MANPOWER POLICY UNDER INDUSTRIAL RESTRUCTURING: SINGAPORE IN THE 1980s

Ph.D.

91.

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ABSTRACT

In the short run, the size of a labour force is strongly influenced by participation rates. In the longer term it is governed by the rate of population growth through natural increase and immigration and by a country's investment in its human resources that raises the productivity of the workforce.

The challenges facing Singapore as it tries to overcome its manpower constraints will involve tradeoffs. For instance, raising the female labour force participation rate may exact higher costs in the long run by preventing the achievement of replacement level fertility rates, thereby constraining the rate of future population growth. On the other hand, accepting stable participation rates, *ceteris paribus*, would mean a continued sizable foreign worker presence in Singapore. Government intervention to increase the provision of childcare facilities may help to raise both the female participation rate in the short run as well as long run fertility levels.

Decisions will have to made with respect to the type of education best suited to future growth. At present a technical and vocationally-oriented curriculum is favoured to support what is still a primarily manufacturing-based development strategy. Cost-benefit calculations based on starting salary data suggest that, while the returns to middle-level skilled worker technical training are higher than those to general tertiary training, the payoff to tertiary finance and business-related courses are greater than the payoff to engineering.

One factor that will impinge significantly on the scope of policy is the incidence of international mobility. The large scale influx of foreign workers was one factor that spurred the restructuring programme. Any attempt to restrict individual mobility within the economy may provoke a flood of emigration among the well educated. This is a factor that has made general skills and training a public good requiring public subsidy and an area where the government will continue to exert its influence in resource allocation.

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TO MOM, DAD AND DEREK

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CHAPTER ONE:
STATEMENT OF THESIS OBJECTIVES

The ability of an economy to thrive and prosper is being gradually redefined in terms of the quality of its manpower and that manpower's capacity to adapt to rapid changes in technology. This issue is especially significant for Singapore as her people are her greatest and most crucial resource. Astute management of this resource contributed to the success of the export industrialization drive in the late 1960s and early 1970s.

The new economic policy of 1979 sought to diversify the base of Singapore's economic growth to stay ahead of competition from other developing economies by entering new markets for future development. The success of this strategy, which seeks to raise productivity levels to facilitate industrial upgrading to higher-value activities, depends critically on the quality of Singapore's manpower.

However, the effort to raise the labour force's skill profile is increasingly bound by demographic constraints. Fertility declined as a result of the successful family planning campaign and the rapid social changes accompanying high economic growth, particularly as the entry of more women into the workforce affected fertility decisions.

Demographic constraints provided the context for manpower policy in the 1980s. A country's labour supply depends on the size, age structure and growth rate of its population. The population growth rate, through natural increase and immigration, changes the size and age structure of the population and thus the available supply in the long run.

In the short term, the size of the labour force is strongly influenced by labour force participation rates, and by the intensity and hours of work. In the longer term, it is influenced by the country's investment in its human resources which raises the productivity of the work force.

Much of the literature on Singapore manpower policy in the 1980s either describes the policies or examines the manpower forecasting aspects (Islam

1987, Vente and Chow 1986). This thesis will examine in detail selected aspects of manpower policy since 1979 and draw inferences for future consideration.

The Main Policy Issues

1. Implications of fertility patterns for the size and structure of the labour force.

Low fertility has been one result of rapid economic development. Women's increased participation in the workplace encouraged them to postpone marriage, and enhanced career opportunities raised the opportunity cost of childbearing. The decline in fertility has been accompanied by a "lopsided procreation" pattern with comparatively well educated and well-to-do families having fewer children. This could lead to widening living standards between large and small families and the danger that the talent pool will be depleted if the well educated do not procreate enough.

Projections of population and labour force structures based on different fertility assumptions will highlight the gravity of the demographic constraint. A selective pronatalist policy designed to encourage those couples who can afford it to have more children will also be examined.

2. Increasing the size of the labour force in the short-run: raising participation rates

The government has sought to raise the participation rates of two groups in particular: married women with children willing to take up or return to market work if reasonable childcare arrangements are available, and those over the current retirement age of 55 but who are healthy and otherwise able to continue working.

The tasks are not straightforward. For instance, increased female participation throws up a related dilemma. As women are traditionally the main providers of childcare, their return to the workforce after childbirth implies a demand for alternative childcare arrangements. At present because of the dearth of creches and such, working mothers employ foreign maids to take care of their young children.

This is at odds with the current government policy of phasing out the economy's dependence on low skilled foreign labour. On the other hand, increased female participation has helped mitigate labour shortages and reduced foreign labour demand in manufacturing and services.

This exercise will ask if the pecuniary benefits of women's education, particularly higher education are being fully recouped if further emphasis is placed on women's childbearing role. The gain to society from this role will have to be balanced against the depreciation of existing human capital and reduced opportunity for further accumulation resulting from periods of withdrawal from the labour force.

As for retaining older workers beyond the usual retirement age, the current seniority-based wage system will have to be reformed to make it attractive for firms to hire, retain and retrain their older workers beyond 55 years of age.

3. Increasing the size of the labour force in the long run

a. Investment in Human Resources

One way of increasing labour force size in the long run is to increase its productivity which requires a well educated and flexible workforce. Wage differentials are examined to assess relative demand for the various educational and occupational groups. Cost-benefit analysis using starting salary data drawn from tracer studies forms the basis for an evaluation of education policy. In addition, an econometric model is constructed to identify the determinants of starting salaries of fresh skilled workers. The modus operandi and record of the training system in promoting employer-based training is scrutinized in Chapter Nine using information obtained from a survey of employers carried out by the author.

b. Immigration and Foreign Workers

The long term absorption of foreign workers is the other method of augmenting the size of the domestic labour force. In Singapore the practice of relying on unskilled and low skilled guest workers to support labour intensive industrialization has switched to a strategy of attracting skilled foreign technical and

professional personnel to encourage the establishment of higher value added industries.

To this end, a selective immigration policy has been adopted but doubt has been expressed as to whether Singapore can compete successfully for this type of manpower under a manufacturing-based industrial strategy.

3. Manufacturing vs. Services?

Some observers believe that Singapore's long term comparative advantage lies not in manufacturing but in traded services. The weakness of the manufacturing sector in the 1980s is examined within the context of the 1985-1986 recession. The case for services rests on recent productivity trends and patterns of employment and foreign investment. It is asserted that promoting traded services as the future engine of growth would make it easier to attract the requisite manpower and also make more efficient use of domestic labour resources.

4. Future role of the government in resource allocation

While the government's role in Singapore's past economic success must be acknowledged, one must ask if the state can continue to play such a dominant role in the future. The thesis will make the case that conditions likely to prevail in the future will be much more complex. The recession is the prime example of the state's inability to forecast all possible effects of deliberate policy guidelines, the costs of which have been clear. Yet selective government intervention is essential in areas such as training provision to correct market failure.

Layout of the Thesis

The thesis begins in Chapter Two with an review of Singapore's economic performance up until 1988. Chapter Three presents a brief survey of the literature on human capital and manpower development planning. The data and the methodologies employed in this exercise are set out in Chapter Four.

Chapter Five discusses the demographic constraints and fertility policies. The structure of the labour market is outlined in terms of employment patterns and wage differentials. Particular attention is paid to the position of women in the labour force and examines the arguments for and against attempts to increase their labour force participation rate in the light of labour shortages on the one hand, and declining fertility on the other. Chapter Six scrutinizes sectoral wage, employment and productivity trends leading up to the recession and analyzes the process of adjustment. The main issues of the manufacturing vs. services debate are highlighted.

Chapter Seven examines the returns to different types of education using starting salary data culled from educational institutions' tracer studies. An econometric model based on the same data is constructed in Chapter Eight to identify the determinants of starting salaries for fresh graduates. The exercise rounds off in Chapter Nine with a survey-based examination of the nature and extent of government intervention in the training market and asks whether this is the most efficient way of encouraging employer-based training in view of the high level of job mobility.

Chapter Ten summarizes the main findings and conclusions and draws up some policy recommendations.

CHAPTER TWO:
STRUCTURAL CHANGE AND MANPOWER POLICY IN AN OPEN ECONOMY

In twenty-five years, Singapore has undergone a metamorphosis from a declining and uncertain entrepot into a thriving service and manufacturing centre, home to some 1300 foreign companies. In the course of this development, the country has overcome obstacles ranging from political upheaval and labour unrest to a lack of natural resources and a small domestic market. Henceforth, manpower limitations in terms of both quality and quantity, will be the most serious constraints to growth. An overview of the economy is therefore a necessary prelude to the manpower issues which are the focus of this thesis.

2.1. The Economy at a Glance

Annual Gross National Product (GNP) growth averaged about 10% a year in the 1960s and accelerated to 15% in the 1970s.[1] GNP per capita at current prices rose at an average annual rate of 13.4% from S$2,825.30 in 1970 to S$9,940.60 in 1980, and by 7.5% between 1980 and 1988 to stand at S$17,848.00 in 1988. Real GNP per capita grew at the average rate of 7.6% per annum, which is above the corresponding rate of 4.7% for Japan.[2] Real Gross Domestic Product (GDP) increased at an annual rate of 8.7% in the 1960s and 9.4% in the 1970s. In the 1980s, GDP growth averaged 9% except for 1985 when the economy shrank by 1.6%, and 1986 when it recovered with 1.8% growth.

Real indigenous GNP per capita rose by about 6% per annum between 1970 and 1988.[3] Growth was achieved with relative price stability.[4] The Consumer

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1. The basic economic indicators are given in Appendix 1.
2. World Development Report 1987 as quoted in Lim Chong Yah et.al. (1988). Of course it must be borne in mind that Japan is a much larger economy and therefore needs very much larger income increments to generate a given rate of change. But the comparison remains and is indicative of Singapore's success.
3. Nominal figures obtained from Singapore Ministry of Trade and Industry, Economic Survey of Singapore 1988 and deflated by the relevant GDP deflators. This concept measures the income and output accruing to citizens and excludes the value added accruing to resident foreigners and resident foreign companies. The concept was developed to counter a premature attempt by the World Bank to reclassify Singapore as a developed country which would have meant the loss of substantial privileges under the Generalized System of Preferences (GSP). This brought the indigenous per capita GNP for 1973 and 1974 below the cut off point for promotion into the ranks of the developed countries and so, a respite was obtained.

Price Index (CPI) averaged 5.6% in the 1970s, peaked at 8.5% in 1980 and by 1988, had dipped to 1.5%.[5]

2.1.2. Capital Accumulation and National Saving

Growth was generated by a rapid rate of capital accumulation funded almost entirely from domestic savings. Table 2.1 shows the trends in capital formation, saving and capital inflow from 1965 to 1988.

Capital accumulation as a proportion of GDP at current market prices rose from 22% in 1965 to 48.5% in 1984 before slowing to 36.6% in 1988.[6] Private gross domestic capital formation outstripped public capital formation, the latter of which accounted for less than 30% of total capital formation in most years (Wong 1986). Moreover, while most of the private sector capital formation was devoted to transport and machinery, most of the public sector funds were channelled to the construction of public housing for residential purposes.[7]

Table 2.1
Capital Formation, Saving and Capital Inflow (% OF GDP) 1965-1988

	GDCF	GNS	NCI
1965	22.0	12.0	10.4
1973	39.0	27.0	12.5
1980	46.3	33.0	13.3
1984	48.5	46.4	2.0
1988	36.6	43.6	-7.0

GDCF: Gross Domestic Capital Formation
GNS: Gross National Saving
NCI: Net Capital Inflow
All figures are expressed as a percentage of Gross Domestic Product at current market prices.

Source: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988

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4 This was due in large part to the policy of wage restraint that was in effect for most of the 1970s and which is discussed in detail in Chapter Six.

5 Annual inflation in the GDP deflators were 5.3% in the 1970s, 11.4% in 1980 and 3.0% in 1988.

6 This is high relative to the other ASEAN countries. In 1988, the corresponding figures for some Asian countries were as follows: Hong Kong 28%, South Korea 30%, Malaysia 26%, Japan 28% and Thailand 28%. Source: World Development Report 1988

7 For instance in 1980, 79% of public capital funds went into construction, of which 30% was for public housing.

A high (by international standards) domestic savings rate financed most of the capital accumulation. The percentage of gross national saving rose from 12% of GDP in 1965 to 43.6% in 1988. Saving financed 68% of capital formation in 1965 and 96% in 1984. Since 1985, Singapore has been a net lender to the rest of the world. Most of the saving took place through the national social security scheme, the Central Provident Fund (CPF).[8] The rates of contribution are set out in Table 1.2. In 1984, it was the largest source, 62%, of private sector saving (Ho 1988).

Table 2.2
Rates of Contribution to the Central Provident Fund (%) 1955-1988

	By Employer	By Employee
1955	5.0	5.0
1968	6.5	6.5
1970	8.0	8.0
1971	10.0	10.0
1972	14.0	10.0
1973	15.0	11.0
1974	15.0	15.0
1977	15.5	15.5
1978	16.5	16.5
1979	20.5	16.5
1980	20.5	18.0
1981	20.5	22.0
1982	22.0	23.0
1983	23.0	23.0
1984	25.0	25.0
1986	10.0	25.0
1988	12.0	24.0

Source: Singapore Yearbook of Labour Statistics, 1988

8 The CPF was established in 1955 to ensure savings for employees upon retirement or involuntary premature withdrawal from the labour force. It is fully funded by contributions from employers and employees. Contributors are allowed to withdraw their CPF balances with interest, upon retirement subject to the maintenance of a "minimum balance" to ensure that those who use up their withdrawn balances do not become destitute and burdens on the state. Before retirement, CPF balances may only be used to buy housing or stock in approved public and private companies, to pay members' hospital bills and some insurance premiums and the cost of local education. A new "topping up" scheme allows members to transfer part of their savings or cash to parents over 55 years of age as a means of providing support for their old age.

2.1.3. Foreign Investment

Foreign investment has been integral to Singapore's export-oriented industrialization strategy, and the contribution of foreign direct investment testifies to the extent of Singapore's interaction with the rest of the world. Foreigners' share of GDP rose from 9.3% in 1966 to 26% in 1983-1985 and the foreign share of net investment commitments in manufacturing constituted 70%-80% for most years (Table 6, Appendix 1). Investment was made attractive through labour market stability and a host of tax incentives. In 1987, majority and wholly foreign-owned firms accounted for 74.9% of gross output, 72.4% of value added, 57.6% of employment and 86.4% of direct exports.[9]

2.1.4. Foreign Trade and the Balance of Payments

The value of Singapore's merchandise trade is almost three times its GDP, confirming that it is one of the world's most open economies. The trade ratio[10] is inflated by the value of its entrepot activity which needs to be deducted to make a reliable comparison with other countries (except Hong Kong which also has a sizable entrepot element). The ratio of domestic exports to GDP has been in the region of unity, which is high by international standards.[11] Because of the poor resource base, the import content of domestic consumption and production are high, but data on retained imports are not published. The share of domestic exports of total exports has risen to 63% in 1988, from about 10% in 1969.

The need to import both consumption and capital goods is exemplified by the consistently negative trade balance. This has been offset by positive capital inflows, the net result of which has been a steadily increasing overall Balance of Payments surplus. In 1986, the foreign reserves amounted to almost S$13 billion,

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9 Singapore, Report on the Census of Industrial Production 1987.

10 The trade ratio is calculated as a ratio of exports and imports to the sum of imports and GDP.

11 Comparative merchandise trade ratios of selected countries are set out in Table 1.2 of Lim (1988). The Export/GDP ratio of Singapore in 1984 was 1.32, Hong Kong's was 0.93, Korea's 0.35 and Taiwan's 0.53.

nearly double the 1980 figure and the highest level of per capita foreign reserves in the world (Balassa and Williamson 1987).

2.2. Industrial Policy

Manufacturing exports have been the backbone of the economy. In 1960, manufactured goods formed only 21.4% of exports but by 1988, manufactures including chemicals, manufactured goods by material, machinery & transport equipment and miscellaneous articles constituted 72% of total exports. The changes reflect the stages of Singapore's industrial development which can be divided roughly into three stages.

