample period. As a developing country, the education system was reorganised in every one of the five year Malaysian plans, depending on the short term problems encountered in previous plans. As mentioned in Chapter 2, the strategy in The First Outline Perspective Plan (OPP1) was more focused on the integration of ethnic groups, on the physical infrastructure of the economy, the development of the country's rural areas, and addressing social and economic problems. Only at the end of OPP1, which was in the Fifth Malaysia Plan, did the government start emphasising the development of the country's human capital. This action was taken when the Malaysian government started to realise that shortages in the labour market were beginning to develop.

The next stages of our analysis involve a two-stage estimation process. In the first, wage equations are estimated to obtain industry wage premiums. The latter are then regressed on measures of technology and trade. The results indicate that industry wage premiums are higher in those industries that are export-orientated and are negative in industries facing strong import competition (as measured by import penetration). Surprisingly, industries with the highest levels of technology (measured by total factor productivity) have lower wage premiums. This analysis was further broken down for employees with tertiary and secondary qualifications. For workers with higher levels of educational qualifications the results suggest the same results for export intensity and technology but that import penetration is now associated with higher wage premiums for these workers. In contrast, export orientated industries are associated with lower wages for workers with secondary level qualifications but that they are higher in industries with higher levels of technology.

The second two-stage analysis uses estimated earnings equations to calculate inter-industry differences in returns to different levels of education. These are then analysed to see if they are correlated with trade and technology proxies. Interestingly, industries with higher levels of technology have higher wage premiums between high and low levels of education but lower premiums between high and secondary levels of education. Industries with a strong export orientation have lower wage premiums when comparing high and low levels of education, but otherwise they are higher. Export penetration generally lowers the advantage people with higher levels of qualification have over other education groups.

The final analysis looked at differences between traded and non-traded sectors with a particular focus on differences in rates on return to education. Although differences are observed these are not large and do not tend to display an obvious pattern.

8.2.3 Overall Conclusion

It is interesting to note that, both technology and trade results show that the effect of changes in the patterns of trade and technological change are different for men and women. Males with rather higher levels of education and training are most affected by technological change. Female workers on the other hand, are more likely to be affected by the changes in the pattern of trade. As discussed earlier in Chapter 7, these results are due to the nature of the educational system, culture and the low interest women have traditionally had (compared to men) for being involved in technical work. Enrolment in the vocational and technical fields has been dominated by males. Males favour jobs in industries such as building, electronics and engineering which tend to lead to higher pay. On the other hand, women have led in courses traditionally considered more suitable for them, such as the arts and education. More recently employment patterns reveal that women are now concentrated in the lower level jobs in production which are more affected by trade.

8.3 Policy Implications

There are several possible reasons for the observed changes in Malaysia's labour market during the period. First, investments and incentives to increase the level of productivity are not balanced between sectors and most of the Government Plans are focused on the manufacturing rather than in the agricultural sector and other sectors. The Fifth, Sixth and Seventh Malaysia Plans concentrated on industrial development and especially on the promotion of exports. When productivity in the agricultural sector dropped drastically during the Outline Perspective Plan 2 (OPP2) the Ninth Malaysia Plan took up the challenge to improve the productivity in the agriculture and mining sectors though this was not entirely successful. Second, the transition of the economy from agriculture to manufacturing was in conflict with the educational system and the development of human capital. In that Malaysia lacked the semi and skilled work force necessary rather for economic development.

However, in the Fifth Malaysia Plan (1986-1990) it began to focus on human capital development. Until these policies had an effect on the labour market the country relied on bringing in foreign labour to meet the mismatch between supply and demand. The implementation of the industrialization process encouraged foreign workers to come to the country, especially in construction, plantation and manufacturing sectors. In 1984, the Malaysian government signed the Medan agreement with Indonesia, and this agreement, under which Malaysian plantations could recruit immigrant workers if there were no Malaysian workers available, was soon extended to the Philippines, Thailand, Bangladeshi and Indian workers. In 1989 and 1991 the Malaysian government revised its immigration policies. There is no accurate estimate of the number of foreign workers in Malaysia, as different sources provide different estimates. According to official estimates, there were 290,000 foreign workers in 1990. This number increased to 852,000 in 1995 (Malaysia, 1996). Ragayah (2002) has argued that foreign workers have contributed to the competitiveness of Malaysian exports. This situation has motivated employers to undertake more capital and technology-intensive methods of production and to provide skills training to their workers.

The increasing wage inequality observed, especially in the 1990s (with the exception of 1997) is due to the rising pay levels of skilled workers and semiskilled workers. This in part reflects the implementation of the New Economic Plan (NEP) and Export Orentation 2 (EO2) (Ragayah *et al.*, 2000:2-3). Exports drove Malaysian economic growth, and competitiveness was a key factor in determining the country's economic performance (National Productivity Corporation, 2002). Athukorala (2002) argues that Malaysia is considered one of the great development success stories in the developing world. As a small open economy dependent on trade, most of the companies in the early 1990s entered through Foreign Direct Investment (FDI). As mentioned in Chapter 2, the strategy to improve investment in IT was required to bring Malaysian society into the Information Age and enable it to embrace new technology. Widespread IT information would increase Malaysia's Gross Domestic Product (GDP). Parallel with this aim, former Prime Minister, Mahatir Mohamed, transformed the Multimedia Super Corridor (MSC) into a world-class economy and enabled it to act as a vehicle for bringing all IT information to Malaysia. In March 1998, from the 180 applications related to IT investment that were made, 34 percent were from foreign companies, 43 percent from Malaysian firms and 23 percent from joint ventures involving Malaysian and foreign partners. The implementation of IT knowledge in the 1990s increased educational attainment in Malaysia during the sample period. Even though this study has concluded that changes in relative labour demand have favoured middle-income groups, there was a large improvement in educational attainment over the period. As mentioned in Chapter 6, the percentage of those with either a primary education or no schooling fell from 68.3 percent in 1984 to 56 percent in 1997. On the other hand, the contribution of those with a tertiary education increased from 3.7 percent in 1984 to 7.3 percent in 1997.

8.4 Recommendations

Overall, our results point to a very definite conclusion and that is that the 1980s and 1990s were periods of significant structural change that saw a major decline in agriculture and the establishment of a significant manufacturing base into the Malaysian economy. As in other developing countries, however, the expansion of an export orientated manufacturing sector increased the demand for semiskilled labour relative to skilled labour. This raises an important policy question, namely, can Malaysia move towards full economic development in which the structure of employment contains a significant percentage of high skill (and wage) jobs.? It would seem that to become a developed nation by 2020 policies would need to be introduced that encourage higher education and skill levels amongst its population. This could be achieved by expanding the application of technology in human capital development. In addition, policies should be adopted that encourage an increase in the diffusion and application of technology and which promote science and technology innovation in both traded and non traded sectors. In the former, the aim would be to upgrade the quality of labour from semiskilled levels to skilled levels whereas in the latter the aim is to increase the demand for skilled workers.

Clearly one type of policy that would improve the quality of labour would be to improve the country's educational programmes. For example, starting pre-school and primary education at aged four or encouraging more science stream students and increasing the basic essentials of leaning and technical equipment such as computer and science laboratories, especially at rural area.

To enhance the competitiveness of the country's manufacturing sector, Malaysian manufacturing firms must be willing to adopt more advanced manufacturing technology including training programmes for its workers. In addition, we should follow industrialized countries and introduce the concept of lifelong learning to upgrade workers skills.