2.2.2. 1959-1965

The period from the attainment of self-government in 1959 to 1965 saw an emphasis on the domestic market and import protection. In 1961 Singapore enacted its one and only development plan (State of Singapore Development Plan 1961-1964, Ministry of Finance 1961) which stipulated the type and level of spending needed to speed up growth along the lines recommended by the U.N. Industrial Survey Mission of 1961.[12] The plan was later modified and extended by one year to coincide with the planning period in Malaysia in anticipation of the political merger.[13]

Labour unrest, political factionalism and the Indonesian Confrontation (1963-65) during this period deprived Singapore of her largest trading partner, Indonesia (Lim and Ow 1971). Strained relations between Singapore and her nearest neighbour culminated in Singapore's separation from the Federation of Malaysia in

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12 A Proposed Industrialization Programme for the State of Singapore, United Nations Industrial Mission, 1961 commonly referred to as the Winsemius Report after the head of the mission, Albert Winsemius. The report recommended a strategy of selective import protection to secure the domestic market, five year tax holidays for approved enterprises, liberalization of immigration permits for foreign managers and technicians, expansion of technical and vocational training, machinery to settle industrial disputes and the setting up of a quasi-government body to spearhead the promotion of manufacturing investment.

13 Rueff's Mission Report on the Economic Aspects of Malaysia, International Bank of Reconstruction and Development, 1963.

1965 which shattered hopes of a common market arrangement. These difficulties were compounded by the pullout of all British military forces east of the Suez, which meant the loss of 20% of Singapore's GDP and forty thousand jobs. In addition, the external position was weakened considerably when sterling, which made up about 20% of Singapore's foreign reserves, was devalued in 1967.

2.2.3. 1966-1979

Singapore embarked on a strategy of labour-intensive export manufacturing spearheaded by foreign multinationals, with the hope of overcoming the problems of the lack of a viable domestic market and a dearth of natural resources and technical expertise. Foreign investment was seen as the best way of procuring capital, technical and managerial know-how, as well as tapping the multinationals' international export market network. Singapore was fortunate in that she kicked off her industrialization programme during an era of expanding world trade which, together with positive domestic policies, helped to secure her position as a competitive production base (Hughes and You 1969, Chia 1976, 1982,).

2.2.4. 1979 to the Present

In 1979, the New Economic Policy was launched to restructure the economy to higher value-added, higher productivity industries. The blueprint set out a GDP growth target of 8-10% a year[14] and identified manufacturing, trade, tourism, transport and communications and the "brain" services (encompassing financial, medical and architectural services) as the five pillars of growth.[15]

This "indicative plan" was a response to both internal and external pressures (Lim 1980). By the end of the 1970s, the labour force was being squeezed by the fall in the number of new labour force entrants. The subsequent excess demand for labour exerted increased pressure on wages which threatened to erode

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14 In March 1985, the government revised this growth target to 5-7% a year to reflect Singapore's diminished growth prospects.

15 "Highlights of Singapore's Development Plan for the Eighties" Appendix 1 of "Towards Higher Achievement" Budget Speech 1981 by Goh Chok Tong, Minister for Trade and Industry, March 1981

Singapore's comparative advantage in labour-intensive manufacturing production vis-a-vis other developing countries. A large influx of foreign workers to relieve the shortage depressed wages of Singaporean workers and led to threats of social tension. The slowdown in world trade encouraged protectionism in developed countries towards newly industrializing countries. Singapore thus had to reorientate herself to the new economic order.

Singapore started to encourage higher value-added activities that relied on more sophisticated technology and skilled labour and were amenable to greater automation. Together with a GDP growth target of 8-10% per annum and a productivity growth target of 6-8%, three sets of policies were formulated to encourage firms to upgrade and mechanize: a "wage correction policy" to restore wages to market levels and promote more efficient use of labour after a period of modest wage rises ; tax incentives to attract "desired" industries, and a concerted expansion of educational and training facilities to raise the skill level of the labour force.

2.2.5. Sectoral Change

In 1966-1973, manufacturing was the fastest growing sector with annual growth rates of output of between 20% and 25%. Total employment increased by 65% of which manufacturing sector accounted for 40%, trade for 18% and financial and business services, 13%. Since 1974 the growth of manufacturing output has outpaced the growth in GDP (Figure 2.1a). The rate of change in GDP closely tracked the rate of change in manufacturing output (Figure 2.1b). By 1980, manufacturing employment accounted for 30% of total employment. Two-thirds of manufacturing output was exported. In 1988, manufacturing exports accounted for 30% of GDP and 29% of employment.

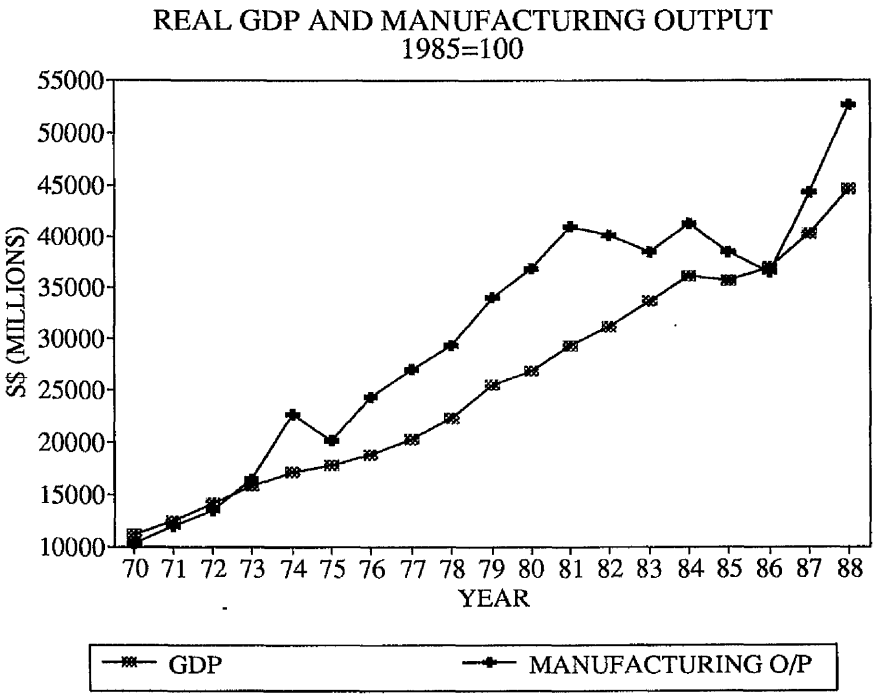
Food and printing were the largest industries in the early 1960s and their output was mainly sold locally. In the 1970s petroleum, transport equipment and electrical and electronic products together accounted for half of manufacturing

value added. From 1979 to 1988, the output of electronics and electronic components grew the fastest, rising five-and-a-half times. Other expanding industries were those engaged in producing electrical machinery, fabricated metal products, appliances and supplies. The value added of these industries also rose by two-and-a-half to three times over the same period. (For a discussion of changes in the composition of manufacturing, see Chng. et.al 1988).

The composition of exports has also changed. In the 1960s exports were dominated by items such as clothing, footwear and textiles. During the 1970s, these switched to manufacturing-based activities such as petroleum refining, machinery, shipbuilding and oil rig construction, precision engineering and chemicals.

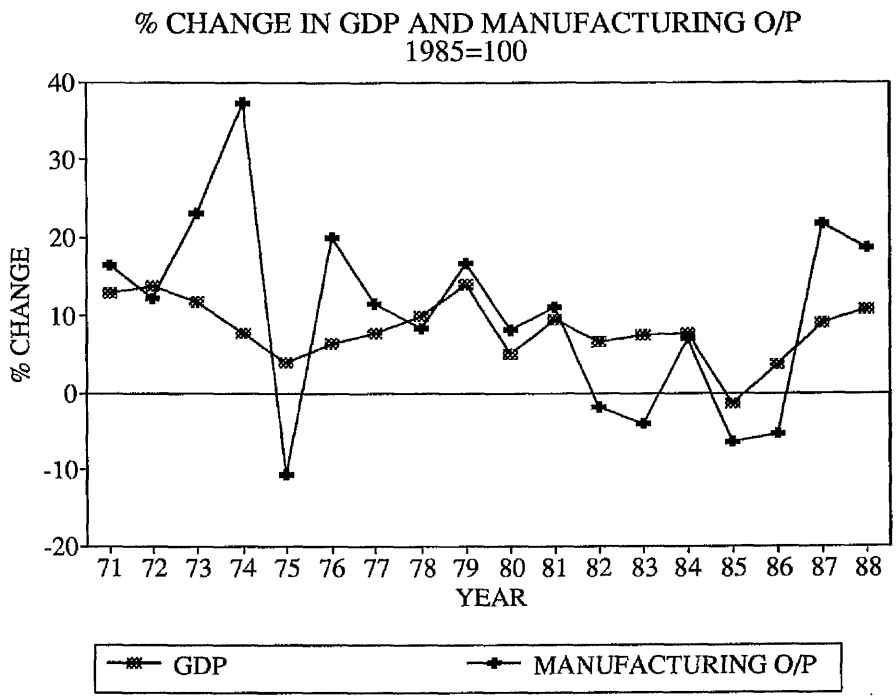
In the 1970s the traded services sector comprising tourism, transport and communications and financial and business services assumed greater importance. By 1979, services had expanded to account for one-fifth of total output and employment. Entrepot trade continued to contribute a sizable albeit declining share.

Figure 2.1a



Source: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988. Graphed by author.

Figure 2.1b



Source: see Figure 2.1a. Graphed by author

2.3. The Changing Role of the State

The view that Singapore's success can be ascribed to economic liberalism and the free market is one shared by Balassa (1978), Little (1981), Fields (1984) and Krueger (1984). They point to the fact the Singapore is a free port with few tariffs, no foreign exchange or domestic price controls, no controls on private enterprise and investment by local or foreign entities.

At the other end of the ideological spectrum, Sen (1981), Hamilton (1983), White (1984), Wade (1984), Evans and Alizadeh (1984) Fransman (1984) believe that government control has been the key to the success of the Asian newly industrializing countries (save Hong Kong) and Singapore is the epitome of this strategy.

In fact, Singapore's approach to development has been pragmatic and highly interventionist (Lim 1983, Pang 1988, Rodan 1989).

> "The Singapore government subscribes to a philosophy of economic liberalism but not the *laissez-faire* model of minimal government intervention that is said to characterize the economy of Hong Kong. Rather, it believes in selective state interventions to correct market failures and advance social goals. In consequence, its interventions extend beyond the usual macroeconomic policies employed by market economies. It strongly influences resource allocation through investment incentives, controls land and labour, and state-owned enterprises." (Pang 1988)

In addition to being the sole provider of infrastructure, the government participates directly in the goods market either on its own or in conjunction with private enterprise, and engages in activities such as steel manufacturing, oil refining, shipbuilding and shipping, trade and banking. The state-owned Singapore Airlines, is one of the world's most successful international carriers. More pertinently, the government is not hesitant to close down or pull out of unprofitable enterprises, a characteristic it shares with the South Korean government.

The government owns 75% of all land in the country and is empowered to acquire any of the remainder it wishes. As part of the Home

Ownership Scheme, it competes directly with the private sector in the provision of middle-income housing.[16]

More than half of all domestic income passes through government hands predominantly through the national Post Office Savings Bank and the Central Provident Fund (CPF). The Post Office Savings Bank competes directly with the private banking sector by offering tax-free interest on personal savings.[17] The CPF provides the government with a large amount of relatively cheap funds for investment and has permitted non-inflationary financing of productive social domestic investment and economic services. Since the late 1970s, CPF funds have increasingly been "sterilized" as foreign reserves ensuring non-inflationary growth in an era of high wage increases.

The state has manipulated certain prices to create "desirable" patterns of resource allocation. Export manufacturing thrived in the 1970s under foreign investment management by the Economic Development Board which administered tax exemptions, subsidies and accelerated depreciation schemes, write-offs and low-interest loans. A list of incentives is in Appendix 2. Wages were restrained to support the labour-intensive export strategy. This policy is discussed below and in Chapter Six.

2.4. The State in the Labour Market

The nature of state intervention in the labour market has changed over the course of development.

i. 1960s: Industrial Relations and Collective Bargaining

In the beginning, regulation of labour market contracts and wage setting procedures were of prime importance. Labour peace was secured mainly via two pieces of radical labour legislation. The Industrial Relations Ordinance 1960

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16 Government middle income flats are cheaper than those in the private sector but are subject to many restrictions, limits on the number and relationship of occupants, on rental and resale etc.

17 It does not however, deal with corporate accounts.

introduced procedures for speedy settlement of disputes and defined strikes as illegal after the Industrial Arbitration Court (IAC) had taken cognizance of a dispute, making a strike possible only with the tacit approval of the government. Decisions or awards made by the IAC were binding on the parties concerned and not subject to challenge in a court of law. The 1968 Amendment redefined the purview of collective agreements and removed issues such as promotion, transfers, retirement, retrenchment, dismissal and work assignment from collective bargaining and the jurisdiction of the IAC. The minimum duration of a collective bargaining agreement was extended from one and a half to three years.

Employment conditions were standardized under the 1968 Employment Act. The number of holidays, rest days, annual and sick leave were reduced and workers were entitled to retrenchment and retirement benefits only after three and five years of service respectively. Bonus was limited to one month's wages and the standard week was fixed at 44 hours. Employers effectively gained the upper hand but this was accepted by employees, foreign investors and trade unions. For well over ten years, man-days lost through strikes and other labour actions have been negligible, and in the last few years, non-existent. Most workers have visibly enjoyed the fruits of economic growth and have generally identified their interests with those of the ruling party and the nation (Chalmers 1969, Balakrishna 1976, Pang and Cheng 1977, Pang 1981, Ho 1988)

ii. 1970s: Wage Guidelines and Foreign Labour

Once industrialization was underway, the National Wages Council (NWC), established as a tripartite council in 1972, was charged with recommending low and orderly annual wage increases to preserve and perpetuate the economy's competitiveness in labour-intensive manufacturing exports in the face of full employment and upward pressure on wages. Although the guidelines were in theory not mandatory, they were adopted by all major bargaining groups. The recommendations are set out in Table 6.1.

The low wage policy was coupled with a fairly liberal attitude towards the immigration of foreign labour. Workers from Malaysia were first allowed into the country in the late 1960s when rapid rates of economic growth created labour shortages. Access to external labour sources enabled Singapore to augment domestic supplies without having to bear the cost of their education and training. It was also widely believed that foreign workers would be easily repatriated in a recession but the number of work permit holders did not fall substantially despite massive layoffs in the female intensive manufacturing industries as they generally out performed many of the locals (Pang 1979).

The size of the non-resident working population swelled from 20,710 in 1970 to 79,275 in 1980.[18] Between 1970 and 1980, the non-resident worker population grew by 14% a year, reflecting the tremendous expansion of labour-intensive manufacturing industries which raised demand for unskilled and semi-skilled labour. The non-resident proportion of the working population more than doubled from 3.2% to 7.4%. If resident foreign workers are included, foreign labour made up 11% of the total working population in 1980.

iii. 1980s: Labour Market Implications of Industrial Restructuring

The focus of manpower policy in the 1980s switched to the efficient allocation and utilization of labour in response to the dramatic slowdown in population and labour force growth in 1970s and the early 1980s. Average labour force growth declined from 5.7% in 1970-1974 to 3.5% in 1980-1984. Of this, the contribution from the indigenous labour force formed a decreasing percentage, from 5.7% to 1.6%. Although foreign workers comprised an increasing share of the labour force over this period, their continued and unchecked inflow would have imposed social costs and depressed wages of citizen workers. It is thus the intention of policy makers to reduce the economy's dependence on foreign, especially unskilled labour.

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18 Economic Research Centre (1982), p.88

Manpower policies currently focus on increasing the size and raising the quality of the workforce. The government has adopted a selective pronatalist stance whereby those couples who can afford it are encouraged to have three or more children. Skilled and professional foreign workers are welcome on a permanent basis. Employers are urged to raise the retirement age from the current 55 years to 60 and adopt more part time and job-sharing arrangements to maximize the use of available part time female labour.

Since an educated and trained workforce is essential to support an upgrading exercise that presupposes a greater dependence on skilled labour, the other aspect of manpower policy involves raising the labour force skill profile. To this end, the education system was reviewed in 1978 and the launch of the restructuring exercise paralleled a concerted expansion of education and training facilities.

2.5. Conclusion

The role of the state in the labour market has clearly evolved. Resource allocation in the 1960s and 1970s was comparatively straightforward. Increasing complexity and less benevolent economic conditions will require that resource allocation guidance be much more sophisticated. For instance, conventional wisdom says that for an LDC, the returns are greater to investment in primary education (Psacharopoulos 1973). This was true for Singapore in the beginning. However for a middle level country, the most efficient resource allocation directions are not as clear cut and there is greater danger of misallocation. It will be difficult in future to attain the results government intervention has achieved in the past.

The manpower policies that Singapore has undertaken will be discussed in detail after a review of the extant literature and a discussion of data sources and methodologies.

CHAPTER THREE:
A SURVEY OF THE LITERATURE

The survey gives a brief exposition of the relevant theories of earnings and appraises the empirical results. The starting point is the practice of manpower planning, in particular the manpower requirements approach which spawned an extensive literature and formed the basis of the economics of education. This survey will elucidate aspects of human capital theory with especial reference to the returns to schooling and experience for men and women, as well as the challenge posed by the screening and segmented labour market models. Empirical work is cited where it is relevant to policy issues in Singapore.

3.1. The Manpower Requirements Approach

"Never before has there been so much education. Yet never before has there been so much talk of the shortages of trained people or of the need to expand education as an investment in the formation of human capital. In an Alice-in-Wonderland sort of way it seems that the more we have the greater the shortage." (Bowman 1963).

Manpower issues were particularly important for the less developed, newly independent countries in the 1950s which demanded faster economic growth, rapid structural change and the indigenization of industry and public services. As they inherited only the most rudimentary educational structures from the colonial governments, educational expansion was accorded high priority together with the search for an appropriate methodology on which to base this expansion. Many embraced the strategy of comprehensive national economic planning encompassing educational and manpower forecasting. Interest in manpower planning in Europe developed between 1962 and 1965 when six countries[1] were the subjects of the OECD Mediterranean Regional Project (OECD 1965).

Manpower requirements should be distinguished from the demand for labour. The demand for a particular category of manpower is expressed by a schedule relating quantities of labour demanded to wage rates. Similarly the supply of labour relates the number of people available at different wage levels. Actual employment at

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1. The six were Italy, Spain, Portugal, Yugoslavia, Greece and Turkey.

any one time depends on the interaction of both demand and supply forces. Manpower requirements on the other hand, relate to the level and composition of employment judged necessary to achieve certain social and economic targets.

3.1.2. Rationale for Manpower Forecasting

Manpower forecasting is based largely on the view that the level and structure of educational expansion ought to a significant extent be geared to the expected demand for labour (Parnes 1962). Central to this is the conviction that the market mechanisms of neoclassical theory are not adequate to ensure market clearing. Many types of educated labour have long gestation periods (Bombach 1965, Tinbergen 1963) where training periods are of such a length that even if individuals do respond to higher wages by commencing a period of training, demand will have fallen by the time they are trained or so many others have responded in a similar way that excess supply occurs. Rigidities in the labour market resulting from say, public sector pay scales, may prevent wages from rising in times of excess demand and thus stifle potential increased supply. Mobility between areas and jobs may be low and labour market information concerning wages, employment vacancies and labour availability, restricted. Persistent shortages and surpluses and the ensuing cobweb cycles may generate continual disequilibrium which would be detrimental to society as a whole. Removal of these potential imbalances would increase production and lead to a higher level of earnings. Forecasts would help to ensure that supplies of manpower were available when new requirements arose.

Blaug (1970) argues that the postulated inadequacy of market forces to guarantee equilibrium is by itself insufficient to justify long-term manpower planning. The critical assumption is that each level of national income or rate of economic growth requires specific skills and that these in turn can be translated into educational needs through a rigid connection between each occupation and level of education. The presumption that limited substitution possibilities between the different types of labour gives rise to stable relationships between occupation and education lies at the

heart of the manpower requirements approach. Inadequate supplies of one type of labour may reduce potential output either by lowering productivity levels (Parnes 1962) or by increasing the relative cost of production (Ahamad and Blaug 1973) as defined by the partial elasticity of substitution.[2]

3.1.3. Methods of Manpower Forecasting

i. The Manpower Requirements Approach

The method that has dominated the manpower forecasting literature is the projection of manpower-output ratios adopted by the Mediterranean Regional Project (MRP) which attempted to forecast manpower requirements in six Mediterranean countries. The methodology was laid out by Hollister (1965):

a. Estimates of the total output of the economy.

b. Estimates of sectoral output. The level of disaggregation depends on the main purposes of the forecast and the availability of data.

c. Estimates labour productivity by sector. These are obtained by dividing output by output per unit of labour to give the labour required.

d. Estimates of sectoral occupational distribution. Each sectoral labour force has to be divided into occupational groups by multiplying the estimated total sectoral labour force by the coefficients from an occupational profile at an estimated target date. Numbers of workers per occupation per sector are also forecast.

e. Estimates of total occupational distribution. Sectoral requirements are added to obtain the total number of workers needed in each occupation.

f. Estimates of the education associated with each occupation. The types of education associated with each occupation need to be estimated. Multiplying these by the numbers required in each occupation provides

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2. The partial elasticity of substitution measures the percentage change in the relative quantities of two types of manpower employed resulting from a 1 per cent change in their relative wages.

estimates of the number of people with each kind of education in each occupation.

g. Estimates of total educational stock. Estimates produced in f. are aggregated to give estimates of the total number of workers requiring each type of education.

h. Estimates of the required increment by education. Those workers in the present labour force expected to be still working in the target year have to be subtracted. The result is an estimate of the additional manpower by educational level required over the planning period to reach target output levels.

i. Estimates of the total graduate flow. Since not all the graduates actually enter the labour force, the estimates derived in h. must be multiplied by the inverse of the labour force participation rate to obtain the required total flow of graduates over the plan period.

The whole notion of manpower requirements for meeting economic targets rests on "the rather rigorous link that has been assumed between productivity levels and occupational structure on the one hand, and between occupation and educational qualifications on the other." (Parnes 1962). Several assessments of manpower forecasts have been carried out, among them, a review of more than thirty manpower plans in Africa from 1960 to 1972 (Jolly and Colclough 1972) and a post mortem of similar forecasts in both developed and developing countries (Ahamad and Blaug 1973). These reviews found many forecasts based on the manpower requirements approach to be inaccurate and unreliable for several reasons.

The method assumes fixed productivity trends over time but studies for the US (Kendrick 1961) have shown productivity changes to be irregular over time and between sectors. Forecasts of future changes are thus likely to be inaccurate and there is no agreement on the most effective way of predicting future occupational structures. These have been done in a variety of ways such as employers' estimates,

international comparisons and extrapolation of past trends, all of which assume that present and past occupational patterns are solely the results of demand and that the supply of manpower have no influence on occupational structures.

If supply effects are significant, future occupational patterns based on present observed occupational structures will be bogus since each observed structure will be a result of a unique set of demands and supplies. The assertion that a single set of occupational requirements corresponds to each level and pattern of output then becomes problematic, and the postulate that a unique relationship exists between occupation and type and level of education, spurious. "The failure to differentiate supply effect from other factors influencing the occupational structure can...introduce serious biases into the estimates of manpower requirements." (Hollister 1965).

If it is possible to substitute between various types of skilled labour without substantially altering productivity levels, a variety of occupational patterns will be consistent with each forecast of output. Bowles (1969) produced an elasticity of 202 between workers with some college education and those with 8 to 11 years of schooling. With a sample of 28 states in the US, Dougherty (1972) obtained an estimate of over 8. Psacharopoulos and Hinchcliffe (1972) divided the international sample by degree of development, obtaining an infinite elasticity which implies perfect substitution in the developed countries, but a smaller value in the developing countries. These findings cast doubt on the value of the fixed coefficient model for educational planning.

The link between education and occupation is even more tenuous, and several reasons suggest that it is fluid and changing over time. An increased supply of educated people may cause educational upgrading so that the qualifications of new entrants will be higher than those of older workers. Employers may regard on-the-job experience as a substitute for formal education in equipping workers with the necessary skills (Psacharopoulos and Woodhall 1985).

Another frequent weakness of manpower forecasts is the neglect of the question of costs, or at least the question of the relative cost-effectiveness of alternatives. They also ignore the influence of relative prices in determining choices between alternative techniques and combinations of inputs.

ii. The Employers Survey

Where there was inadequate knowledge of past labour market trends and how the market functioned, employers were directly asked to forecast their own future levels of employment usually with respect to scientific and technical manpower. The resultant forecasts tended to be short-term and geared more towards employment policy than manpower forecasting as a tool for educational planning. Apart from the problems common to most surveys, the employer survey has some additional ones. Employers are unlikely to make common assumptions about future growth and structure of output. Individual firms' responses have to be weighted because a simple aggregation will not reflect the variety in the quality of forecast. The Economic Development Board (EDB) in Singapore uses this approach to gauge incipient manpower requirements at the firm level.

iii. International Comparisons

The lack of domestic labour market information also prompted the use of international comparisons. These take the form of time-series data from a single country or cross sectional data from a range of countries whose experiences are regarded as particularly relevant. The Singapore Development Plan for the 1980s implicitly used the structure of the Japanese economy in 1980 as the target for the Singapore economy in 1990.

In addition to the problem of incomparability of international data, the approach presupposes the existence of a world manpower growth path on which every country is placed (Blaug 1970). Such a path implies that the experiences of today's richer countries are to be imitated by the LDCs and assumes that all countries follow the same development path with the same compositions of output and that these in

turn have very specific educational and occupational requirements. Studies by Layard and Saigal (1966), Horowitz, Zymelman and Herrnstadt (1966) and the OECD (1970) illustrated that few relationships were strong enough to justify transferring findings reached from international cross-sectional data at one moment in time to a single country attempting to forecast labour demand through time. Stocks of manpower employed at any one time are a result of demand and supply forces and there is no sense in which these stocks can be described as optimal.

3.1.4. Recent Developments: Labour Market Analysis

Richter (1982, 1984, 1986) and Psacharopoulos et. al. (1983) have developed a new approach to manpower planning which focuses on developing a system of local labour market analysis and building up a network of key informants. The rationale is that "people in the know" are able to give systematic, comprehensive, qualitative information on a regular basis and at a much lower cost than formal manpower planning exercises. This information, if fed back regularly into the policy-making process, will supplement other data and allow incremental changes over time and increase the accuracy of forecasts. Information obtained in this way would be based on personal perceptions but advocates believe that these would be more accurate than those obtained solely from the "formal" approach.

3.1.5. Manpower Planning in Singapore

Singapore first experimented with formal manpower and economic planning in the early 1960s when the first development plan for 1961-1965 was published.[3] The first formal manpower plan was prepared in 1973 which was later converted by the Ministry of Finance into rolling 5-year manpower budgets. These were aimed at providing a coherent perspective on the future manpower trends of manpower needs and projected supplies and formed the basis for setting out enrolment targets for tertiary and technical institutions.

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3. The Second Plan was abandoned when Singapore separated from Malaysia in 1965.

No formal plans were made until 1979 when the 10-Year Development Plan for the 1980s was elucidated and the formal manpower planning framework was formulated. The Ministry of Trade and Industry emerged as the central agency engaged in long-term economic planning.

3.1.6. Evaluation of Singapore's Manpower Planning

Islam (1987) evaluated the accuracy of the 1977 manpower budget which focused on two subperiods 1977-81 and 1982-1986. He compared the actual and predicted trends for employment distribution across major economic sectors for 1977-1984, and calculated the discrepancies in terms of the percentage prediction error which he defined as

$$PPE = \frac{\text{Actual Employment - Projected Employment}}{\text{Actual Employment}} \times 100$$

He found that for the economy as a whole, the PPEs ranged from less than 1 to 9 per cent, having tended to increase over the years. Several sectors like agriculture, utilities, transport and communications were prone to high prediction errors of more than 50%, with a pattern of overprediction in agriculture, utilities, transport and communications and construction.

Two factors could account for the inaccuracy. The construction sector has had a high proportion of foreign workers and it is unlikely that manpower planners would have been able to make precise predictions of the inflow of foreign workers as work permits are granted at the discretion of the Ministry of Labour. There have also been marked sectoral variations (see Figures 6.1a and 6.1b) and it is likely that the fixed coefficients model could not capture the sectoral diversity over time.

3.1.7. The 1979 CPTE Projections

The 10-Year Development Plan set out the targets for the Singapore economy for 1990: a per capita income equal to that of Japan in 1980, a GDP growth

rate of 8-10% a year and an annual productivity growth rate of 6-8%. The forecasts of the Council for Professional and Technical Education (CPTE) were guided by this time frame. It also assumed that the economic structure of Singapore in 1990 would resemble that of Japan prevailing in 1980, and accordingly the skill ratios in the various sectors were expected to reflect a steady increase in line with the desired Japan-style economic structure (Islam 1987).

The CPTE educational expansion targets which emphasized technical manpower as a whole, are set out in Table 3.1. The CPTE recommended that undergraduate engineering intakes in particular be expanded. These estimates were revised downwards in 1985 by the Manpower Subcommittee. Table 3.2 compares targets and the actual intakes of educational institutions between 1980 and 1985. Expansion of technician and skilled worker intakes was in excess of 15% and the actual intakes in 1985 suggest that the targets set out in 1980 were fairly closely adhered to.

The impact of the expansion programme is reflected in the skill profile of the workforce (Table 3.3). The expansion of the educational intakes translated itself fairly quickly into changes in the skill profile, particularly at the tertiary level.

Table 3.1
Annual Intakes of Educational Institutions: CPTE vs. Manpower Subcommittee

	CPTE 1980-85 (% Av. Annual Growth)	Manpower Subcommittee 1985-90 (% Av. Annual Growth)
Graduatese	10	3
Technicians	17	2
Skilled workers	16	2

Source: Islam (1987), Table 4.9

Table 3.2
Recommended vs Actual Intakes

	1980 Actual	1985 Actual	1985 Targetted	Target vs.Actual %	1980-85 Av Growth%
Graduates	3000	4800	4500	6.8	10
Technicians	4100	8800	8200	7.3	17
Skilled Workers	6100	12900	15400	-19.4	16

Source: Adapted from Table 11.1, The Singapore Economy: New Directions

Table 3.3
Educational Profile of the Workforce 1979-1988

	All Workers 1979	1988	New Entrants 1979	1988
Primary & Below	60	49	43	41
Secondary	28	31	40	32
Post-Sec	9	13	14	16
Tertiary	3	6	4	10

Sources: Islam (1987), Table 4.2; Singapore, Report of the Labour Force Survey of Singapore 1988, Ministry of Labour

3.2. The Demand for Education

The demand for education is postulated to be a function of the direct and indirect costs of that education and the earnings differentials associated with it. According to Blaug (1976a) there are two versions of the demand for schooling hypothesis: the first is that future enrolments can be predicted by calculating expected

future rates of return by relating the private costs to expected future benefits; the second is that enrolments in specific fields of study can be predicted.

Attempts at proving these hypotheses have been fraught with difficulty mainly due to the inability to include either earnings forgone or some measure of expected future earnings as independent variables. Freeman (1971) attempted to model the demand for specialized fields of study particularly for engineers and scientists. His use of starting salaries as a proxy for lifetime earnings meant that the hypothesis that students take a life-cycle view of earnings was not tested directly. However it can be argued that if students take up courses with the highest starting salaries, they are in fact viewing earnings over the life cycle if starting salaries are a good proxy for discounted lifetime earnings.

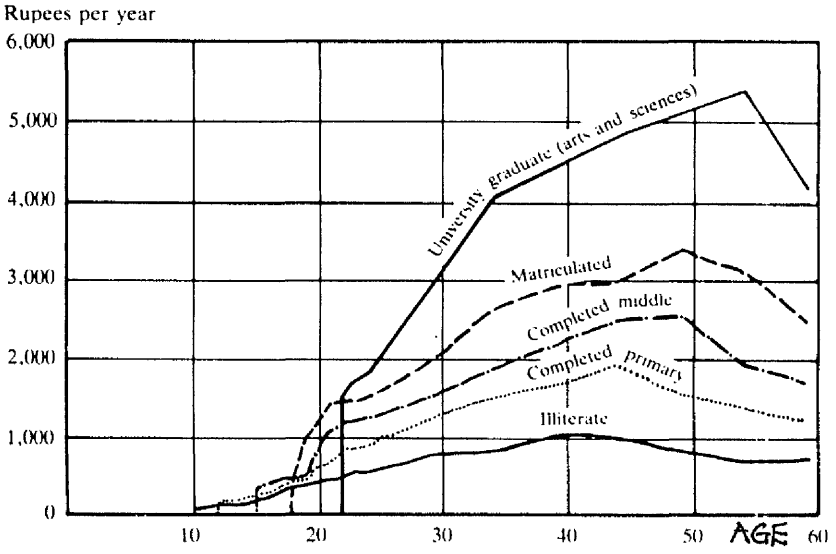
Another weak point is the identification problem. The models focus on the supply of human capital, ignoring the nature of labour demand. The earnings function from which all basic results are derived is itself a "reduced form" equation based on an interaction of both demand and supply forces(Blaug 1976a).