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APPENDICES

Table A2.1: Basic Economic Indicators for Malaysia

Item	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population, millions	15.45	15.88	16.33	16.77	17.22	17.66	18.10	18.55	19.04	19.56	20.11	20.69	21.17	21.67	22.18	22.71	23.28
Growth rate, %	2.67	2.80	2.81	2.73	2.65	2.57	2.49	2.46	2.67	2.74	2.80	2.87	2.32	2.35	2.37	2.40	2.48
GDP growth rate, %	7.76	-1.13	1.15	5.39	9.94	9.06	9.01	9.55	8.89	9.89	9.21	9.83	10.00	7.32	-7.36	6.14	8.55
Per capita GDP, growth rate, %	4.95	-3.78	-1.73	2.33	6.71	5.87	5.87	6.91	6.08	6.97	6.23	6.75	7.51	4.85	-9.50	3.33	6.30
Per capita GDP, 1987 ringgit	4,979	4,789	4,712	4,834	5,177	5,504	5,854	6,259	6,638	7,101	7,543	8,054	8,659	9,078	8,216	8,516	9,021
Per capita GDP, current US$	2,197	1,964	1,698	1,919	2,048	2,200	2,432	2,649	3,106	3,419	3,703	4,294	4,764	4,623	3,254	3,485	3,874
Illiteracy rate, % of people 15+	24.72	23.72	22.83	21.96	21.07	20.18	19.32	18.60	17.89	17.16	16.44	15.70	15.10	14.47	13.84	13.22	12.61
Labour force, millions	5.86	5.99	6.22	6.46	6.66	6.78	7.00	7.20	7.32	7.70	7.83	7.89	8.62	8.78	8.88	9.15	9.62
Employment, millions	5.57	5.65	5.76	5.98	6.18	6.39	6.69	6.89	7.05	7.38	7.60	7.65	8.40	8.57	8.60	8.84	9.32
Unemployment rate, %	5.05	5.62	7.43	7.32	7.24	5.73	4.50	4.34	3.71	4.11	2.95	3.14	2.52	2.45	3.20	3.43	3.06
Labour force participation rate, %	65.3	65.7	66.1	66.5	66.8	66.2	66.5	na	65.9	66.5	na	64.7	66.3	65.6	64.3	64.2	65.5
Exports on GDP, %	54.96	55.83	61.70	62.89	63.44	67.01	72.43	76.54	79.15	80.34	89.68	97.14	96.45	94.81	102.84	109.65	117.24
Imports on GDP, %	57.75	52.66	48.70	49.03	53.39	61.53	71.28	81.48	79.60	83.32	95.85	107.95	102.93	101.50	89.01	92.72	106.24

Source: World Bank 1984-2000

TableA2.2: Malaysia's External Trade by Major Commodity Group (Exports)

EXPORTS (total exports in US$ millions, commodity group shares of total exports in %)

	1984	1992	1995	1996	1997	1998	1999
Total merchandise exports	16,490	40,768	73,778	78,315	78,729	73,254	84,512
Agricultural products	19.09	10.44	9.48	8.69	8.62	9.95	7.96
Crude materials excluding fuels	21.01	10.63	6.42	5.39	4.52	3.22	3.08
Mineral fuels	29.92	12.95	6.99	8.06	8.13	6.17	6.80
Chemical manufactures	1.10	2.03	3.02	3.11	3.54	3.45	3.20
Machinery manufactures	18.95	43.81	55.13	55.27	56.12	59.21	62.32
General machinery	1.49	3.39	3.81	3.77	3.01	3.33	3.02
Office & computing machinery	0.17	5.82	9.73	11.50	14.34	15.95	20.30
Telecommunications machinery, etc.	1.85	13.16	16.67	15.18	13.27	12.33	11.69
Other electrical machinery	13.91	17.74	22.08	22.46	23.25	24.76	25.72
Road vehicles	0.16	0.66	0.63	0.66	0.66	0.72	0.55
Other transport equipment	1.37	3.04	2.20	1.70	1.59	2.12	1.04
Other manufactures	9.71	19.69	17.64	18.37	17.83	17.08	15.77
Textiles	1.08	1.46	1.59	1.73	1.69	1.52	1.33
Apparel	1.76	4.62	3.08	3.04	2.97	3.14	2.67
Leather products	0.02	0.02	0.07	0.10	0.08	0.12	0.04
Footwear	0.12	0.29	0.15	0.13	0.11	0.09	0.09
Wood products	1.10	2.23	2.59	2.98	2.75	1.89	1.98
Furniture	0.06	0.96	1.24	1.43	1.53	1.52	1.66
Paper products	0.09	0.50	0.49	0.45	0.51	0.52	0.54
Rubber products	0.28	0.72	0.54	0.52	0.52	0.57	0.44
Non-metallic mineral manufactures	0.36	0.85	0.89	0.82	0.76	0.71	0.68
Iron & steel	0.18	0.87	0.67	0.76	0.76	0.97	0.63
Non-ferrous metals	3.23	1.13	1.06	0.99	1.00	1.02	1.01
Metal products	0.29	0.80	1.01	1.03	0.99	1.03	0.93
Professional & scientific instruments	0.24	0.69	0.55	0.62	0.74	0.63	0.66
Photographic & optical, watches	0.21	1.02	1.01	0.96	1.03	1.03	0.85
Miscellaneous manufactures	0.71	3.52	2.70	2.81	2.38	2.32	2.27
Not classified	0.22	0.45	1.32	1.10	1.24	0.93	0.88

Table A2.3: Malaysia's External Trade by Major Commodity Group (Imports)

IMPORTS (total imports in US$ millions, commodity group shares of total imports in %)

	1984	1992	1995	1996	1997	1998	1999
Total merchandise imports	14,049	39,788	77,046	77,905	78,434	57,759	64,939
Agricultural products	10.81	6.11	4.54	5.02	5.12	5.37	5.11
Crude materials excluding fuels	3.52	2.59	2.40	2.53	2.50	2.52	2.51
Mineral fuels	10.12	4.24	2.31	2.71	2.98	3.17	3.11
Chemical manufactures	8.00	7.94	6.99	6.65	6.88	7.05	7.36
Machinery manufactures	45.95	54.96	59.84	59.90	59.98	62.94	61.72
General machinery	14.83	16.96	15.19	14.56	13.72	10.47	9.73
Office & computing machinery	1.11	3.07	3.62	5.01	6.03	6.00	5.59
Telecommunications machinery, etc.	3.25	4.90	5.01	4.12	3.94	3.44	3.48
Other electrical machinery	18.51	21.46	27.87	29.20	28.26	36.59	38.22
Road vehicles	5.31	2.95	3.55	3.92	3.76	1.24	2.05
Other transport equipment	2.95	5.61	4.60	3.09	4.27	5.21	2.65
Other manufactures	20.66	21.87	18.97	18.40	18.42	16.34	16.99
Textiles	2.32	3.29	2.00	1.75	1.56	1.60	1.57
Apparel	0.38	0.33	0.20	0.21	0.20	0.19	0.19
Leather products	0.03	0.12	0.20	0.14	0.10	0.09	0.10
Footwear	0.09	0.06	0.05	0.06	0.07	0.04	0.06
Wood products	0.13	0.09	0.11	0.10	0.10	0.11	0.13
Furniture	0.14	0.15	0.12	0.15	0.16	0.12	0.13
Paper products	1.91	1.83	1.74	1.40	1.38	1.23	1.39
Rubber products	0.34	0.34	0.24	0.25	0.26	0.23	0.27
Non-metallic mineral manufactures	1.76	1.49	1.46	1.39	1.19	0.81	0.82
Iron & steel	4.88	4.34	4.24	4.48	4.48	3.04	3.39
Non-ferrous metals	1.47	2.16	2.24	2.19	2.27	2.21	2.47
Metal products	2.61	2.36	1.75	1.79	1.74	1.76	1.57
Professional & scientific instruments	1.25	1.64	1.55	1.47	1.95	2.04	1.85
Photographic & optical, watches	1.05	1.50	1.20	1.13	0.94	0.86	0.85
Miscellaneous manufactures	2.31	2.17	1.87	1.90	2.03	2.02	2.20
Not classified	0.94	2.29	4.94	4.78	4.12	2.61	3.21

Source: World Bank (2000).