In countries where higher education is effectively rationed, it is not possible to test the hypothesis that the demand for education is sensitive to earnings. This is the case in Singapore where the number of places particularly at the tertiary level are administratively determined in accordance with manpower forecasts.

3.3. Age-Earnings Profiles

Empirical studies of the relation between education and earnings usually include another variable, age, from which age-earnings profiles are constructed. Blaug (1970) Woodhall (1970) have discerned certain patterns, as illustrated in Figure 3.1 for urban India in 1960.

Figure 3.1
Age-earnings profiles by level of education in urban India 1960



Source: Woodhall (1970, p.20)

Earnings are highly correlated with education: at every age the highly educated earn more than workers with less education and there is no crossing of profiles.

Earnings rise with age to a single peak and then flatten or fall until retirement.

The higher the level of educational attainment, the steeper the rate of increase of earnings and in most cases the higher the initial earnings of workers at the start of their working lives.

Workers with higher levels of education reach their maximum earning capacity later than the less educated and their level of earnings at retirement is also higher.

The distribution of earnings at each educational level is wider for older age groups especially for those with higher education.

Furthermore the increments arising from education and age appear to have different effects depending on the type of education, with both being larger for professional than manual workers.

3.4. Human Capital: Education as an Investment

The concept of human capital is central to the theory of earnings. Traditionally, the term "capital" referred only to physical assets which generated income in the form of goods and services. In the 1960s economists like Schultz (1961, 1971) Mincer and Becker (1975) developed the concept of human capital which treated education and training as investments which produced future benefits in the form of higher income for both educated individuals and society as a whole. Expenditures on activities such as health care and migration that also raise the quality and productivity of the labour force and future income levels also constitute human capital investment.

The concept of education as an investment made it possible to evaluate its profitability in the same way as for physical investment. There are two common approaches. The first measures the present discounted value of additional lifetime earnings associated with additional years of schooling. The discount rate is usually the yield on the next best alternative investment opportunity. The second and more common approach is comparison of rates of return. The rate of return is the rate of discount at which the present discounted earnings of an additional year of schooling just equal the discounted costs.

3.5. Profitability of Investment : The Rate of Return

The profitability of an educational investment is assessed by the rate of return at which the present discounted value of extra lifetime earnings from extra

years of education exactly equals the present discounted costs of staying in school. It involves comparing the total costs of education either to the individual or to society with the expected returns from investment in schooling and on-the-job training.

The equilibrium condition can be written as equation (3) in Becker (1975):

$$\sum_{t=0}^{n-1} \frac{Rt}{(1+i)^{t+1}} \cdot = \sum_{t=0}^{n-1} \frac{Et}{(1+i)^{t+1}} \qquad (1)$$

where n is the number of periods, R*t* are the extra earnings in period *t* and E*t* the extra costs of an additional year of schooling, and *i* is the internal rate of return.

Estimates of the profitability of human capital have been used in the discussion of issues such as the determinants of income distribution (Chiswick and Mincer 1972) and optimality of resource allocation between education and other sectors (Dougherty and Psacharopoulos 1977).

The total resource cost of education is the opportunity cost rather than purely monetary cost. In addition to the cost of direct inputs and training staff, education also involves the time of the students which do not form part of the monetary cost of schooling but are nevertheless part of the real resource cost. Earnings foregone is the usual measure of the cost of staying on in school, both for the student and the economy as a whole.

The measurable benefits of education are the extra lifetime earnings accruing to an extra period in school. It must be stressed that the earnings of workers do not capture or measure adequately the non-pecuniary or indirect benefits of education. These include for example, the intangible externalities in terms of an educated, well informed and law abiding citizenry (Spiegleman 1968, Webb 1977).

This method implies that resources should be allocated to levels of education so as to maximize the marginal social rate of return on educational investment. In addition the equalized yield on educational investment should not fall

below the yield on alternative private investments. The social rate of return is also calculated on the basis of observable pecuniary benefits; the non-pecuniary benefits to education as well as the externalities associated with schooling are excluded, although some attempts have been made to measure these using shadow prices. (see survey by Michael 1982).

3.6. International Trends in the Rate of Return

Cross-country comparisons of social and private returns to different educational levels were attempted by Psacharopoulos (1973, 1981) first for 32, and later updated for 44 countries for 1958 to 1978. From these surveys, Psacharopoulos (1981, 1985) discerned the underlying patterns:

a. Rates of return decline by educational level.

b. Private returns exceed social returns because of public subsidy.

c. All rates of return to investment in education are well in excess of the 10% common yardstick of the opportunity cost of capital.

d. The returns to both forms of capital are higher in developing countries than developed countries, the disparity reflecting the differences in the relative scarcity of both types of capital in the former.[4]

e. The returns to education in less developed countries are higher relative to the returns in more advanced countries.

f. The returns to investment in traditional academic general curricula are greater on average than the returns to investment in specialized subjects.

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4. The returns to alternative forms of capital by level of economic development

Level of development	Physical Capital		Human Capital
Per capita income under $1,000 (7 countries)	15.1	<	19.9
Per capita income over $1,000 (6 countries)	10.5	>	8.3

Source: Psacharopoulos (1981 p.329)

3.7. Rate of Return Patterns in Singapore

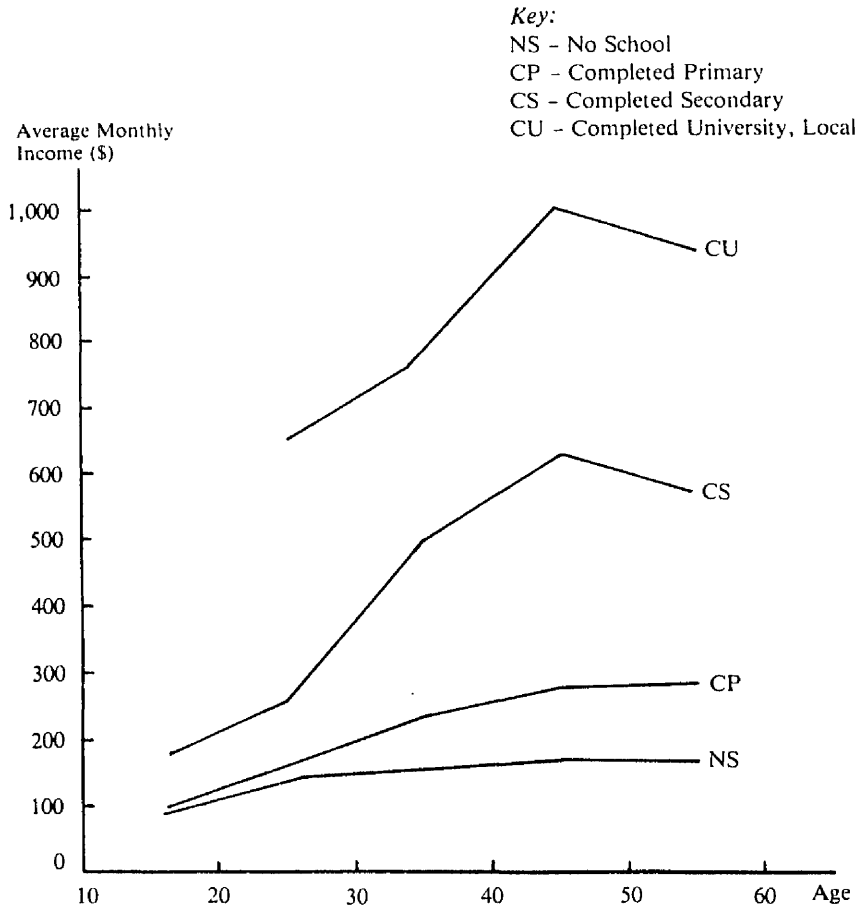
How do the returns to education in Singapore compare with these findings? Studies on the subject were done by Clark and Pang (1970) and Ng (1987). The earlier study used data from the Sample Household Survey 1966 carried out by the Ministry of National Development and the Economic Research Centre. Ng utilized data from the 1980 Census of Population and the Survey of Graduates, the latter conducted by the Research and Statistics Unit of the Inland Revenue Department in January 1981.

Clark and Pang found that the age-earnings profiles of men with no schooling and those who had completed primary education were low, flat and not very different from each other (Figure 3.2). The difference in the profiles of those with completed secondary education and those with completed primary education was large as was the difference between those who had a local university degree and those with completed secondary education.

Both the social and private internal rates of return were estimated (Table 3.4). From the social point of view, the returns to secondary education were the highest, followed by university and then primary education. The social rates of return to completed secondary education for males and females were 18.2% and 17.0% respectively. The rates of return to a local university education were lower: about 15.4% for males and 13.7% for females. For the individual, the most profitable investment was university education where the post-tax rate of return was about 25%.

Even in 1966, the social returns to primary education were below the 10%, the common yardstick of the rate of return to capital. Primary education's low rates of return can perhaps be explained by the fact that primary education was free and universal under British administration. The type of manpower in greatest demand at the start of Singapore's industrialization were skilled and technical personnel, followed by university educated professionals.

Figure 3.2
Age-Earnings Profiles of Men without Job Training
Singapore 1966



Source: Pang (1982a), Figure 2

Table 3.4
Rates of Return to Education for men, women and persons 1966 and 1980 (%)

rates	Private pre-tax		Private post-tax		Social	
	1966	1980	1966	1980	1966	1980
PRIMARY						
men	n.a.	8.5	n.a.	18.1	9.4	9.0
women	n.a.	27.5	n.a.	25.0	3.8	7.2
		(31.0)		(28.3)		(10.9)
persons	n.a.	20.3	n.a.	19.8	n.a.	8.7
SECONDARY						
men	21.6	24.5	21.0	22.9	18.2	16.9
women	19.5	13.2	19.0	12.7	17.0	8.5
		(18.7)		(18.1)		(13.5)
persons	n.a.	20.3	n.a.	18.6	n.a.	14.1
TERTIARY						
men	27.3	32.0	25.5	29.1	15.4	18.9
women	26.5	17.9	25.3	16.4	13.7	6.5
		(26.9)		(25.2)		(13.5)
persons	n.a.	28.1	n.a.	25.8	n.a.	14.6

Note: Rates in brackets are unadjusted for labour force participation

Source: Table 5.2.1., Ng (1988), page 84

Ng showed that the social rates of return to secondary and tertiary education, at about 14%, were not much changed from the estimates for 1966. The noteworthy difference is the very significant decline in the social rates to women at both levels. In 1966, the social rate of return to secondary education for women was 17.0% and that for tertiary education was 13.7%. In 1980, the rates had dropped to 8.5% and 6.5% respectively. Part of this decline reflects that fact that women's average earnings have not risen as fast as men's while the social cost of their education has. The rates unadjusted for labour force participation, 13.5% for both secondary and tertiary levels, indicate that greater returns could be obtained if more women entered and remained in the labour force. These trends are mirrored in the private rates where the post-tax rates adjusted for labour force participation declined for both secondary and tertiary education. If labour force participation is not considered, the rates for 1966 and 1980 are very similar.

3.8. Human Capital Creation: On-the-job Training

Becker (1964, 1975) incorporated investments in human beings in post-school years with two essential elements. Opportunity cost was applied as earnings which are foregone when an individual takes a job in which he will receive lower starting pay but a compensating increase in the value of his human capital. Foregone earnings are the individual's investment in the acquisition of that capital. The second strand of Becker's analysis was the distinction between general and specific training. Becker's model is detailed in Chapter Nine in the discussion of Singapore's training structure.

Mincer (1974) extended Becker's formulation by introducing the concept of "overtaking". Different individual time preferences will produce an initial dispersion of earnings by levels of education. Mincer contends that this dispersion will decline subsequently only to rise again in the later stages of working life. The profiles cross at the "overtaking" point where the dispersion of earnings is

minimized, the effects of formal schooling on earnings are maximized and the returns on post-school investments just about equal their current costs to the individual in terms of earnings foregone. His research for the United States found that the cross-over occurs 7-9 years after entry into the labour force; among a cohort of men with 7-9 of work experience, one third of the inequality of earnings can be explained solely by differences in schooling (Mincer 1974).

One difficulty with this formulation is separating costly on-the-job training from costless learning-by-doing. The model fails to observe lifetime earnings profiles for individuals who have neither invested in nor received any post-school training. Mincer assumed that the base line earnings would remain horizontal throughout working life which is an approximation in the absence of sufficient data. He further assumed that marginal rates of return to schooling and postschool investments were equal which enabled him to estimate the costs from the returns to postschool investments.

3.9. General and Specific Training

Mincer's model applies only to general training[5] in which the employer would not invest unless he could shift the cost onto the employee in the form of foregone earnings. Both the firm and individual should ideally have a stake in the accumulation of firm-specific human capital which raises the worker's productivity only in that firm. The full model and its implications for Singapore are elaborated in Chapter Nine.

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5. General training refers tothe acquisition of capabilities that have value over a wide range of activities, the most general of which is literacy and numeracy. "General training" in human capital incorporates portability whereby general human capital embodied in a person can be applied in agencies other than that in which the capabilities were acquired. For instance, a doctor may have been trained in a highly specialized skill such as open heart surgery. This is not usually considered a general type of skill but the heart surgeon can practise his skills in hospitals other than the one in which he received his training. The skills are thus "general". By the same analysis, firm-specific training denotes nonportability.

3.10. Returns to Vocational Training

The "vocational school fallacy" (Foster 1966) can be examined in two ways. The first is by comparing the returns to vocational training in institutions and firm-based job training. The second involves comparing the merits of vocational training in institutions with longer academic schooling coupled with on-the-job training. The crucial question is "Does vocational schooling result in sufficiently superior job performance and earnings to justify the extra cost?" (Staley 1971).

Studies of training in Brazil (Castro 1979), Chile (Arriagazzi 1972) and Colombia (Puryear 1979) all show a fairly high payoff to vocational training On the other hand, findings by Borus (1977) and Levine (1979) for Israel suggest that vocational secondary schools are much less cost-effective than other methods of training skilled and semi-skilled workers, particularly apprenticeships. Fuller (1976) studied the cost-effectiveness of different types of vocational training in one large plant in Southern India, using job performance assessment by supervisors, as indicators of productivity. Fuller found that for the sample of 474 workers, job performance was around 10% higher among those formally or informally trained in-plant than the Industrial Training Institutes. He concluded that, in the case of this particular firm at least, the Industrial Training Institutes were not cost-effective.

These conclusions were supported by Psacharopoulos (1982) in his analysis of SENATI training in Peru, and by Psacharopoulos and Loxley (1984) who contrasted the labour market and educational attainments of graduates from academic and vocational schools with different biases. In Colombia they found no statistically significant difference, other things being equal, between the mean earnings of those from post-secondary academic and vocational schools. For Tanzania, "the first indications do not corroborate the hypothesis that the introduction of pre-vocational studies into secondary schooling can be justified on the basis of the economic payoff being greater than for academic schooling." (see Zymelmen 1976, Metcalf, 1985).

A comparison of the payoff to vocational training with that to longer academic training may not be relevant in the Singapore context. The educational system is such that most of those who undergo vocational training did not do well in the academic stream. Vocational and academic education in Singapore are not substitutes as implied by the vocational school fallacy.

3.11. Earnings Functions

Some rate of return studies have adopted the earnings function approach developed by Mincer (1974) where the relationship between earnings (Y) and years of schooling (S) is specified in semi-logarithmic form

$$\text{Ln } Y = a + bS \qquad (2)$$

where a and b are the estimated parameters. This can be rewritten in log linear form

$$\text{Ln } Y_S = \text{const.} + bS \qquad (3)$$

The b coefficient can be interpreted as an approximation of the average rate of return to schooling, an approximation because it assumes that direct costs of schooling equals part-time student earnings and constant age-earnings profiles. Equation (4) has been expanded to included post-school investment and the specification is

$$\text{Ln } Y = b_0 + b_1 S + b_2 X + b_3 X^2 + u \qquad (4)$$

where Y = earnings
S = years of schooling
X = years of experience - i.e. Age-6-S
u = random error

One difficulty with this specification is that the dependent variable earnings is a product of hours worked and an hourly wage rate. Economic theory suggests that hours worked depends on, *inter alia,* the wage rate which in turn depends on human capital characteristics. Blinder (1973) pointed out that the use of earnings as the dependent variable can result in biased estimates of the earnings function parameters, with the direction and magnitude of the bias depending on the effect of labour supply on wage rates. He recommended that the dependent variable be the wage rate rather than earnings. Mincer (1974) added the log of labour supply units (weeks) on the right hand side with earnings remaining as the dependent variable. If this coefficient turns out to be unity, this will be equivalent to Blinder's suggestion. Should it differ significantly from unity, the interpretation of the coefficients becomes difficult. Corbo and Stelcner (1983) tested for the influence of labour supply in Chile by estimating an earnings function with the log of hours on the right hand side and found that it was significantly less than unity. They subsequently restricted their sample to a group of men aged 14 years and over who worked at least 35 hours a week and who had positive monthly earnings, and thus controlled for possible labour supply effects in their test for possible differences in the structure of earnings functions for workers across various sectors of the economy.

The coefficients b_1 and b_2 represent estimates of the average rates of return to schooling and post-school investments respectively, with the returns to the latter generally being higher. This could be because schooling confers more non-pecuniary benefits or consumption gains than post-school training activities. The main advantage of the earnings function over the estimation of returns using differentials between age-earnings profiles is that the function allows for the separation of the effects of schooling b_1 and the post-school investments b_2.

Schooling, work experience and (in more sophisticated forms) differences in ability together account for a third of the variance in wage rates (Mincer 1980). When hours worked are added to the equation, the explanatory power

rises to almost one half. Jencks (1979) using data for men aged between 25 and 64 years in the United States concluded that the number of years of education is the best single predictor of eventual occupational status of a labour force entrant.

3.12. Education and Earnings: The Human Capital Explanation

Proponents of human capital theory contend that the shape of age-earnings profiles reflects investment in human capital (Becker 1975). The steady rise in earnings in the early years of working life represents investment in formal schooling, on-the-job training, acquisition of information and job mobility, the rewards for which are later reaped in the form of higher earnings. Depreciation of skills and a decline in earnings herald the end of working life.

Mincer (1974, 1976) analyzed the effect of age on earnings in terms of experience. He claimed that "where age and work experience are statistically separable, the earnings curve is found to be mainly a function of experience, rather than of age." and years of experience reflect cumulated investments in job training and job mobility (Mincer 1976). This implies that it is better have data on the years of work experience and educational qualifications of workers to construct education-experience profiles rather than using age as a proxy. For workers with a continuous history of employment throughout their working lives, it makes little difference whether age or experience is used but for those whose working lives are interrupted such as women who leave the labour market to have children or those who are unemployed for a time, information on age is a poor proxy for work experience. But the lack of data on work experience means that age remains the common proxy.

Mincer's (1976) findings on the effects of women's work experience on earnings are summarized as follows:

a. Prolonged non-participation caused by child bearing and rearing and the smaller consequent participation in the labour force will hasten skill depreciation and reduce the investment aspect of women's education and the acquisition of job training relative to men.

b. At the same time, women who return to work after their children reach school age have a strong incentive to resume investment in job-related skills. This implies that the investment profiles of married women are likely to show negative values during the child bearing age while the investment profiles of childless women are likely to resemble more closely those of men with greater continuity.

c. The profiles of men are the steepest and concave, those of childless women less so and those of mothers are double peaked with least overall growth.

d. Women with higher levels of education are more able to regain their former level of earnings after a period of absence but women with less education may not be able overcome a similar loss of earning capacity.

3.12.2. Women, Experience and the Return to Human Capital Investment

The implications of these findings for educated women in Singapore are far-reaching. The average labour force participation for women is about 50% which means that they are active in the labour force on average only about 50% of the time in what is normally deemed to be the economically active period.

This reduces the opportunities and the incentive for their employers to invest their skills acquisition. Even if women's wages grow at the same rate as men's wages in intervals of work activity, the overall growth would be half as large for them since they work, on average, half the time.

While expectations of discontinuity reduce investment incentives, periods of absence from the labour market will tend to erode acquired skills. Whereas returns to education do not seem to differ between the sexes as illiustrated in Table

3.4, lesser participation implies a lesser payoff with the average wage growth in women's earnings profiles being significantly less than the rate of growth of men's earnings. Thus for women, age is a poor proxy for post-school investments.

3.12.3. Allocation of Time between Work and Childcare

Women's labour force rates nevertheless increase with education (see Table 5.7). Their higher market earning power induces families of more educated women to substitute purchasable goods and services for their work in the household up to a certain degree. Even though they may spend more time in the labour force, more educated women are also more likely to reduce or stop market work to take care of children, notwithstanding the fact that the opportunity cost of doing so in the form of foregone earnings is much greater than for less educated women.

An analysis of the relationship between education and fertility (Cochrane 1979) suggests that a negative correlation between education and fertility is more often observed for females than for males. This is typically regarded as a positive externality of women's education in developing countries. However in the case of Singapore, the increased incidence of women's education has started to generate disbenefits in terms of low fertility levels. This is a factor that has to be taken into account in assessing the returns to education for women. The implications of low fertility is taken up in Chapter Five.

3.13. Adjustment for Ability

The pure effects of education on earnings cannot be identified unless earnings are standardized for other factors that affect it. Regression analysis is one way of measuring the effects of other variables such as ability. In the simplest form, earnings differentials are adjusted by a constant factor that represents the proportion of earnings differentials assumed to be result of other factors apart from education. This is termed the "alpha coefficient". Denison first put the value of alpha at about 60% but later studies have found the value to be between three-quarters and four-

fifths when ability and background were considered together (Becker 1975: 0.8; Psacharopoulos 1975: 0.86).

A more satisfactory way of making this adjustment is to estimate an earnings function of the form

$$Y = f(S, IQ, F, Age....)$$

where Y represents the earnings of the individual, and the amount of schooling (S), natural ability (IQ score or a similar index), and family background (F) help to determine earnings, together with age as a proxy for experience.

Several studies have used earnings functions to examine the relationship between education (as measured by years of schooling), ability (as measured by IQ), cognitive skills (as measured by test scores), and earnings. The findings of a recent study on East Africa (Boissiere, Knight and Sabot 1985) suggests that ability, years of schooling and cognitive skills interact to influence earnings. This conclusion was based on estimated earnings functions for samples of 2,000 workers in Kenya and Tanzania and on their standardized earnings for variables such as reasoning ability and cognitive achievement. The results indicate that the indirect effects of reasoning ability and cognitive achievement on earnings differentials exceed the direct effect of years of schooling. It has also been suggested that ability and schooling interact and that their combined effects are greater than their separate effects. (Hause 1971)

3.14. The Contribution of Education to Growth

The most important resource cost of education is the time of students measured in terms of earnings foregone. In many cases, the opportunity cost is reduced by student aid in the form of grants, scholarships or student loans, but these do not generally cover the entire loss of earnings.[6] While the assumption of

6. Widespread unemployment among school leavers reduces but does not eliminate earnings foregone: they will have to be adjusted by the probability of unemployment. However for pupils in school who may not be able to find employment, the opportunity cost may well be close to zero.

alternative paid employment often does not hold in developing countries like India, fast growth and labour shortages have probably made this the scenario for Singapore. The individual and society bear the burden of earnings and output foregone respectively. Earnings foregone represent a higher proportion of the total opportunity cost of higher education in developed countries where they constitute over half the total social opportunity costs of secondary and higher education (Psacharopoulos 1973) than in developing countries where they account for about half the total cost of secondary education and a third of the cost of higher education.

The use of earnings foregone in estimating the cost of education presumes that earnings are a satisfactory measure of the value of output produced and sacrificed when students enrol in school. The assumption that earnings reflect productivity in turn assumes that markets are fundamentally competitive and prices reflect relative scarcities. This was probably not the case in Singapore in the 1970s when relative earnings were distorted by the low wage recommendations of the National Wages Council.[7] If earnings differentials reflect differences in marginal productivity, the extra earnings of the educated workers measure their contribution to output. But even if there are imperfections, earnings will still reflect productivity differences if the forces of demand and supply ensure that scarce factors of production command a higher price than abundant factors.

Denison (1962, 1967) used relative earnings as a measure of the marginal productivity of different groups of workers when he analyzed the rate of economic growth in the United States. He found that between the years 1930 and 1940, 23 per cent of the rate of growth of national income was the result of the education and subsequent increased productivity of the workforce.

Pang (1973) studied the contribution of education to Singapore's growth. He found that labour contributed 24.2% to the GDP growth in 1966, with 7.2% resulting from the quantitative increase and 17% due to the increase in the

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7. This point is discussed in Chapter Six.

quality of the labour force, with 4.4% due to primary education, 7% to secondary education and 5.6% to higher education. This study was later updated by Chew (1986) who found that education's contribution had declined since 1966. In 1980, labour contributed 18.6% to Singapore's growth, with 7.7% due to the rise in the number of people in the labour force and 11% due to the improvement in the quality of labour. Of the educational contribution, 1.84% was due to primary, 5.3% to secondary and 3.8% to higher education.[8] Chew suggests that the decline could have been caused by the increased capital intensity of production, and the narrowed wage gap between workers with no education and those primary and secondary education caused by the labour shortage.

3.15. The Screening Hypothesis

The screening hypothesis or credentialism challenges the basic tenet of human capital theory that higher wages paid to better educated workers reflect their increased productivity arising from the extra years of schooling. It argues that education contributes to economic growth by acting as a device which enables employers to identify individuals who possess either superior innate ability or certain personal characteristics which employers value and are rewarded by higher earnings. (Arrow 1973, Spence 1973, Taubman and Wales 1974, Stiglitz 1975). As such the rate of return to educational investment is a rate of return to an occupational selection mechanism rather than a yield on resources invested to improve the quality of the workforce.

While employers' preferences for better-educated employees may account for differences in starting salaries, the weak version of the screening hypothesis is hard put to explain the fact that earnings are positively correlated with the first 10-15 years of work experience (Blaug 1972, Layard and Psacharopoulos

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8. While Chew acknowledged that other factors besides education such as differences in ability could influence wage differentials and that these should be adjusted by the alpha coefficient, this was not done so.

1974). An employer has sufficient opportunity with a long-time employee to judge his capabilities without continuing to rely on educational qualifications.

3.15.2. Job Competition Theory and Internal Labour Markets

The correlation between education and earnings can however be explained by the job competition model and internal labour markets. Within the job competition framework postulated by Thurow and Lucas (1972), potential workers are ranked according to their expected training costs which are a function of years of schooling. High productivity jobs are offered to those at the head of the queue. Once a worker has landed a job and has received the training to raise his productivity to that demanded by the job, the time required for further training for a higher productivity job is likely to be less than that for someone recruited from outside the firm.

This process leads to the development of "internal labour markets" (Doeringer and Piore 1971) whose principal function is to maintain output in the face of changes in demand and minimize the costs of labour turnover to the firm. Firms operate with enough manpower slack to ensure that every new recruit has a well defined sequence of promotions throughout his working life. In this way, the discrimination based on paper qualifications that operates to determine starting salaries in the weak version of credentialism is extended to lifetime earnings.

3.15.3. Implications for Educational Policy

In a screening scenario, individuals will still invest in education until marginal benefits just equal marginal costs, since individual investment in education confers the same benefits in terms of extra earnings, regardless of whether education enhances productive skills or helps to identify and label an existing set of skills. But educational expansion is unlikely to have much impact on earnings differentials in this system because an increased supply of graduates will simply promote a system of upgrading of hiring standards or "bumping". If post-secondary graduates are perfect substitutes for tertiary graduates and skilled workers the same for post-secondary graduates, educational differentials will be unchanged and the social return to

educational expansion will be zero. However the social return may be positive if these groups are not perfect substitutes for each other.

3.15.4. Empirical Evidence

The biggest problem in proving the screening model is that its strongest conclusion, that productivity and wages increase with academic credentials, is also consistent with human capital theory (Boissiere et.al. 1985) If education helps to sort individuals according to ability, the most powerful test would be to estimate the relationship between education and earnings controlling for ability. This is problematic as productive abilities valued by employers may not be the same abilities typically measured by tests of cognitive skills (Taubman and Wales 1974). The Arrow model postulates that education provides two principal screens - admission of the student to a course of study and successful or unsuccessful completion of that course of study. If this is so then the rate of return to dropouts should be lower than the returns to those who complete the course. Layard and Psacharopoulos (1974) found that this was not the case.

3.15.5. The Singapore Evidence

Pang (1979) tested for the effect of screening for male manufacturing workers. Using 1974 data from a two-stage survey of 124 manufacturing firms chosen from a stratified sample, and interview data from 1249 workers from 133 firms, he constructed earnings functions for primary and secondary workers with earnings as the dependent variable. He found that the coefficients for both primary and secondary school certificates were not significant. Workers holding either certificate did not earn significantly more than those who only completed primary and secondary levels of education. There is no explanation why those who had completed those levels of education did not obtain certificates. Based on the evidence however, Pang concluded that the use of educational qualifications for screening was not widespread in 1974.

Although no econometric study has been done on screening since, casual evidence suggests that "skill labelling" in the Singapore labour market is extensive. The debate on the question "Is there life without a degree?" is on-going and intense. The Straits Times newspaper in 1989 conducted a series of interviews on this subject with five large employers. While employers asserted that beyond the entry point, promotion and prospects were based solely on merit, they acknowledged that tertiary graduates commanded starting salaries about double that for diploma graduates (Straits Times 8 July 1989) This could well reflect the fact that the two theories need not be mutually exclusive (Sobel 1982). It is possible that education raises the productivity of workers while employers also use it as a convenient screening device, not because they need the skills directly imparted by education but because they value the attitudes and abilities that are indirectly fostered by that education.

Nevertheless, the general sense among the school-going population is that a degree is the passport to lucrative and high-level jobs. Over a four-day period in 1989, a degree was listed as a prerequisite for about 80% of high-level jobs (Straits Times, 11 March 1989). Available data on earnings seem to support the widespread belief that better monetary rewards accrue to degree holders. In 1988, 46% of workers with a tertiary education earned S$3,000 or more while only 3% of those with secondary qualifications had an income of that amount. The personnel manager of a manufacturing firm summed up: "I can't help but think that someone with a degree is more capable." (Straits Times, 11/3/89).

This sentiment is reflected in the steadily rising demand for a university education, especially by those who are only able to gain entry into the polytechnics. To dissipate possible unrest, the government has announced that by 1991, polytechnic graduates in engineering and technology will be admitted to university engineering and hard sciences courses as long as they meet the university entrance criteria. At present, polytechnic graduates are placed on a lower priority

than A-level students for entry. This step creates another avenue to university in addition to more usual academic route.

The premium that is placed on degrees can also be illustrated by the "bumping" that has taken place. Jobs which previously did not require a university degree are now out of reach of workers without one. Foreign exchange dealing is one example. The government as the largest employer has also perpetuated this practice. The civil service's premier administrative service is open only to scholars or top honours graduates and not generally to those with general degrees. However, recent recruitment advertisements for administrative service and professional service officers specifically invited applications from polytechnic diploma holders (Straits Times, 6 August 1989). This indicates that perhaps the government is starting to do its part to remedy the situation.

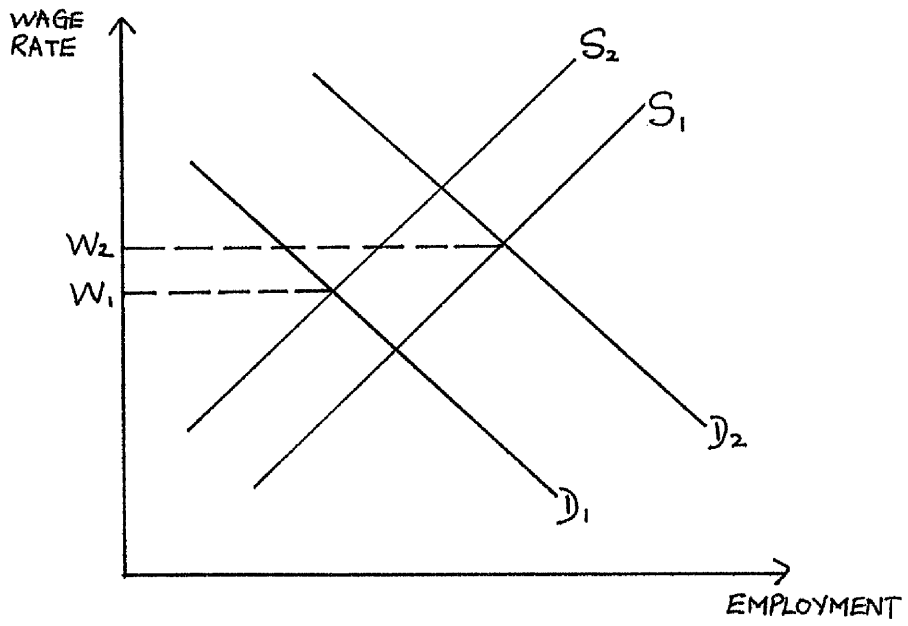
3.16. Segmented Labour Markets

This concept was first used by Kerr (1977) to describe the fragmentation of the labour market into a large number of separate units which are largely isolated from each other. Each segment recruits from separate sections of the labour force and has different wage-determining mechanisms in which human capital factors are of secondary importance.