Table A2.4: Skill Composition and Wage Shares of the Labour Force

	Working proprietors& active business partners		Unpaid family workers		Professional		Non-Professional		Technical & Supervisory	
	Employment	Wages	Employment	Wages	Employment	Wages	Employment	Wages	Employment	Wages
1985	0.005		0.001		0.021	0.119	0.024	0.084	0.089	0.153
1986	0.005		0.001		0.021	0.126	0.022	0.084	0.090	0.157
1987	0.005		0.001		0.021	0.127	0.021	0.080	0.089	0.160
1988	0.004		0.001		0.020	0.123	0.019	0.077	0.084	0.155
1989	0.003		0.001		0.019	0.124	0.018	0.070	0.082	0.153
1990	0.003		0.001		0.020	0.122	0.017	0.067	0.085	0.154
1991	0.002		0.001		0.020	0.128	0.017	0.069	0.086	0.156
1994	0.002		0.001		0.023	0.126	0.020	0.073	0.092	0.162
1997	0.008		0.002		0.028	0.136	0.023	0.073	0.103	0.173
1999	0.007		0.001		0.032	0.151	0.027	0.077	0.104	0.176

	Clerical and related occupation		Drivers		Other general workers		Skilled directly employed		Semi-Skilled directly employed	
	Employment	Wages	Employment	Wages	Employment	Wages	Employment	Wages	Employment	Wages
1985	0.087	0.101	0.017	0.015	0.038	0.029	0.255	0.222	0.103	0.066
1986	0.084	0.102	0.016	0.016	0.035	0.027	0.257	0.220	0.108	0.067
1987	0.081	0.101	0.015	0.015	0.034	0.025	0.251	0.215	0.114	0.070
1988	0.073	0.093	0.014	0.015	0.033	0.024	0.239	0.210	0.109	0.065
1989	0.068	0.084	0.013	0.014	0.028	0.021	0.240	0.218	0.108	0.068
1990	0.066	0.081	0.012	0.013	0.027	0.020	0.233	0.211	0.135	0.090
1991	0.065	0.078	0.012	0.012	0.025	0.018	0.232	0.210	0.148	0.100
1994	0.063	0.071	0.011	0.010	0.024	0.016	0.229	0.210	0.165	0.112
1997	0.064	0.068	0.013	0.011	0.021	0.015	0.227	0.203	0.175	0.119
1999	0.065	0.068	0.011	0.010	0.020	0.014	0.239	0.213	0.183	0.118

	Unskilled directly employed		Skilled through contractors		Semi-Skilled through contractors		Unskilled through contractors		Paid employees (part time)	
	Employment	Wages	Employment	Wages	Employment	Wages	Employment	Wages	Employment	Wages
1985	0.253	0.135	0.033	0.034	0.021	0.016	0.037	0.021	0.014	0.004
1986	0.253	0.134	0.027	0.027	0.026	0.018	0.039	0.019	0.015	0.005
1987	0.268	0.141	0.033	0.028	0.022	0.016	0.031	0.017	0.015	0.005
1988	0.296	0.158	0.034	0.038	0.022	0.016	0.037	0.020	0.014	0.005
1989	0.314	0.172	0.028	0.032	0.022	0.018	0.039	0.021	0.017	0.006
1990	0.307	0.166	0.026	0.031	0.020	0.018	0.036	0.020	0.013	0.005
1991	0.309	0.168	0.019	0.023	0.020	0.015	0.031	0.018	0.013	0.006
1994	0.298	0.168	0.018	0.020	0.020	0.015	0.027	0.015	0.008	0.002
1997	0.257	0.143	0.030	0.029	0.020	0.014	0.022	0.012	0.008	0.002
1999	0.249	0.132	0.014	0.016	0.017	0.012	0.022	0.011	0.007	0.002

Sources: DOS 1985-1999.

Table A6.2: Distribution of Economic Activity by Gender (1984-1997)

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Self-	6.0[1]	1.9	**7.9**	6.6	1.9	**8.5**	6.4	1.9	**8.3**	6.1	1.8	**8**	6.0	2.0	**8**
Employed	12.1[2]	3.9		13.3	3.8		12.8	3.9		12.2	3.6		12.0	3.9	
	75.6[3]	24.4	**100**	77.7	22.3	**100**	76.8	23.2	**100**	77.6	22.4	**100**	75.4	24.6	**100**
Employee	17.3	8.1	**25.4**	15.9	7.8	**23.7**	17.4	8.8	**26.2**	17.7	9.0	**26.7**	18.3	9.7	**28**
	34.8	16.1		31.9	15.5		34.7	17.7		35.3	18.0		36.4	19.4	
	68.2	31.8	**100**	67.0	33.0	**100**	66.3	33.7	**100**	66.5	33.5	**100**	65.5	34.5	**100**
House	0.9	15.3	**16.2**	1.1	15.3	**16.4**	0.6	14.2	**14.8**	0.7	14.8	**15.5**	0.5	14.4	**14.9**
Wife	1.8	30.4		2.2	30.5		1.2	28.5		1.4	29.9		1.0	29.0	
	5.6	94.5	**100**	6.8	93.2	**100**	4.0	96.0	**100**	4.5	95.5	**100**	3.3	96.7	**100**
Student	12.4	12.0	**24.4**	12.5	12.2	**24.7**	12.7	12.5	**25.2**	13.6	13.0	**26.6**	13.4	12.8	**26.2**
	24.9	24.0		25.1	24.3		25.4	25.0		27.0	26.2		26.6	25.8	
	50.8	49.2	**100**	50.5	49.2	**100**	50.4	49.6	**100**	51.5	48.9	**100**	51.0	49.0	**100**
Family	1.0	2.4	**3.4**	1.2	2.6	**3.8**	0.9	2.0	**2.9**	0.7	1.6	**2.3**	0.5	1.6	**2.1**
Worker	2.0	4.7		2.4	5.1		1.7	4.0		1.4	3.2		1.0	3.1	
	29.0	70.8	**100**	31.9	68.1	**100**	30.9	69.9	**100**	31.1	68.9	**100**	25.2	74.8	**100**
Children	9.3	8.8	**18.1**	8.2	7.8	**16**	7.8	7.4	**15.2**	7.5	7.1	**14.5**	7.7	7.1	**14.8**
No	18.6	17.5		16.5	15.5		15.6	14.8		14.8	14.3		15.2	14.3	
Schooling	51.4	48.6	**100**	51.3	48.7	**100**	51.5	48.5	**100**	51.3	48.7	**100**	51.8	48.2	**100**
Others	2.9	1.7	**4.6**	4.3	2.6	**6.9**	4.3	3.0	**7.3**	4.0	2.4	**6.4**	3.9	2.2	**6.1**
	5.8	3.4		8.6	5.2		8.6	6.0		7.9	4.9		7.8	4.3	
	63.3	36.7	**100**	62.3	37.7	**100**	59.0	41.0	**100**	62.1	37.9	**100**	64.5	35.5	**100**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of workers in each economic activity in total employment; row 2 shows the share of all workers by each particular economic activity in each gender groups and row 3 shows the percentage of workers in each economic activity by gender.