The prime example is the dual labor market scenario postulated by Doeringer and Piore (1971). The labour market is divided into "primary" and "secondary" segment workers and jobs. In the primary segment wages are high, there are good working conditions, stable employment, job security and the rules and regulations that determine worker allocation and promotion are well-defined. In contrast, the secondary segment contains jobs that involve low wages, low status, poor working conditions, employment instability and no opportunity for advancement in training.

Figure 3.3, adapted from Wachtel and Betsey (1972), illustrates the labour market under neoclassical human capital theory and the dual labour market hypothesis. Under the neoclassical model, workers are distinguished by the amount and type of education, formal training and on-the-job experience. The supply curves S_1 and S_2 denote increasing human capital endowments. All workers face the same demand curve D_1 and the level of wages is determined solely by the amount of human capital embodied in the worker. If labour demand is segmented as depicted by the two demand curves D_1 and D_2, the earnings of either group of workers depends on the position of their supply curve as well as the position of the demand curve that faces them. Thus a worker with the larger amount of human capital on supply curve S_2 but who is unfavourably placed with respect to demand on D_1, will earn less than one with less human capital S_1 but facing the more advantageous demand curve D_2. Thus persons with the same supply curves can face two different wage levels depending on their luck in getting jobs in the primary sector (D_2). In this case human capital explains only some of the earnings differentials between individuals and educational expansion for those consigned to the secondary market will not lead to increased earnings. Moreover interaction of job and worker characteristics over time foster different kinds of worker behaviour which results in limited mobility between sectors.

Figure 3.3
Segmentation



Source: Wachtel and Betsey (1972)

3.16.2. Empirical Issues

Empirical work on segmentation has focused on two issues: the impact of education and training on the earnings of lower segment workers, and the extent and determinants of mobility between the two segments. McNabb (1987) suggests that the best way to test for segmentation is to estimate earnings functions for primary and secondary segment workers using regression analysis, which would enable the researcher to standardize for other factors which may generate earnings differences. He put forward two equations:

Earnings of primary workers =

$$a_0 + a_1 \text{ Education} + a_2 \text{ Other factors}$$

Earnings of secondary workers =

$$b_0 + b_1 \text{ Education} + b_2 \text{ Other factors}$$

If $b_1 = 0$ this would be evidence of segmentation indicating that differences in educational attainment would not lead to earnings differentials in the secondary

segment. McNabb claims that this has not been found to be the case although education is a more important determinant of earnings in the primary market which may indicate preferential treatment of primary segment workers.

Some segmentation authors (Gordon 1972) have claimed that the econometric results of the human capital model were "artefacts of aggregation" in which workers of the secondary labour market whose wages did not increase with greater education or work experience, were wrongly pooled with workers of the primary labour market whose wages did increase with schooling and experience. This conclusion was supported by a study by Osberg et.al (1987) based on a stratified random sample of all private sector employees in Canada. The way the subsectors of the labour market were aggregated into segments made a major difference in empirical work and they recommended that different equations be used when estimating the determinants of wages in different employment segments.

On the other hand, Mazumdar (1983) has outlined a process by which the urban market for low skill workers in LDCs may plausibly develop a sector with high wages, job security and fringe benefits unavailable to the large number of workers outside this sector, even though the latter may have human capital endowments similar to those employed in it.

3.16.3. Segmentation in Singapore?

Pang (1979) tested for the relative importance of human capital and segmentation variables in earnings determination by constructing earnings functions for male manufacturing workers with primary and secondary education based on data collected from a two-stage survey conducted in mid-1974[9] using standard human capital as well as occupation and industry dummy variables. The results showed that a large number of occupational variables were significant, with secondary-educated professional workers earning 33% more than secondary-educated production workers.

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9. The first stage gathered information on general characteristics, personnel and wage policies in 124 manufacturing firms chosen from a stratified sample. In the second stage, 1,249 workers from 133 firms were interviewed including nine firms which were not able to participate in the first stage of the survey.

Some industry variables were also significant. For primary educated workers, the food and shipbuilding and repairing industries were significant determinants of earnings, while being in the basic metals industry significantly increased the earnings of those with secondary education. However Pang concluded that human capital variables were more powerful predictors of earnings than segmentation variables.

He also measured the extent of occupational mobility between the "primary" and "secondary" labour markets. He found that of the 136 persons who had held clerical first jobs, 71 had moved to professional and managerial positions. Of the 22 workers who started out as supervisors, more than half were holding high level jobs after working an average of 15 years. Of the 605 workers who began as production workers, 303 were in skilled occupations, 41 were supervisors and 78 in high level jobs at the time of the survey. His evidence does not support the contention that those who start in low-level jobs stay in low level jobs all their lives and refutes the hypothesis that there is little mobility between primary and secondary labour markets.

As far as internal labour markets are concerned, while most firms preferred to fill vacancies for supervisors through internal promotion, over four-fifths of clerical and technical personnel were recruited from the external labour market. All firms said that ability and performance were the important promotion criteria, and most identified market forces, especially wages paid by their competitors, as the most important influence on their wage structure. Data on intrafirm mobility also did not support the dual labour market hypothesis. Of 698 workers who began as production workers in their firms, 242 were in skilled jobs, 31 were supervisors and 14 had moved into high-level jobs.

The main drawback of Pang's study was that it was confined to male manufacturing workers. Casual observation of later earnings data suggests that there may be evidence of wage segmentation by gender among workers with similar educational qualifications. This forms the basis of the study of Chapter Eight .

3.17. Conclusion

The above chapter outlines some of the issues in the literature and I have attempted to assess their relevance for Singapore. It is clear that the feasibility of many of the techniques described, particularly those for cost-benefit analysis, depends on data availability. The lack of necessary data means that alternative data sources and methodologies have to be tapped. Examination of these alternatives forms the basis of the next chapter.

CHAPTER FOUR:
DATA SOURCES AND METHODOLOGIES

Although tracer studies have been conducted by educational institutions since the early 1970s, they have not been rigorously used for labour market analysis. While the design of tracer studies is still evolving, they nevertheless are an important instrument for labour allocation. Since this thesis is the first study to rigorously use salary data culled from these studies, it is necessary to outline their main features. The author also conducted an enterprise survey to gather information for an evaluation of the training system.

4.1. Labour Market Information in Singapore

Comprehensive and consistent sources of labour market data were developed only in the early 1970s. Moreover cross-section time-series data on earnings, educational qualifications and years of labour market experience required for a Mincer-type earnings function to isolate human capital effects on earnings are not available.

Table 4.1 identifies some of the major sources of labour market information as well as the organizations both within and outside the formal bureaucracy involved in their collection and compilation.

The Ministry of Labour is the main government body generating regular time-series data on the various aspects of the labour market. It produces among others:

1. The Weekly Hours and Earnings Survey
2. The Occupational Wages Survey
3. The annual Labour Force Survey

The Hours and Earnings Survey focuses on sectoral (manufacturing, services etc.) and occupational (professionals, production workers) groupings. It is conducted twice yearly and covers firms employing at least 10 paid workers.

Table 4.1
Major Sources of Labour Market Information

Type/Nature of Information	Coverage	Agency	Availability
Labour Force Survey	Labour Force (National Basis)	Ministry of Labour	Annual since 1973
Occupational and Industrial Wage Data	Labour Force (National Basis)	Ministry of Labour	Annual Time Series since 1972
Occupational Monthly Wage Data	Company-based Data	SNEF	Annual Time Series-non Executives: 1975: Executives: 1981
Job Vacancy Survey	Labour Force (National Basis)	Ministry of Labour	Annual since 1983
Educational Statistics	Students/ Teachers	Ministry of Education	Annual
Tracer Studies	Universities Polytechnics, VITB	The Institutions Concerned	Annual since mid 1970s
R & D Survey	R&D Manpower	Ministry of Science & Technology Science Council	Triennial since 1974

Source: Table 4.20, Islam (1987)

The Occupational Wages Survey covers all public and private sector establishments with at least 25 active CPF contributors and provides detailed occupational wage data segregated by the sector of economic activity. It is conducted by the Central Provident Fund on behalf of the Labour Ministry.

The Labour Force Survey, based on a sample of households, is the chief source of key statistics such as activity status, participation rates, employment rates for specific categories, as well as income distribution data by sector of activity, employment status and gender.

The Job Vacancy Survey and the Annual Conditions of Employment Survey are also conducted by the Ministry of Labour. The former is used to compile vacancy rates which are available both on sectoral and occupational groupings.

A private sector organization, the Singapore National Employers Federation (SNEF), compiles earnings from company-based data which are used to guide wage and salary adjustments in the private sector. The salary and wage series are divided into executive and non-executive classes and in terms of company characteristics eg. sector of activity, average size in terms of capital ownership and seniority status of the worker.

Past studies (Clark and Pang 1970, Ng 1987) have utilized the large-scale Sample Household Survey and the Census of Population which are carried out once a decade. The Household Survey, based on a representative sample of private households provides data on income, expenditure and other aspects of household finances. The Census of Population, last conducted in 1980, compiles data on almost every aspect of life in Singapore from demography and education to religion and transportation. It is more comprehensive in coverage and probably superior in quality to the Labour Force Surveys. However, being large-scale in nature , they are conducted with fairly long intervals, have long gestation periods and are not able to capture dynamics.

4.2. Deficiencies in Labour Market Information

Until very recently there was no explicit distinction between new entrants and existing members of the workforce.[1] Incipient trends and changes in the labour market are usually manifested in the market experiences for fresh graduates.

There is little or no explicit data on wage and employment trends in the public sector. The Yearbook of Statistics publishes data on employment trends for the civil service only and excludes the vast category of statutory boards. There is also

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1 The SNEF does try to take this into account by classifying data in terms of seniority of the employee.

little or no information on the supply price of workers. More importantly wage data are aggregated, and income, age and educational attainments are not tabulated simultaneously. Hence neither age-earnings profiles nor Mincer-type human capital earnings functions can be constructed for recent years.

The distribution of workers by educational qualification is available in time-series form but mean earnings for each group are difficult to extract. The Labour Force Surveys group workers into different income ranges, so while it is possible to calculate the mean, these estimates may not be accurate due to the absence of information on the distribution within each range.

Moreover, there is no one-to-one correspondence between the categories used by manpower planners - graduates, technicians and skilled workers - and the educational categories used to organize Labour Force data. Manpower planners use a cross between educational and occupational groupings which cannot be linked to explicit levels of the education system given the lack of distinction between fresh and existing workers.

4.3. Aims and Data

This dissertation will attempt to examine how and if the returns to graduate, technical and vocational training have evolved through the 1980s.

It is regrettable that macro labour data sources have not analyzed fresh labour market entrants separately until recently.[2] The features of the labour market for fresh entrants are usually different from those of existing workers. For instance, fresh entrants tend to be better educated than the overall workforce. In 1986, 55% of fresh entrants had at least secondary education compared with 48% of the overall workforce[3]. Economic changes manifest themselves first in starting salaries and the rate of absorption of fresh graduates into the workforce is an indication of the state of

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2 The Labour Force Survey has recently started compiling a separate table analyzing the characteristics of fresh entrants.

3 Report on the Labour Force Survey of Singapore 1986

the economy. Manpower policy actions are translated first and foremost through the experiences of fresh labour market entrants, and unless a household survey is done annually - which would undoubtedly be prohibited by the cost - these dynamics are not captured.

The best source of information on the labour market experiences of fresh graduates are tracer studies. Singapore is relatively well endowed in this area as all the post-secondary and tertiary educational institutions, the National University of Singapore, the Singapore Polytechnic, the Ngee Ann Polytechnic and the Vocational and Industrial Training Board (VITB) conduct employment surveys. They are done either annually[4] or biannually. Graduates of these institutions also roughly correspond to the skill groups that are of interest to manpower policy makers.

Examining the changes in the rates of return to the various levels and types of education may shed light on relative profitability. If tracer studies are done continually over a long period, changes in the structure of the labour market may be discerned. This in turn may help in the evaluation of the effectiveness of policies to increase the supply of particular types of graduates relative to changes in demand.

4.4. The Tracer Study

"A tracer study is an impact study of the effects of a training programme" (Hilowitz 1983). It usually involves selecting a sample of ex-students and following those students on to the labour market or unemployment.

Tracers attempt to evaluate the effectiveness of a training programme by examining the labour market experiences of graduates via a series of indicators. Some also attempt to appraise the cost of training relative to the benefits accruing to the trainee or to society.

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4 Up until 1983, Ngee Ann Polytechnic produced two batches of graduates a year and so conducted surveys twice a year. The Vocational and Industrial Training Board presently graduates two batches annually and so conducts surveys twice a year.

In addition to standard tracers, "manufacturing backtracers" attempt to assess the fit between training and work by investigating the training backgrounds of those actually at work in the manufacturing industry. These are in effect reverse follow-up studies.

4.4.2. Methodology of Tracer Studies

Hilowitz (1983) surveys tracer studies conducted to date in developed and developing countries and discusses some of their main advantages and drawbacks for planning purposes. The main methodological issues include the following: who was followed up or traced; mode of contact; the use of other sources of information; sampling techniques, response rates and the use of control groups; and modes of data processing.

Who was followed up or traced: Most studies surveyed graduates and in some cases, dropouts from the programme concerned while some studies collected data on both in-training participants and programme graduates.

Mode of contact: Questionnaires were either administered by mail, direct interview or some combination of the two.

Use of other sources of information and how they were tapped: The most frequent alternative source were employers. Others included headmasters, former teachers of graduates and administrators of the training institute.

Sampling techniques, response rates and control groups: Hilowitz found that many studies/reports did not specify the total number of individuals in the universe, how a sample was chosen, the response rate, or more than one of these items. The response rate to questionnaires varied between 40% and 80% but it was not known what the variance depended upon. Response rates apparently did not vary very much between developed and developing countries.

Many studies could not identify the nature and extent of the non-response bias. Hilowitz often found that where a questionnaire had been sent by mail and had not been returned, another was not subsequently sent. Often too, a single

questionnaire was sent and those who responded were not followed up later to determine what changes had occurred in their work situations. Many tracer findings thus rest on one-time surveys of graduates.

Some studies tried to follow up more than one cohort of graduates. This was usually done at a single point in time by looking at students who graduated at different times in the past. The alternative was to follow-up the same cohort over a long period. This method provides information on what happens to a given group of individuals as they proceed to the world of work but it does not provide feedback on the changing relation between the training institution in question and the labour market. It is not possible to judge the relative expense of the longer range follow-ups as no study gives any indication of their tracing costs.

While no study specifically attempted to construct a control group to validate the findings for a given category, comparative studies of more than one group used control groups implicitly, the "control" being a group which had only general education or a different kind of training from the one in which the researcher was primarily interested. This is an area where perhaps more rigour should be introduced.

Modes of data processing: Several tracers relied on statistical elaboration of the data, with reference to frequency counts, cross tabulations and significance tests. Other studies used multiple regression analyses and calculated benefit-cost rates of return.

4.4.3. Labour Market Indicators

Hilowitz stressed the importance of multiple measures and the need to establish the benchmark in each criterion deemed to constitute programme success.

1. Employment

As the primary aim of all types of training is to improve the employability of trainees, this is the most frequent measure of programme effectiveness. The degree to which graduates are employed is usually seen to provide the most direct measure of programme success.

This rate should be compared with national employment figures for similarly skilled workers, and with the rates for any control group. High employment rates may reflect general shortages of skilled manpower with employers having no alternative but to utilize that institute's output, regardless of their quality. This situation is likely to obtain in countries experiencing rapid development with a concomitantly high demand for skilled manpower like Singapore. A high rate may also be temporary and only a follow-up study can verify its durability.

2. Waiting Time before First Job

The inference drawn from this indicator is that the longer the waiting time, the less successful the programme. But waiting time is influenced by many other factors such as the aspirations of graduates willing to hold out for the "right" job, availability of help with job seeking and general economic conditions. Tracer study planners in Singapore have attempted to separate graduate choice and general economic conditions by asking instead for the "waiting time before first job offer" and the "number of job offers received".

3. Wage and Salary Data

These are usually short-term and unreliable, especially when pay packets comprise several categories (basic wage, wage supplements, bonuses, etc), and it is sometimes unclear which category is being reported. Other sources, such as tax and social security records and employer pay sheets provide longer range data but may infringe privacy.

Pre-programme and post-programme earnings are usually compared. Many factors affect earnings levels and if they are taken as proxies for productivity, underlying assumptions and conditions should be explicitly stated. In Singapore for instance, the boom in the finance and business services sector in the 1980s boosted the starting salaries of business and accountancy graduates. A sizable portion of this was probably economic rent.

4. Job Mobility and Promotion

Here the average tracer study is ill-equipped to provide feedback. Since the standard tracer occurs only a short time (six months to a year) after graduates begin their first job, it cannot capture subsequent job shifts unless they are repeated regularly over a longer period.

5. Degree of training utilization on the job

The data source for this question is usually the ex-trainee and the judgement, a subjective one. A more useful source would be employers' assessment of the adequacy of training. Hollister (1981) cautions that one should be flexible in interpreting the results of this indicator because

> "There is no reason to expect that 100% of the graduates of any training programme should end up in occupations for which they were trained (in fact....it was the flexibility and response of workers and firms and the mobility across firms in response to different opportunities which...reduced the likelihood that critical shortages or surpluses would emerge and persist."

6. Employer satisfaction with the trainee

Interviews with trainees' employers are usually required for this. This may be costly, time-consuming and relies on a high student response rate to get an adequate employer sample. The alternative is to conduct a manufacturing backtracer where an employer is asked to rate and compare employees with different histories of skills acquisition. This however requires a large establishment with sufficient numbers of trainees from different programmes.

4.5. Tracer Studies in Educational Planning

"The credibility, value and worth of an evaluation study is enormously decreased if its usefulness cannot be demonstrated." (Morell 1979, p. 218). It is important to know beforehand what questions the tracer is supposed to answer because the way in which it will be used will determine much of its design.

The planning of a tracer should be a joint exercise involving the subjects, those with the technical expertise and those who need the information it will

provide for planning purposes. Tracer findings must be utilized quickly as it is an instrument of short-term prediction. After several years, the findings may no longer be valid for present graduates of the same programme. How a tracer's findings are used will determine to a large extent what outcome measures are used to evaluate the training programme in question. Furthermore, the economic context in which the findings are embedded and which they express is a subject of rapid change.

According to Hilowitz, if a tracer can provide statistically reliable answers to a few key questions that have been specified beforehand, comprehensiveness should not be sought. It is all too easy to lose sight of the main aims of a tracer in an overemphasis on the collection of all available data.

It would be ideal to set up a single tracing unit on a permanent basis which, while having the task of providing input for decision-making, was independent of actual policy formulation and the cost should be built into the budget of the training system. This would provide planners with reliable findings.

Tracers can help to upgrade the public image of vocational education and training, particularly in countries like Singapore where it is held in low regard relative to the "proper" academic streams. Widespread publication of favourable tracer results may increase employer utilization of trainees and increase the public demand for vocational education and training.

4.6. Tracer studies and other sources of labour market information (LMI)

While other more common sources of LMI - employer surveys, key informant interviewing, the use of statistical data etc.- tend only to identify the job openings and the kind of training required, tracers are the only form of LMI which tells what actually happened once the training has occurred and whether or not a particular trained source of supply is being utilized. It is only with this information that planners can determine whether or not to discourage or encourage this source of

supply. In this sense, tracer studies are an important "supply side" instrument for resource allocation.

Tracers lend themselves easily to integration with data drawn from other sources. Much of current labour market analysis focuses on short-term and local labour market feedback rather than macroeconomic forecasting techniques and tracers, with their short-term feedback and projection capacities are suited to supply-oriented data requirements.

Tracer studies are thus an important "supply-side" instrument for assessing the effectiveness of existing training programmes. If used in conjunction with other forms of labour market signalling to evaluate demand and supply, they are a potentially powerful tool for discretionary decisions for resource allocation in the field of training.

4.7. The Tracer System in Singapore

All post-secondary technical and tertiary institutions carry out employment surveys of their fresh graduates about 3-6 months after graduates complete their courses. These set out to obtain information on, *inter alia*, the average actual earnings and minimum expected earnings of graduates; sectoral composition of employment (public or private sector and the percentage in manufacturing within the latter); number of and reasons for job changes; and the duration and incidence of unemployment. This information is categorized by degree/subject for the University and Polytechnics, and by skill level (eg. Diploma, technician and craft) for the VITB. University and VITB tracer data are also tabulated by gender. The tracer questionnaire used by the University is in Appendix 3.

These studies have been in existence since the 1973/74 and the VITB and the Singapore Polytechnic tracer series are unpublished. While some of these data have been used in various studies from time to time,[5] this thesis is the first known instance that data from all institutions have been studied simultaneously. I am

5 Islam (1987) used wage and employment data from the University tracer studies to evaluate the accuracy of manpower forecasts.

grateful to the Singapore Polytechnic and the VITB for furnishing the unpublished studies.

4.7.2. Advantages of Tracer Studies in the Singapore context

The data give a fairly detailed picture of how each type of graduate fares in the job market and forms a basis for adjusting admission levels into various courses. At the vocational and polytechnic levels, surveys are also carried out for demobilized national servicemen to cover the large numbers that are drafted into military service soon after graduation. Unemployed graduates are also surveyed to determine the incidence of unemployment which has hitherto been minimal. In addition, each institution is guided by a general ten year manpower plan produced by the Ministry for Trade and Industry which indicates the likely level and structure of manpower needs that would be generated by the targetted growth rate.

Tracers in Singapore have several advantages over large-scale surveys. They are relatively simple to conduct. Survey questionnaires are conducted by mail and are usually short, uncomplicated. Repeats are usually sent to those who do not respond to the first. Since respondents fill in the questionnaires themselves, they are relatively inexpensive to administer and can thus be conducted far more frequently (and usually are) than large-scale surveys which frequently need enumerators to ensure accurate tabulation of responses. The costs of carrying out large-scale labour markets surveys may thus be considerable relative to the benefits of obtaining information as specific as that on the labour market.

In a situation with diverse sectoral productivity and high labour mobility as characterizes the Singapore economy, tracer studies are better able to capture the dynamics of change over a period of time than are the more conventional types of econometric cross-section data. Moreover rate of return analyses and the manpower requirements approach both require data that are generally culled from large-scale surveys.

Response rates of these surveys are generally over 70%. They therefore furnish fairly accurate information about the patterns of fresh graduates' absorption into the labour market, some of which have considerable policy significance, like the ones below which have been discerned from recent National University of Singapore Graduate Employment Surveys.

1. The graduate employment rate is quite low with the exception of the recession year of 1985.
2. The bulk of the unemployed graduates are made up of those holding "non-specialist" general degrees, such as the Bachelor of Arts.
3. Up until 1986/7, an increasing number of graduates were being absorbed into the public sector.
4. Female graduates seem to fare less well than their male counterparts in terms of duration and incidence of unemployment and mean earnings.

4.7.3. Caveats

Tracer studies carry data only on starting salaries. Using starting salaries in cost-benefit analysis assumes that they are accurate proxies for lifetime earnings and that earnings differentials will remain constant throughout the working lives.

As questionnaires are filled in by respondents themselves, there is no way to compel individuals to respond if they do not wish to. Furthermore, random samples are not constructed for tracer surveys in Singapore. This means that there is no way of identifying the non-response bias whereby the characteristics of those who do not respond may differ from those who do.

Like the Labour Force Surveys, graduates' earnings are grouped into ranges. Although it is possible to compute average salaries, it is not known how accurate these sample averages are since there are no data on the distribution within each group.

The university data pertain only to Singaporean graduates and may not accurately reflect the trends for non-Singaporeans working in Singapore. The graduate supply is usually taken to be the number of graduates each year but not all graduates may enter the labour market. Thus the supply variable used in the model constructed in Chapter Eight was adjusted for those not economically active. The model also assumes that graduate starting salaries are dependent only on the graduate supply of that year which supposes that numbers of past graduates do not affect the salaries of that year's graduates. This may be a valid assumption given the fairly low unemployment rate of recent years but it may not be so in the future.

Tracer studies for university graduates are conducted 6-7 months after they have passed their exams. This time frame affects the proper assessment of graduates of professional courses such as law, medicine and dentistry where graduates will still be undergoing a period of apprenticeship such as housemanship or pupillage. The importance of speedy publication of the findings should be stressed, especially at the tertiary level.

In terms of educational planning, tracer studies can only suggest changes in enrolment levels of existing courses. They cannot reveal new skills required by the economy. But educational institutions by their very nature can only produce general skills while firm-specific skills are usually developed on-the-job. The relative cost-effectiveness of the various forms of formal and non-formal methods of manpower development has been widely debated (see discussion in Chapter Three). The overriding factor governing the education-employment fit is the adaptability of employers and workers, and available evidence for Singapore suggests that both workers and employers are extremely flexible in responding to changing market conditions.[6] In addition, tracer studies focus only on short-term adjustments

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6 A case study of how employers and workers adjust to changing labour market conditions was undertaken by D.H. Clark and Pang Eng Fong (1977) "Accommodation to Changing Labour Market Conditions: The Singapore Experience" Malayan Economic Review, April, pp. 26-39

and cannot indicate structural and long-term changes which may be needed by the educational system.

While the benefits of tracer studies should not be underestimated, very often they are done on an ad hoc basis without the full commitment of the institutions concerned. For example, tracer studies of one of the institutions surveyed were not carried out every year. Even if they are prodigiously carried out, it is not clear to what extent the information is fed into the policy-making process.

Given the overriding importance of data in any research exercise, it can be argued that effort should be expended in obtaining the highest quality and rigour possible. But Castro (1989) and Pang (1978) contend that instead of concentrating on novel and sophisticated methods of econometric estimation, more attention should be devoted to simple and accurate data-gathering efforts to enhance understanding of the education-employment fit. It is more important that the findings be fed into the policy-making process: additional research would be self-defeating if policy-makers are not convinced of the usefulness of the data collected.

4.7.4. Application of Tracer Studies in this Exercise

Because of the short time series (most of the institutions started their tracer studies only in 1973), the data had to be pooled into a time-series cross-section data set. As the data did not carry information on lifetime earnings or even earnings after a few years of working experience, it was not possible to construct a Mincer-type earnings function or to carry out traditional rate of return computations. Instead the data were used to compute payback periods to the various types of training (see Chapter Seven). An earnings function was constructed to examine the determinants of starting salaries and test the hypothesis of structural change in the labour market for fresh skilled labour before and after restructuring (Chapter Eight).

4.8. Evaluation of the Training Structure

The current training system has been operating since 1980 but an independent appraisal has not yet been published. Much of the data pertaining to training are confidential and the information which is available focusses on numbers of training places and dollar amounts spent on training by employers. There has not been a critical assessment of the system's modus operandi and how well it is actually serving the training needs of employers.

A survey was carried out by the author based on a list of employers supplied by the Skills Development Fund (SDF). 116 letters were sent out and although an attempt was made to follow up non-replies, only 20 companies agreed to interviews. The size of the sample is not large enough for statistical analysis but the employers' comments nevertheless shed light on the advantages and drawbacks of the system and suggest ways it could be improved.

There are 13 local or predominantly local, and 7 foreign firms in the survey sample. In the local group, 3 are in manufacturing comprising a paper/wood processing company, a food and beverage manufacturer, and a die-casting firm. The rest are in different industries in the service sector ranging from tourism, banking, insurance, stockbrokerage, computer support, financial and accounting services, car parking and retailing. Of the foreign firms, 4 are wholly in manufacturing, two are in manufacturing-cum-services, one in manufacturing-cum-trading. Of the remaining two, one is involved in the installation and service of instrumentation/control systems, and the other in marketing/distribution for its manufacturing arm.

3 of the local firms had less than 50 employees, 3 had between 50 and 100, another 3 were less than 500 strong, and the rest had a workforce ranging from 600 to 3500. All the foreign firms had more than 100 employees, the smallest 135 and the largest, 2400.

The survey attempted to address several issues:

1. The type and amount of training provided by different types of enterprises, their training budget, whether and how training needs assessment were conducted, and whether and how they conducted performance evaluation.

2. How far they had utilized the existing training scheme, the level of grant support they had obtained and the type of courses for which they had received support.

3. If there were other areas where they felt the grant-levy system could be of greater benefit to the firm, and whether the current levels of training would have been conducted in the absence of the subsidy incentive.

4. Employers' views of the rationale and modus operandi of the present system and their suggestions for refinement.

5. The horizons of firms' manpower forecasts where they were conducted.

6. The types of manpower demanded by the firm and whether they had been able to recruit the supplies meet this demand.

7. Employers' views on the direction and pace of the restructuring policy.

4.9. Conclusion

All the data from tracer studies and the enterprise survey gathered using the procedures outlined above have been used in subsequent chapters.

CHAPTER FIVE:
A PROFILE OF THE LABOUR MARKET

Restructuring posits a greater demand for skilled manpower but wage patterns suggest that demand for semi-skilled production workers is unabated. This implies that despite government hopes to the contrary, unskilled foreign workers will continue to play a critical role in the foreseeable future. Working women's comparatively weaker remunerative position is surprising in the light of the drive towards greater efficiency in labour utilization. These findings have important ramifications for returns to further investment in education and endorses a more active role for the state in the provision of childcare.

5.1. Fertility, Demography and Labour Supply[1]

Key population and labour supply statistics are set out in Table 5.1. Between 1957 and 1966, Singapore's population grew by 3.3% per annum. Natural increase accounted for 2.9% of this increase and net immigration from Malaysia 0.4%. This rapid growth resulted in a surge of new entrants into the labour market from the late 1960s to the 1975 when the mid-1970s. Replacement fertility was attained in 1975 with a gross reproduction rate (GRR) of 1.025.[2] However vastly improved economic and social conditions and a successful family programme[3] propelled its continued slide to reach the low of 0.779 in 1985. The rate of population growth is now in the region of 1.1%.

Projections of population and labour force using 1985 data were carried out by Saw (1987) Projections assuming achievement of replacement level by the year 2000 and held at that point indefinitely show that Singapore's total population

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1. For discussions on labour supply and population policy, see Pang (1988), Cheng (1983), Chen and Fawcett eds (1979), Shantakumar (1983)

2 The GRR refers to the average number of daughters a woman will produce during her child bearing years if she lives the entire period. The GRR minus the death rate of women in this age group gives the Net Reproduction Rate (NRR). If the NRR is exactly 1 (commonly referred to as the two child family level since each woman has one son and one daughter on the average), we can expect the population to replace itself in the future. If it is less than 1, too few daughters are born for the population to replace itself. If it is more than 1, the size of the population will grow. When the NRR is exactly 1 in Singapore, the GRR will be about 1.025. This is the replacement fertility level.

3. The family planning programme urged all couples to "Stop at Two", regardless of the sex of the children.

will peak at about 3.39 million in 2030 and stablilize at just slightly below this figure. Annual population growth will be reduced continuously from 1.11% in 1985-1990 to 0.11% during 2025-2030, after which it will stay flat near the zero growth level. From that time, the population is expected to remain almost stationary at slightly below 3.4 million.

Table 5.1
Singapore: Population, Labour Force and Employment

	1957	1966	1974	1979	1984	1988
Population ('000s)	1446	1930	2230	2383	2529	2647
Average Annual Increase in Pop.		3.3	1.8	1.3	1.2	1.1
Labour Force ('000s)	472	571	851	1053	1207	1281
Average Annual Increase in Lab.		2.1	5.1	4.4	2.8	1.5
Employed Persons	449	519	818	1018	1175	1239
Average Annual Inc. in Employed Pers.		1.6	5.9	4.5	2.9	1.3
Unemployed Persons ('000s)	23	51	33	35	33	43
Unemployment Rate	4.9	9.0	3.9	3.3	2.7	3.3

Notes: Labour Force estimates include foreign workers. Labour force defined as employed and unemployed persons aged 15 and above. Labour force, employed persons and unemployment estimates for 1970 have been adjusted to exclude persons not actively searching for a job. All figures have been rounded off.