Table A6.3: Distribution of Working Age by Economic Activity by Gender over the Period 1984 -1997

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Self-	9.5[1]	3.1	**12.7**	10.5	3.1	**13.6**	10.0	3.1	**13.1**	9.5	2.8	**12.4**	9.3	3.1	**12.4**
Employed	19.3[2]	6.2		21.3	6.1		20.2	6.1		19.1	5.6		18.7	6.2	
	75.2[3]	24.8	**100.0**	77.3	22.7	**100.0**	76.5	23.5	**100.0**	77.0	23.0	**100.0**	74.9	25.1	**100**
Employee	29.3	13.7	**43.0**	26.9	13.3	**40.2**	29.3	14.9	**44.2**	29.9	15.1	**45.0**	30.3	16.1	**46.5**
	59.4	27.0		54.6	26.1		58.9	29.7		60.0	30.1		61.1	31.9	
	68.2	31.8	**100.0**	66.9	33.1	**100.0**	66.2	33.8	**100.0**	66.4	33.6	**100.0**	65.4	34.6	**100.0**
House	0.9	23.7	**24.5**	1.2	23.6	**24.8**	0.6	22.2	**22.8**	0.7	22.7	**23.4**	0.4	21.5	**22.0**
Wife	1.8	46.7		2.4	46.5		1.2	44.2		1.4	45.2		0.9	42.7	
	3.5	96.5	**100.0**	4.8	95.2	**100.0**	2.7	97.3	**100.0**	3.0	97.0	**100.0**	1.9	98.1	**100.0**
Student	5.5	5.3	**10.9**	5.3	5.4	**10.7**	5.2	5.5	**10.7**	5.7	6.0	**11.7**	6.1	6.3	**12.5**
	11.2	10.6		10.7	10.6		10.5	10.9		11.5	11.9		12.4	12.6	
	50.8	49.2	**100.0**	49.5	50.5	**100.0**	48.8	51.2	**100.0**	48.8	51.2	**100.0**	49.2	50.8	**100.0**
Family	1.5	3.9	**5.4**	1.9	4.3	**6.2**	1.4	3.3	**4.7**	1.1	2.6	**3.7**	0.8	2.5	**3.4**
Workers	3.1	7.7		4.0	8.4		2.8	6.6		2.2	5.1		1.7	5.1	
	28.4	71.6	**100.0**	31.4	68.6	**100.0**	29.5	70.5	**100.0**	30.1	69.9	**100.0**	24.5	75.5	**100.0**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of workers in each economic activity in total employment; row 2 shows the share of all workers by each particular economic activity in each gender groups and row 3 shows the percentage of workers in each economic activity by gender.

Table A6.4: Distribution of Gender by Education Level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
No Schooling	12.9[1]	17.4	**30.3**	12.4	16.2	**28.6**	12.0	15.2	**27.3**	11.2	14.0	**25.2**	11.0	13.5	**24.4**
	25.9[2]	34.7		25.0	32.2		24.0	30.5		22.3	28.2		21.9	27.1	
	42.6[3]	57.4	**100**	43.5	56.5	**100**	44.1	55.9	**100**	44.5	55.5	**100**	44.9	55.1	**100**
Primary	19.6	18.4	**38.0**	18.7	17.8	**36.5**	17.6	16.6	**34.2**	16.8	15.9	**32.7**	16.1	15.5	**31.6**
	39.3	36.7		37.6	35.5		35.2	33.3		33.4	32.0		32	31.1	
	51.5	48.5	**100**	51.2	48.8	**100**	51.5	48.5	**100**	51.4	48.6	**100**	51.0	49.0	**100**
Secondary	15.1	12.8	**27.9**	16.0	14.3	**30.3**	17.4	15.6	**33.0**	18.9	16.9	**35.9**	19.2	17.5	**36.7**
	30.3	25.6		32.2	28.4		34.7	31.2		37.7	34.1		38.2	35.1	
	54.1	45.9	**100**	52.9	47.1	**100**	52.7	47.3	**100**	52.8	47.2	**100**	52.4	47.6	**100**
Tertiary	2.2	1.5	**3.7**	2.6	2.0	**4.6**	3.1	2.5	**5.5**	3.3	2.8	**6.2**	4.0	3.3	**7.3**
	4.5	3.0		5.2	3.9		6.1	4.9		6.6	5.7		7.9	6.7	
	59.9	40.1	**100**	56.9	43.1	**100**	55.5	44.5	**100**	54.0	46.0	**100**	54.3	45.7	**100**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in total employment by education level ; row 2 shows the share of all workers by level of education in each gender groups and row 3 shows the percentage of workers in each education level by gender.

Table A6.5: Distribution of Gender by Qualification Level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Other Qualification	12.4	16.2	**28.6**	2.7	2.5	**5.1**	12.0	15.2	**27.3**	11.2	14.0	**25.2**	11.0	13.5	**24.5**
	25.0	32.2		4.0	7.4		24.0	30.5		22.3	28.2		21.9	27.1	
	43.5	56.5	**100**	52.0	48.0	**100**	44.1	55.9	**100**	44.5	55.5	**100**	44.9	55.1	**100**
No Qualification	26.1	24.1	**50.2**	35.1	12.9	**48.0**	24.8	22.8	**47.6**	23.8	21.8	**45.6**	23.3	21.6	**44.9**
	52.4	48.1		52.5	39.0		49.5	45.7		47.3	43.9		46.3	43.5	
	51.9	48.1	**100**	73.1	26.9	**100**	52.1	47.9	**100**	52.2	47.8	**100**	51.8	48.2	**100**
Low Qualification Education (LCE)	3.9	3.5	**7.4**	7.6	3.1	**10.7**	4.9	4.4	**9.3**	5.4	4.9	**10.3**	5.5	5.0	**10.5**
	7.9	6.9		11.4	9.5		9.7	8.9		10.7	9.9		10.9	10.0	
	53.1	46.9	**100**	70.9	29.1	**100**	52.3	44.7	**100**	53.4	47.6	**100**	52.5	47.5	**100**
Medium Qualification Education (MCE)	5.2	4.9	**10.1**	14.5	10.2	**24.7**	5.9	5.5	**11.5**	7.1	6.8	**13.9**	7.3	7.1	**14.4**
	10.4	9.8		21.7	30.9		11.9	11.1		14.1	13.7		14.6	14.3	
	51.2	48.8	**100**	58.6	41.4	**100**	51.7	48.3	**100**	51.0	49.0	**100**	50.7	49.3	**100**
High School Qualification Education (HSCE)	0.7	0.6	**1.3**	1.8	1.2	**3.1**	0.8	0.8	**1.6**	0.9	0.9	**1.8**	0.8	0.9	**1.7**
	1.4	1.2		2.8	3.7		1.6	1.6		1.8	1.9		1.6	1.8	
	53.1	46.9	**100**	60.2	39.8	**100**	50.6	49.4	**100**	49.6	50.4	**100**	48.3	51.7	**100**
Diploma	0.7	0.6	**1.3**	2.5	2.0	**4.5**	0.8	0.6	**1.4**	0.9	0.8	**1.5**	1.2	1.0	**2.3**
	1.4	1.1		3.8	5.9		1.6	1.3		1.9	1.5		2.5	2.1	
	55.9	44.1	**100**	56.5	43.5	**100**	55.2	44.8	**100**	55.5	44.5	**100**	54.3	45.7	**100**
Degree	0.8	0.4	**1.1**	2.6	1.2	**3.8**	0.9	0.4	**1.3**	0.9	0.5	**1.4**	1.1	0.7	**1.8**
	1.5	0.7		3.9	3.6		1.7	0.9		1.8	1.0		2.2	1.3	
	66.7	33.3	**100**	68.8	31.2	**100**	66.4	33.6	**100**	65.7	34.3	**100**	63.1	36.9	**100**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in total employment by qualification level; row 2 shows the share of all workers by level of qualification in each gender groups and row 3 shows the percentage of workers in each qualification level by gender.

Table A6.6: Distribution of Employees by Gender and Education Level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
No	3.9	3.6	**7.5**	2.7	2.5	**5.2**	2.8	2.3	**5.0**	2.5	1.9	**4.4**	2.0	1.5	**3.5**
Schooling	5.8	11.3		4.1	7.5		4.2	6.7		3.7	5.6		3.0	4.3	
	52.1	47.9	**100**	52.2	47.8	**100**	55.1	44.9	**100**	57.0	43.0	**100**	67.0	43.0	**100**
Primary															
	25.2	8.6	**33.8**	21.7	7.6	**29.2**	19.0	7.1	**26.2**	16.7	6.3	**23.0**	15.6	6.6	**22.2**
	37.0	26.9		32.4	22.9		28.8	21.1		25.1	18.7		23.8	19.0	
	74.7	25.3	**100**	74.1	25.9	**100**	72.8	27.2	**100**	72.6	27.4	**100**	70.2	29.8	**100**
Secondary	32.8	16.4	**49.2**	35.1	18.5	**53.6**	36.4	19.2	**55.7**	38.6	19.9	**58.5**	38.2	19.8	**58.0**
	48.1	51.4		52.5	55.8		55.0	57.0		58.1	59.3		58.4	57.1	
	66.7	33.3	**100**	65.6	34.4	**100**	65.4	34.6	**100**	65.9	34.1	**100**	65.9	34.1	**100**
Tertiary	6.2	3.3	**9.5**	7.4	4.6	**12.0**	8.0	5.1	**13.1**	8.6	5.5	**14.2**	9.6	6.8	**16.4**
	9.1	10.3		11.1	13.8		12.0	15.2		13.0	16.4		14.8	19.5	
	65.4	34.6	**100**	61.8	38.2	**100**	60.8	39.2	**100**	61.0	39.0	**100**	58.8	41.2	**100**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in total employment by education level; row 2 shows the share of all workers by level of education in each gender groups and row 3 shows the percentage of workers in each education level by gender.

Table A6.7: Distribution of Employees by Gender and Qualification Level 1984 to 1997

	1984			1989			1992			1995			1997		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Mal	Female	Total	Male	Female	Total
Other Qualification	3.9[1]	3.6	**7.4**	2.7	2.5	**5.1**	2.8	2.3	**5.0**	2.5	1.9	**4.4**	2.0	1.5	**3.5**
	5.7[2]	11.2		4.0	7.4		4.2	6.7		3.7	5.6		3.0	4.3	
	51.8[3]	48.2	**100**	52.0	48.0	**100**	55.1	44.9	**100**	57.0	43.0	**100**	57.0	43.0	**100**
No Qualification	37.6	13.1	**50.7**	35.1	12.9	**48.0**	29.6	11.2	**40.7**	26.2	9.6	**35.8**	25.2	9.9	**35.1**
	55.1	41.1		52.5	39.0		44.6	33.1		39.5	28.5		38.6	28.5	
	74.2	25.8	**100**	73.1	26.9	**100**	72.6	27.4	**100**	73.2	26.8	**100**	71.9	28.1	**100**
Low Qualification Education (LCE)	8.8	3.7	**12.6**	7.6	3.1	**10.7**	9.9	4.3	**14.3**	10.6	4.5	**15.0**	10.1	4.0	**14.2**
	12.9	11.8		11.4	9.5		15.0	12.9		15.9	13.3		15.5	11.6	
	70.2	29.8	**100**	70.9	29.1	**100**	69.5	30.5	**100**	70.4	29.6	**100**	71.6	28.4	**100**
Medium Qualification Education (MCE)	12.1	8.4	**20.5**	14.5	10.2	**24.7**	16.3	11.0	**27.3**	18.5	12.3	**30.8**	18.8	12.7	**31.5**
	17.7	26.4		21.7	30.9		24.6	32.6		28.0	36.5		28.8	36.6	
	59.0	41.0	**100**	58.6	41.4	**100**	59.7	40.3	**100**	60.2	39.8	**100**	59.8	40.2	**100**
High School Qualification Education (HSCE)	1.2	0.7	**1.9**	1.8	1.2	**3.1**	2.2	1.7	**4.0**	2.5	1.8	**4.2**	2.1	1.8	**4.0**
	1.8	2.1		2.8	3.7		3.4	5.1		3.7	5.2		3.3	5.3	
	64.7	35.3	**100**	60.2	39.8	**100**	56.5	43.5	**100**	58.5	41.5	**100**	54.0	46.0	**100**
Diploma	2.1	1.6	**3.7**	2.5	2.0	**4.5**	2.6	2.0	**4.6**	3.0	2.3	**5.3**	3.7	3.0	**6.7**
	3.1	4.9		3.8	5.9		4.0	6.0		4.5	6.9		5.7	8.6	
	57.4	42.6	**100**	56.5	43.5	**100**	56.4	43.6	**100**	56.3	43.7	**100**	55.4	44.6	**100**
Degree	2.5	0.8	**3.2**	2.6	1.2	**3.8**	2.8	1.2	**4.1**	2.9	1.4	**4.3**	3.4	1.8	**5.2**
	3.6	2.4		3.9	3.6		4.3	3.7		4.4	4.1		5.2	5.2	
	46.1	23.9	**100**	68.8	31.2	**100**	69.5	30.5	**100**	68.3	31.7	**100**	65.1	34.9	**100**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in total employment by qualification level; row 2 shows the share of all workers by level of qualification in each gender groups and row 3 shows the percentage of workers in each qualification level by gender.

Table A6.8 Distribution of Employees by Occupation and Gender

	1984			1989			1992			1995			1997		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Professional, Technical	6.6[1]	4.6	**11.2**	6.7	5.2	**11.9**	6.6	5.3	**11.9**	8.1	6.0	**14.1**	8.0	6.3	**14.3**
and Related Workers	9.6[2]	14.4		10.0	15.8		10.0	15.8		12.2	17.8		12.2	18.3	
	58.8[3]	41.2	**100.0**	56.1	43.9	**100.0**	55.4	44.6	**100.0**	57.5	42.5	**100.0**	55.7	44.3	**100.0**
Administrative &	2.4	0.3	**2.7**	2.4	0.4	**2.8**	2.4	0.5	**2.9**	2.6	0.8	**3.5**	3.2	1.0	**4.1**
Managerial Workers	3.5	0.9		3.6	1.1		3.7	1.5		3.9	2.5		4.8	2.8	
	88.9	11.1	**100.0**	86.6	13.4	**100.0**	82.7	17.3	**100.0**	75.8	24.2	**100.0**	76.2	23.8	**100.0**
Clerical & Related	7.8	8.1	**15.9**	7.5	0.8	**8.3**	6.7	7.5	**14.2**	6.9	7.9	**14.9**	6.8	9.1	**15.9**
Workers	11.5	25.4		11.3	24.3		10.2	22.3		10.5	23.5		10.4	26.4	
	49.2	50.8	**100.0**	48.4	51.6	**100.0**	47.2	52.8	**100.0**	46.8	53.2	**100.0**	42.6	57.4	**100.0**
Sales Workers	5.0	2.1	**7.1**	4.8	2.3	**7.1**	4.1	2.0	**6.1**	4.3	2.5	**6.8**	3.9	2.5	**6.4**
	7.3	6.7		7.2	7.0		6.1	5.9		6.5	7.3		5.9	7.3	
	69.8	30.2	**100.0**	67.5	32.5	**100.0**	67.1	32.9	**100.0**	63.5	36.5	**100.0**	60.4	39.6	**100.0**
Services	9.0	5.6	**14.6**	9.3	5.9	**15.2**	8.0	5.2	**13.2**	7.7	4.8	**12.5**	7.4	5.3	**12.7**
Workers	13.2	17.7		13.9	17.7		12.1	15.5		11.6	14.2		11.4	15.2	
	61.4	38.6	**100.0**	61.3	38.7	**100.0**	60.6	39.4	**100.0**	61.8	38.2	**100.0**	58.5	41.5	**100.0**
Agricultural, Animal	7.8	4.0	**11.8**	7.5	2.8	**10.3**	7.9	2.6	**10.5**	6.3	1.7	**8.0**	5.4	1.4	**6.7**
Husbandry & Forestry	11.4	12.5		11.2	8.5		11.9	7.8		9.5	5.1		8.2	4.0	
Workers, Fisherman & Hunters	66.2	33.8	**100.0**	72.7	27.3	**100.0**	75.1	24.9	**100.0**	78.8	21.2	**100.0**	79.6	20.4	**100.0**
Production & Related	29.7	7.1	**36.8**	28.7	8.5	**37.2**	30.4	10.5	**40.9**	30.4	10.0	**40.4**	30.8	9.0	**39.8**
Workers, transport	43.6	22.4		42.9	25.6		46.0	31.2		45.8	29.6		47.1	26.0	
Equipment Operators & Labourers	80.7	19.3	**100.0**	77.2	22.8	**100.0**	74.3	25.7	**100.0**	75.3	24.7	**100.0**	77.4	22.6	**100.0**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in total employment by occupation level; row 2 shows the share of all workers by level of occupation in each gender groups and row 3 shows the percentage of workers in each occupation level by gender.

Table A6.9: Distribution of by Occupation and Education Level 1984 to 1992

Occupation	1984				1989				1992			
	No Schooling	Primary	Secondary	Tertiary	No Schooling	Primary	Secondary	Tertiary	No Schooling	Primary	Secondary	Tertiary
Professional, Technical and Related Workers	0.1[1]	0.5	5.1	5.4	0.1	0.5	5.0	6.4	0.0	0.4	4.8	6.7
	1.3[2]	1.6	10.4	57.0	1.4	1.6	9.3	53.2	0.7	1.4	8.7	51.4
	0.9[3]	4.8	45.7	48.6	0.6	3.9	41.9	53.6	0.3	3.0	40.3	56.3
Administrative & Managerial Workers	0.2	0.2	1.1	1.3	0.0	0.2	1.1	1.5	0.0	0.1	1.1	1.7
	0.6	0.6	2.3	14.1	0.2	0.6	2.1	12.5	0.0	0.5	2.0	13.0
	0.0	7.1	41.9	50.4	0.4	5.6	40.2	53.8	0.0	4.7	37.6	57.6
Clerical & Related Workers	0.1	1.0	13.1	1.7	0.0	0.8	12.3	2.4	0.0	0.7	11.2	2.4
	0.9	3.1	26.7	17.6	0.6	2.8	22.9	20.3	0.7	2.6	20.1	18.1
	0.4	6.5	82.6	10.5	0.2	5.3	78.9	15.6	0.3	4.7	78.4	16.7
Sales Workers	0.2	1.8	4.7	0.4	0.2	1.6	4.8	0.4	0.1	1.1	4.3	0.5
	3.1	5.4	9.5	4.0	3.6	5.6	9.0	3.6	2.8	4.2	7.8	3.6
	3.3	25.9	65.5	5.3	2.6	22.9	68.3	6.1	2.3	18.1	74.3	7.9
Services Workers	1.6	6.3	6.5	0.2	1.2	5.5	8.1	0.4	1.0	4.5	7.3	0.5
	20.9	18.5	13.3	2.5	23.4	18.8	15.0	3.2	19.8	17.1	13.1	3.8
	10.8	42.9	44.7	1.6	8.0	36.3	53.1	2.6	7.5	33.7	55.0	3.7
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	2.8	6.9	2.0	0.1	1.8	4.0	2.4	0.1	2.0	5.7	2.7	0.2
	37.0	20.3	4.1	0.9	35.1	20.6	4.5	0.9	39.5	21.7	4.8	1.2
	23.8	58.4	17.1	0.7	17.6	58.2	23.1	1.0	18.9	54.1	25.4	1.5
Production & Related Workers, Transport Equipment Operators & Labourers	2.8	17.1	16.6	0.4	1.9	14.6	19.9	0.7	1.8	13.7	24.2	1.2
	36.5	50.6	33.8	3.9	35.6	50.0	37.2	6.2	36.5	52.5	43.5	8.9
	7.5	46.4	45.1	1.0	5.0	39.4	53.6	2.0	1.8	33.5	59.1	2.9

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular occupation by education level; row 2 shows the share of all workers by level of occupation in each education level and row 3 shows the percentage of workers in each occupation by level of education.

Table A6.9: Distribution of by Occupation and Education Level 1995 to 1997 (continued)

Occupation	1995				1997			
	No Schooling	Primary	Secondary	Tertiary	No Schooling	Primary	Secondary	Tertiary
Professional, Technical and Related Workers	0.0[1]	0.5	6.3	7.2	0.0	0.4	5.6	8.4
	0.8[2]	2.0	10.8	51.0	0.8	1.6	9.6	51.5
	0.3[3]	3.3	45.1	51.4	0.2	2.5	38.7	58.5
Administrative & Managerial Workers	0.0	0.1	1.4	1.9	0.0	0.1	1.4	2.7
	0.2	0.5	2.5	13.3	0.0	0.4	2.4	16.1
	0.2	3.4	41.7	54.6	0.0	2.3	33.7	64.1
Clerical & Related Workers	0.0	0.7	11.6	2.4	0.0	0.7	12.5	2.7
	1.1	3.2	19.9	17.2	0.9	3.1	21.5	16.7
	0.3	4.9	78.4	16.4	0.2	4.3	78.5	17.0
Sales Workers	0.2	1.1	4.9	0.6	0.1	1.1	4.8	0.6
	4.0	4.7	8.3	4.5	3.5	4.7	8.0	3.7
	2.6	16.0	72.1	9.3	1.9	16.4	72.2	9.4
Services Workers	0.9	3.9	7.1	0.5	0.8	4.2	7.1	0.6
	21.3	16.9	12.2	3.5	23.1	18.9	12.3	3.7
	7.5	31.2	57.3	4.0	6.3	32.9	56.0	4.8
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	1.3	4.2	2.3	0.1	0.9	3.7	2.0	0.1
	30.6	18.5	3.9	1.0	26.9	16.5	3.5	0.8
	16.6	52.9	28.9	1.9	13.7	54.5	29.9	2.1
Production & Related Workers, Transport Equipment Operators & Labourers	1.8	12.4	24.8	1.3	1.5	12.1	24.8	1.3
	41.9	54.2	42.4	9.4	44.8	54.7	42.8	8.0
	4.5	30.8	58.5	3.3	3.9	30.5	62.3	3.3

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular occupation by education level; row 2 shows the share of all workers by level of occupation in each education level and row 3 shows the percentage of workers in each occupation by level of education.

Table A6.10: Distribution of Employees by Occupation and Qualification Level 1984

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.9[1]	0.0	1.1	3.7	0.5	2.9	2.0
	1.8[2]	0.4	8.7	17.9	25.7	80.3	61.0
	8.1[3]	0.3	9.8	32.9	4.3	26.4	17.7
Administrative & Managerial Workers	0.3	0.0	0.2	0.8	0.2	0.3	0.9
	0.7	0.2	1.7	3.7	11.2	7.1	26.8
	12.4	0.5	8.2	28.7	7.9	9.7	32.5
Clerical & Related Workers	2.6	0.1	3.2	8.8	0.8	0.3	0.2
	5.1	0.8	25.2	43.1	41.8	7.3	5.9
	16.4	0.4	19.9	55.5	4.9	1.7	1.2
Sales Workers	3.8	0.2	1.2	1.5	0.2	0.1	0.1
	7.5	3.2	9.9	7.4	8.5	1.5	3.4
	53.3	3.3	17.5	21.3	2.2	0.8	1.5
Services Workers	8.8	1.6	2.1	2.0	0.1	0.0	0.0
	17.3	21.1	17.0	9.6	5.2	1.0	0.8
	60.0	10.7	14.6	13.4	0.7	0.3	0.2
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	8.2	2.8	0.4	0.3	0.0	0.0	0.0
	16.1	37.4	3.1	1.6	1.0	0.6	0.9
	69.5	23.7	3.3	2.8	0.2	0.2	0.2
Production & Related Workers, Transport Equipment Operators & Labourers	26.1	2.7	4.3	3.4	0.1	0.1	0.0
	51.5	36.8	34.4	16.7	6.5	2.2	1.3
	70.8	7.4	11.7	9.3	0.3	0.2	0.1

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular occupation by qualification level; row 2 shows the share of all workers by level of occupation in each qualification level and row 3 shows the percentage of workers in each occupation by level of qualification.

Table A6.11: Distribution of Employees by Occupation and Qualification Level 1989

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.8	0.0	0.8	3.7	0.7	3.5	2.2
	1.8	0.8	7.9	15.0	23.1	77.0	59.1
	7.1	0.3	7.1	31.2	6.0	29.2	18.8
Administrative & Managerial Workers	0.3	0.0	0.2	0.8	0.3	0.3	1.0
	0.6	0.2	1.6	3.2	8.2	6.0	25.6
	11.2	0.4	6.1	28.8	9.0	9.7	34.8
Clerical & Related Workers	2.2	0.0	2.2	8.9	1.3	0.5	0.4
	4.6	0.6	20.8	36.2	43.3	10.2	9.3
	14.3	0.2	14.4	57.4	8.5	3.0	2.3
Sales Workers	3.7	0.2	1.0	1.9	2.5	0.1	0.1
	7.6	3.6	8.8	7.8	5.7	3.0	3.0
	51.6	2.6	13.4	27.3	0.2	1.6	1.6
Service Workers	8.4	1.2	2.1	3.1	0.2	0.1	0.0
	17.5	23.7	19.6	12.6	6.5	1.4	1.0
	55.5	8.0	13.9	20.6	1.3	0.4	0.3
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	7.5	1.8	0.5	0.5	0.0	0.0	0.0
	15.6	35.4	4.4	1.9	0.8	0.6	0.4
	7.5	17.6	4.6	4.6	0.3	0.3	0.1
Production & Related Workers, Transport Equipment Operators & Labourers	25.0	1.8	4.0	5.7	0.4	0.1	0.1
	52.1	35.8	36.8	23.2	12.3	3.1	1.6
	67.4	5.0	10.7	15.4	1.0	0.4	0.2

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular occupation by qualification level; row 2 shows the share of all workers by level of occupation in each qualification level and row 3 shows the percentage of workers in each occupation by level of qualification.

Table A6.12: Distribution of Employees by Occupation and Qualification Level 1992

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.5	0.0	0.8	3.8	1.0	3.2	2.5
	1.5	0.7	5.5	14.0	24.0	69.5	61.8
	5.1	0.3	6.6	32.0	8.2	27.0	2.5
Administrative & Managerial Workers	0.2	0.0	0.2	0.8	0.3	0.4	1.0
	0.6	0.0	1.2	3.1	6.7	9.0	25.0
	8.3	0.0	5.8	28.4	9.0	14.1	34.3
Clerical & Related Workers	1.5	0.0	2.0	8.5	1.4	0.5	0.3
	3.6	0.7	14.0	31.1	36.3	11.8	6.8
	10.2	0.3	14.0	59.7	4.6	4.6	1.9
Sales Workers	2.3	0.1	1.2	2.0	0.2	0.1	0.1
	5.6	2.8	8.2	7.4	6.2	2.0	2.5
	37.6	2.3	19.3	33.5	4.0	1.5	1.7
Service Workers	6.5	1.0	2.2	3.2	0.3	0.1	0.0
	15.9	19.8	15.2	11.7	7.6	2.1	1.1
	48.7	7.5	16.4	24.1	2.3	0.7	0.3
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	7.2	2.0	0.6	0.6	0.1	0.0	0.0
	17.7	39.5	4.6	2.1	1.4	0.6	0.7
	68.4	18.9	6.2	5.4	0.5	0.2	0.3
Production & Related Workers, Transport Equipment Operators & Labourers	22.5	1.8	7.3	8.4	0.7	0.2	0.1
	55.2	36.5	51.2	30.6	17.0	5.1	2.1
	54.9	4.5	17.8	20.4	1.6	0.6	0.2

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular occupation by qualification level; row 2 shows the share of all workers by level of occupation in each qualification level and row 3 shows the percentage of workers in each occupation by level of qualification.

Table A6.13: Distribution of Employees by Occupation and Qualification Level 1995

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional, Technical and Related Workers	0.8	0.0	0.9	5.0	1.2	3.5	2.6
	2.3	0.8	6.2	16.3	28.6	65.5	60.3
	5.8	0.3	6.6	35.6	8.6	24.6	2.6
Administrative & Managerial Workers	0.2	0.0	0.2	1.1	0.4	0.5	1.0
	0.6	0.2	1.3	3.6	8.8	10.2	23.7
	6.4	0.2	5.7	31.7	10.8	15.6	29.6
Clerical & Related Workers	1.5	0.0	1.9	9.1	1.4	0.7	0.3
	4.2	1.1	12.7	29.4	32.8	12.3	6.8
	10.0	0.3	12.9	61.0	9.8	4.4	2.0
Sales Workers	2.3	0.2	1.3	2.4	0.3	0.2	0.2
	6.3	4.0	8.6	7.9	6.3	2.9	4.4
	33.3	2.6	19.1	35.9	3.9	2.3	2.8
Service Workers	5.5	0.9	2.2	3.4	0.2	0.1	0.1
	15.3	21.3	14.6	11.1	5.8	2.4	1.6
	43.5	0.9	17.6	27.4	2.0	1.0	0.5
Agricultural, Animal Husbandry & Forestry Workers, Fisherman & Hunters	5.3	1.3	0.7	0.5	0.1	0.0	0.0
	14.9	30.6	4.8	1.7	1.5	0.5	0.5
	66.3	16.6	8.9	6.4	0.8	0.3	0.3
Production & Related Workers, Transport Equipment Operators & Labourers	20.2	1.8	7.8	9.3	0.7	0.3	0.1
	56.4	41.9	51.8	30.2	16.1	6.2	2.8
	50.0	4.5	19.3	23.0	1.7	0.8	0.3

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular occupation by qualification level; row 2 shows the share of all workers by level of occupation in each qualification level and row 3 shows the percentage of workers in each occupation by level of qualification.

Table 6.14 Distribution of Employees by Occupation and Qualification Level 1997

OCCUPATION	No Qualification	Other Qualification	Low Qualification Education (LCE)	Medium Qualification Education (MCE)	High School Qualification Education (HSCE)	Diploma	Degree
Professional,	0.6	0.0	0.7	4.6	1.1	4.2	3.1
Technical and	1.8	0.8	5.1	14.6	26.8	63.0	59.5
Related Workers	0.6	0.2	5.0	32.0	7.4	29.3	21.5
Administrative &	0.2	0.0	0.2	1.1	0.3	0.8	1.5
Managerial Workers	0.5	0.0	1.2	3.6	8.3	12.5	28.6
	4.5	0.0	4.3	27.3	8.0	20.2	35.8
Clerical & Related	1.4	0.0	1.9	10.0	1.5	0.8	0.3
Workers	4.0	0.9	13.6	31.7	37.0	12.5	5.4
	8.8	0.2	12.1	62.7	9.2	5.2	1.8
Sales Workers	2.1	0.1	1.3	2.3	0.2	0.2	0.2
	6.0	3.5	8.9	7.4	6.0	3.0	2.9
	32.8	1.9	1.3	6.4	3.7	3.1	2.4
Service Workers	6.1	0.8	2.2	3.2	0.3	0.2	0.1
	17.3	23.1	15.2	10.1	7.4	2.4	1.2
	47.7	6.3	17.0	25.0	2.3	1.3	0.5
Agricultural, Animal	4.6	0.9	0.6	0.6	0.0	0.0	0.0
Husbandry &	13.0	26.9	4.3	1.8	1.2	0.4	0.3
Forestry Workers,	67.7	13.7	9.0	8.2	0.7	0.4	0.2
Fisherman & Hunters							
Production & Related	20.3	1.5	7.3	9.7	0.5	0.4	0.1
Workers, Transport	57.4	44.8	51.7	30.9	13.3	6.3	2.1
Equipment Operators	50.6	3.9	18.4	24.4	1.3	1.1	0.3
& Labourers							

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular occupation by qualification level; row 2 shows the share of all workers by level of occupation in each qualification level and row 3 shows the percentage of workers in each occupation by level of qualification.

Table A6.15: Distribution of Employees by Gender, 1984 to 1997

	1984			1989			1992			1995			1997		
SECTOR	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Mining & Quarrying	1.1	0.1	**1.2**	0.7	0.1	**0.8**	0.7	0.1	**0.8**	0.5	0.1	**0.6**	0.5	0.1	**0.6**
	1.7	0.4		1.0	0.3		1.0	0.3		0.8	0.3		0.8	0.2	
	90.5	9.5	**100**	87.6	12.5	**100**	86.6	13.4	**100**	85.7	14.3	**100**	88.7	11.3	**100**
Manufacturing	11.4	7.9	**19.3**	12.5	9.6	**22.1**	14.8	12.0	**26.9**	16.5	11.6	**28.1**	16.4	11.0	**27.1**
	16.7	24.9		18.7	28.9		22.4	35.6		24.8	34.6		25.1	31.7	
	59.0	41.0	**100**	56.7	43.3	**100**	55.2	44.8	**100**	58.6	41.4	**100**	59.9	40.1	**100**
Electricity, Gas & Water	1.0	0.1	**1.1**	1.0	0.1	**1.1**	0.9	0.1	**0.9**	0.8	0.1	**0.9**	0.8	0.1	**0.9**
	1.5	0.3		1.5	0.3		1.3	0.2		1.2	0.3		1.2	0.3	
	92.4	7.6	**100**	91.1	8.9	**100**	92.0	8.0	**100**	89.1	10.9	**100**	86.8	13.2	**100**
Construction	10.7	0.8	**11.5**	8.0	0.4	**8.4**	8.9	0.4	**9.4**	8.8	0.2	**9.5**	9.9	0.8	**10.7**
	15.7	2.4		12.0	1.2		13.5	1.3		13.3	2.1		15.1	2.3	
	93.3	6.7	**100**	95.2	4.8	**100**	95.3	4.7	**100**	92.7	7.3	**100**	92.6	7.4	**100**
Wholesale & Retail Trade	7.6	3.6	**11.2**	7.5	3.6	**11.1**	6.3	3.2	**9.6**	6.5	3.7	**10.2**	6.5	4.0	**10.4**
	11.2	11.4		11.2	11.0		9.6	9.6		9.9	10.9		9.9	11.5	
	67.8	32.2	**100**	67.2	32.8	**100**	66.3	33.7	**100**	64.0	36.0	**100**	61.8	38.2	**100**

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular industry by gender; row 2 shows the share of all workers by level of industry in each gender group and row 3 shows the percentage of workers in each industry by gender.

Table A6.15: Distribution of Employees by Gender Level 1984 to 1997 (continued)

SECTOR	1984 Male	1984 Female	1984 Total	1989 Male	1989 Female	1989 Total	1992 Male	1992 Female	1992 Total	1995 Male	1995 Female	1995 Total	1997 Male	1997 Female	1997 Total
Restaurants & Hotel	2.0	1.7	3.7	2.2	1.8	4.1	2.1	1.8	4.0	2.2	1.8	4.0	2.3	2.1	4.3
	3.0	5.3		3.3	5.6		3.2	5.4		3.3	5.3		3.5	6.0	
	54.4	45.6	100	54.6	45.4	100	54.2	45.8	100	55.0	45.0	100	52.1	47.9	100
Transport, Storage & Communication	5.0	0.6	5.6	5.0	0.8	5.8	4.6	0.6	5.2	4.7	0.8	5.5	4.7	0.8	5.6
	7.4	2.0		7.5	2.4		7.0	1.7		7.1	2.3		7.2	2.4	
	88.9	11.1	100	86.4	13.6	100	88.7	11.3	100	85.8	14.2	100	84.8	15.2	100
Finance, Insurance, Real Estate & Business Services	3.3	2.1	5.4	3.8	2.2	6.0	3.2	2.0	5.2	3.4	2.3	5.8	3.5	2.9	6.4
	4.8	6.7		5.6	6.8		4.9	6.0		5.2	6.9		5.3	8.4	
	60.7	39.8	100	62.7	37.3	100	61.6	38.4	100	59.8	40.2	100	54.7	45.3	100
Community, Social & Personal Services	3.3	2.1	5.4	3.8	2.2	6.0	3.2	2.0	5.2	3.4	2.3	5.8	3.5	2.9	6.4
	4.8	6.7		5.6	6.8		4.9	6.0		5.2	6.9		5.3	8.4	
	60.7	39.8	100	62.7	37.3	100	61.6	38.4	100	59.8	40.2	100	54.7	45.3	100
Agriculture, Forestry, Livestock & Fishing	7.5	4.1	11.6	7.0	2.9	9.9	7.6	2.7	10.3	6.0	1.8	7.9	4.8	1.4	6.2
	11.1	12.7		10.4	8.7		11.5	8.1		9.1	5.5		7.3	4.1	
	65.0	35.0	100	70.8	29.2	100	73.6	26.4	100	76.5	23.5	100	77.3	22.7	100

Note: Figures calculated from HIS 1984-1997 in percentage points. Row 1 shows the share of all workers in each particular industry by gender; row 2 shows the share of all workers by level of industry in each gender group and row 3 shows the percentage of workers in each industry by gender.

There is some disagreement about whether occupation should be included along with education in earnings function. A further exercise was therefore conducted to investigate how the returns to education changed when the occupation variables are excluded. The results are shown below in Table A7.7. Comparing these to the estimates presented in Table 7.7 it is clear that occupation does have an independent impact on earnings over and above that for education. However, what is also clear is that whilst the return to education increases when occupation is not included, the pattern of change over time at each level of education and the relative return across education levels remain the same. In other words, in qualitative terms our conclusions hold.

Table A7.7: Estimates of Earning Equation for Qualification by Excluded Occupations Explanatory Variables

	1984	1989	1992	1995	1997
Age	.112	.0175	.0972	.0903	.0776
	(65.73)	(69.91)	(75.88)	(47.89)	(33.72)
Age squared	-.00132	-.001	-.00109	-.00101	-.000890
	(-57.41)	(-59.54)	(-60.66)	(-39.57)	(-28.81)
Male	.333	.290	.287	.273	.159
	(56.94)	(58.22)	(58.15)	(46.02)	(21.914)
Married	.156	.287	.106	.0744	.00425
	(23.56)	(28.55)	(27.54))	(10.50)	(.403)
Other Qualifications	-.374	-.471	-.360	-.319	-.251
	(31.12)	(-32.95)	(-27.40)	(-19.92)	(-11.37)
Primary qualification	.276	.265	.248	.231	.186
	(35.07)	(31.49)	(34.41)	(26.91)	(17.06)
Secondary qualification	.421	.472	.477	.486	.495
	(76.44)	(77.66)	(77.22)	(64.76)	(47.39)
High School qualification	.613	.635	.633	.658	.662
	(43.18)	(50.02)	(51.85)	(46.55)	(30.87)
Diploma	.928	.870	.907	.923	.782
	(68.81)	(74.62)	(79.76)	(71.44)	(53.27)
Degree	1.497	1.511	1.476	1.450	1.131
	(106.08)	(121.73)	(123.25)	(104.26)	(70.19)
Mining	.295	.302	.289	.265	.199
	(13.45)	(11.63)	(11.48)	(7.87)	(4.59)
Electrical	.101	.0617	.0818	.141	.113
	(4.351)	(1.67)	(4.018)	(5.265)	(3.37)
Construction	.0092	-.0596	-.0171	.0369	.0694
	(1.017)	(-9.96)	(-2.27)	(3.20)	(5.55)
Wholesale	.0556	.0061	.0117	.0042	.0455
	(6.217)	(.722)	(1.473)	(.580)	(3.77)
Restaurant	-.0138	-.0569	-.0654	-.124	-.0220
	(-1.027)	(-3.708)	(-5.887)	(-9.03)	(-1.37)
Transportation	.0179	.06784	.0623	.106	.101
	(1.557)	(4.068)	(6.139)	(8.236)	(6.43)
Finance	.171	.155	.187	.236	.158
	(14.331)	(14.400)	(17.90)	(19.44)	(10.94)
Communication	-.0414	-.0122	-.0698	-.0923	-.0414
	(-5.68)	(-3.48)	(-8.136)	(-11.15)	(-3.68)
Number of observation	56191	599020	60978	44010	42196
R^2	.450	.458	.447	.426	.238
F test	758	744	515	621	411
Breusch-Pagan / Cook-Weisberg test for constant variance Chi2 (1)	23.82	20.48	21.60	27.2	25.98
Prob>chi 2	0.25	0.42	0.26	0.10	0.13

Note: The figures in parentheses are t-statistics.