Source: Updated and modified from Pang (1988), Table 6.1

If fertility remains at the 1985 level of 0.779, the population will peak at 3.02 million in 2015. It will fall to 2.58 million in 2045 and reach the low of 2.04 million near 2070, with a negative annual growth rate of -0.95% during 2065-2070. The situation will be worse if fertility is allowed to fall further to 0.668 in the year 2000 and remain constant thereafter. In this case the population will only reach the maximum of of 2.91 million in 2010, after which it is expected to decline to reach 1.6

million in 2070. The annual growth rate will drop from 0.98% during 1985-1990 to 0.11% during 2005-2010, and the negative growth rate will accelerate from -0.04% during 2010-15 to -1.48% during 2065-2070.

Under all theree scenarios, the size of the working age population will shrink and age, the pace being faster the lower and longer fertility continues to be below replacement level. If replacement fertility is attained in the year 2000 with constant participation rates, the labour force will reach a maximum size of 1.44 million in 2015 and will thereafter remain stable at about 1.40 million. However if fertility remains below replacement level, the size of the labour force will shrink continuously in the 21st century.

The structure of the working age population will also change. In 1985, 73.8% of the workforce were under 40 years of age. Even if fertility is restored to replacement level by the year 2000, the number of workers between 15 and 39 years can be expected to decline early in the 21st century as the smaller number of babies born in the 1970s and 1980s begin to enter the labour force. The number of older workers will more than double to constitute just under 50% of the work force in the year 2010 after which it is expected to stay slightly below that level.

If fertility remains below replacement level, there will be a continuous decline in the number of young workers from the year 2000 and old workers from the year 2020. The proportion of older workers will increase from 26.2% in 1985 to 51.8% in 2070. If fertility slides from the 1985 level, the proportion of older workers will reach 55.2% in the year 2070.

These forecasts underscore the two basic manpower constraints. The first is that slow rates of labour force growth signal little relief from the present labour shortage particularly in those sectors which local workers tend to shy away from. Dependence on foreign labour is likely to continue.

The other problem is the greying of the work force. Many more persons in their forties and fifties will be holding senior positions in the public and

private sectors compared with the present situation where relatively younger persons are occupying these positions. Under the present wage system, employers will incur higher labour costs in view of the higher wages that have to be paid to workers with longer years of service. The problems of an older workforce cannot be avoided even if fertility reverts to replacement level.

5.1.2. Fertility and Education Level

The GRR of women by educational level in 1985 were as follows:

Table 5.2
Education and Fertility

Educational Qualification	Gross Reproduction Rate
Primary and Below	0.93
Secondary	0.58
Post-Secondary and above	0.68

Source: Saw (1990), p. 66)

Clearly, women with at least post-secondary qualifications have a lower fertility level than those with at most primary education. Based on this trend, the government in 1987 designed a selective pronatalist policy[4] whereby those parents who can afford to bring up more children are encouraged to do so. Poorer families or those with less well educated parents are exhorted to keep to a lower family norm.[5]

The government's package of incentives includes:

1. Special tax rebates to alleviate the financial burden of having a third child. There is an incentive of tax write-offs of up to S$20,000 over a five-year period for a

4. Mr. Goh Chok Tong, the then First Deputy Prime Minister, announced the "New Population Policy" on 1 March 1987

5. Some demographers are skeptical about selective methods because evidence in developed societies show that fertility differentials by socioeconomic class have been transitory and have had very little effect on the calibre of society. According to Lim (1988, p. 132 footnote 46), although these may only have short -term implications within the Singapore context, they do need to be tried out

third child born from the assessment year 1988. Enhanced child relief has also been provided for working mothers with at least 3 GCE "O" levels.[6]

2. A childcare subsidy of S$100 per month is provided to working mothers for each of their first three school children under 6 years of age placed in approved childcare centres. To discourage demand for foreign workers, this allowance is not available to those who employ foreign maids to care for their children at home.

3. Employers are encouraged to be flexible toward working women with young children by promoting part-time and flexible time employment and extended no pay maternity leave and retraining of women rejoining the workforce. This has also been advocated by Lim (1988).

> "Working women should be provided (with) all the incentives to continue work as well as run families. Children should not be a hindrance, provided they have access to the necessary facilities. Also in bringing up children, the early years are crucial and mothers will be expected to feel the pressure between work and family. Work conditions should be reorganized by adopting measures such as flexi-time, part-time employment and more liberal unpaid leave."

Although employers have been urged to adopt more flexible and part-time work patterns, casual evidence indicates that employers, even those in industries experiencing the tightest labour squeeze, viz. electronics and construction, are not keen on part-time or job-sharing arrangements.[7] Part-time female workers constitute less than 2% of the pool of 1,034,300 females aged 15 years and over.[8] The percentage is thus small. Some employers have hired workers on a part-time basis but not where they are needed most - in production. They claim that having part-timers creates "too much disruption to the process flow in the 24-hour production line."[9] Rotating shifts on the production floor is also problematic as it requires part-timers to follow shift patterns that change weekly or fortnightly, and most part-timers only want to work hours that are convenient to them, which are usually the daytime shifts.

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6. General Certificate of Education "Ordinary" Level.
7. Straits Times, 20 April 1989
8. Straits Times, 8 March 1989
9. Ibid.

Therefore most part-timers in manufacturing are retained in areas less likely to disrupt operations, such as packaging and loading materials onto the production line. Similarly in service industries, they are deployed in areas which do not require much specialized training, such as housekeeping, laundry and restaurant services.

5.2. Structure of the Labour Force

As mentioned above, the decline in fertility mirrors the greying of the population and the labour force. In 1988, 8% of Singaporeans were 60 years and over and this proportion is expected to rise to 22% in 2020.[10] The median age of the workforce is projected to rise from 32.6 years in 1989 to 39 years in the year 2000. Changes in the age distribution of the labour force between 1957 and 1988 are tabulated in Appendix 4, Table 1.

The rise in the numbers of working women has altered radically the sex composition of the labour force. The numbers of economically active women increased by almost six-fold in the 1957-1988 period (Table 1, Appendix 4). The 1970s the number of female workers grew by 7.7% annually which was more than twice as high as the 3.2% for the male labour force. In the 1980s, the rates were 3.2% for women and less than 1% for men. In 1988, women formed more than a third of the labour force compared with a quarter in 1970. In the same period, their participation rate rose by 23% to 47.8%, accounting for much of the increase in the overall labour force participation rate from 46.6% in 1970 to 62.9% in 1988 (Appendix 4, Table 2).

From the mid-1970s, the female working population was supplemented by a growing inflow of foreign female, predominantly Malaysian workers. In 1970, 7.2% of the female workforce were non-citizens; in 1980, they made up 9.7% of the total.

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10. Straits Times, 30 July 1989

5.2.2. Participation Rates By Age and Sex

Figures 5.1 and 5.2 (Table 2, Appendix 4) show participation rates by age and sex. Participation in the 15-19 age group declined from 60% in 1957 to 56% in 1970 for men but increased from 23% to 43% for women. It further increased in 1980 to 51% for women while continuing to decline to 48% for men. The overall participation rate fell sharply to 26.2% in 1988. This was due to the implementation of the education reforms of 1979 which enabled and encouraged more students in that age group to remain in education.[11]

Participation rates of men aged fifty years and over have also declined. Participation for the 55-59 group fell from 85% in 1957 to 65% in 1988; the 60-64 age group, from 67% in 1957 to 47% in 1988, and for those over 65 from 39% to 21%. Employers have been urged to retain their workers beyond the current 55 years to at least 60 years, to help assuage the labour shortage.

While participation for men has been consistently higher, female participation has risen dramatically. 40% of women were economically active in 1980 compared with 20% in 1957 and 25% in 1970. In 1988, the figure stood at almost 50%. Economic and social changes such as increased access to education, expanding job opportunities, the breaking down of social barriers to women working after marriage and the growing trend of smaller families all encouraged women to enter the workforce.

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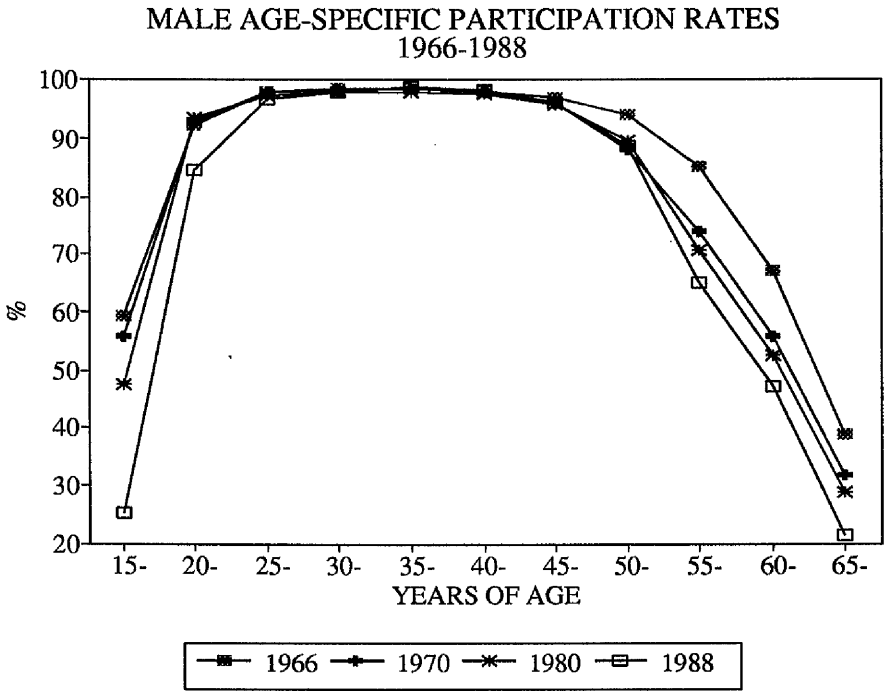
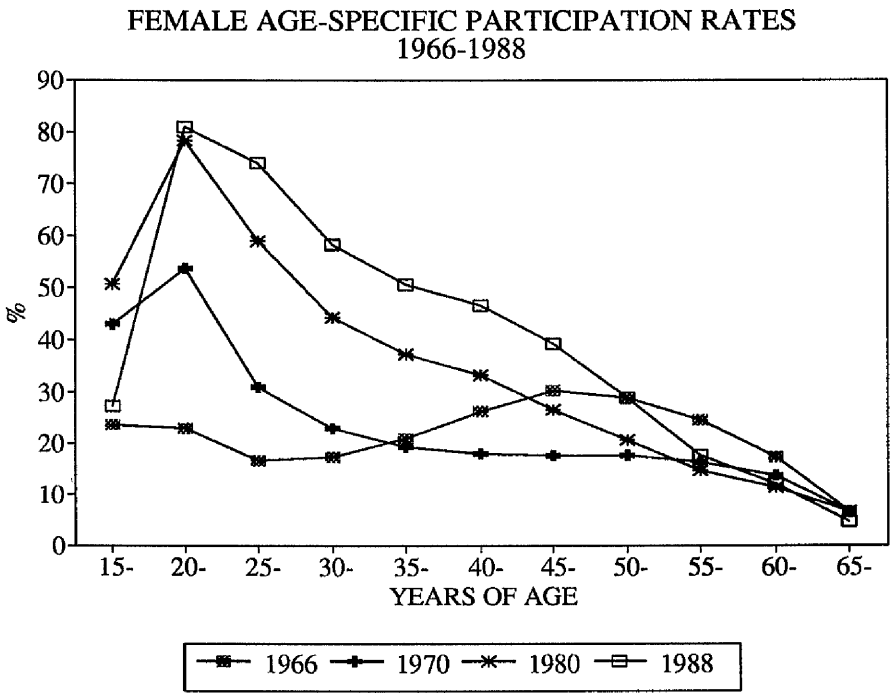
11. The education system and reforms are set out in detail in Appendix 6.

Figure 5.1



Sources: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988. Graphed by author

Figure 5.2



Source: same as Figure 5.1, Graphed by author

5.2.3. Changes in Employment Structure

This brisk expansion also reflected the sectoral patterns of demand. Between 1957 and 1988, manufacturing employment multiplied more than four times to account for 29% of total employment, making it the largest employer in the economy (Table 5.3). In the 1950s and 1960s, women were active in light consumer production such as food and beverages, textiles and garments and trade-based activities like the grading of rubber. During the export expansion phase which began

Table 5.3
Employed Persons by Industry (%)

	1957	1970	1980	1986	1988
TOTAL	100.0	100.0	100.0	100.0	100.0
Agriculture & Fishing	8.5	3.5	1.6	0.8	0.4
Quarrying	0.3	0.3	0.1	0.1	0.1
Manufacturing	14.2	22.0	30.1	25.2	28.5
Utilities	1.2	1.2	0.8	0.7	0.6
Construction	5.2	6.6	6.7	8.7	6.7
Trade	24.2	23.4	21.3	23.1	22.9
Transport & Communications	10.7	12.1	11.1	9.9	9.7
Financial & Business Services	4.6	4.0	7.4	8.7	9.0
Other Services	30.7	26.8	20.9	22.6	21.9
Activities not Adequately defined	0.4	0.1	0.0	0.2	0.1

Other Services include Public Administration, Community, Social and Other Services

Sources: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988

in 1967, women predominated in the textile and clothing, electrical and electronic industries and the commercial and services sectors. The trade sector has remained an important source of employment generating the second largest increase in employment in the 1957-1970 and 1970-1980 periods and the largest increase in the 1980-1988 period of 33%, remaining the biggest source of jobs after manufacturing. The 1980s witnessed the growing ascendency of financial and business services. Employment in this sector more than doubled between 1970 and 1980 and was responsible for 13% of the increase in the working population in the 1970s and 20% in the 1980s. Employment also increased in all other sectors save the traditionally insignificant agriculture, forestry and fishing, and mining and quarrying sectors.

5.3. Educational Profile of the Workforce

In 1966, the proportion of the workforce with at least secondary education stood at about 16% (ERC 1982) In 1979, 39% of the working population had at least secondary education and the proportion increased to almost 50% in 1988 (Table 5.4). Economically active women are on average better educated than their male counterparts. In 1973, only 51% of the female workforce had primary qualifications or less compared with 60% of male workers (Table 5.5). Conversely, only 40% of men had at least secondary education compared with 49% of working women. In 1988, 47% of the male workforce had no more than primary education compared with only 35% of the female workforce. Only 46% of economically active men had at least a secondary education compared with 55% of the women. While working age men almost invariably enter the labour market regardless of educational attainment, work in the market place to a larger extent, is still an option for women and more educated women are more likely than women with little or no education to do so.

The educational profile also improved for new entrants (Table 5.4). While only 4% of fresh labour market entrants had tertiary education in 1979, this

increased to 9% in 1988 as a result of the concerted expansion of education and training. However, Table 5.6 reveals that Singapore still lags behind the other NICs. It is in the light of these gaps that the target educational profiles for 1995 have been drawn (Table 5.4).

Table 5.4
Workforce Educational Profile

	Educational Profile Of the Workforce		Educational Profile Of New Entrants		Targetted Profile
	1979	1988	1979	1988	1995
No Qual.	28	22			
Pri & Post-Pri	31	30	43	42	38
Secondary	28	31	40	31	37
Post-Secondary	8	13	14	16	17
Tertiary	3	5	4	9	8

* Primary and Below
Figures do not add to 100% because of rounding.

Sources: Singapore Ministry of Labour, Report on the Labour Force Survey of Singapore, various years; Report of the Economic Committee (1986), The Singapore Economy: New Directions, Singapore Ministry of Trade and Industry Table 11.2

Table 5.5
Employed Workers by Educational Qualification and Sex

	1973		1979	
	Male	Female	Male	Female
No Qual.	14.5	20.6	17.6	11.1
Pri	45.0	30.2	33.7	25.7
Post-Pri			0.9	0.2
Sec	32.6	42.2	24.8	35.3
Post-sec	5.0	5.0	8.1	9.2
Tertiary	2.8	2.0	3.3	2.4

	1984		1988	
	Male	Female	Male	Female
No Qual.	13.1	8.8	13.9	9.9
Pri	35.2	25.6	32.6	24.7
Post-Pri	0.5	0.1	0.6	0.3
Sec	27.5	38.3	27.6	37.4
Post-sec	10.3	11.6	13.0	13.4
Tertiary	5.6	3.9	5.9	4.8

Source: Singapore, Report on the Labour Force Survey of Singapore, Ministry of Labour, various years

Table 5.6
Comparison of Educational Attainments 1987

Country	No formal Education	Primary	Secondary	Post -Sec	Tertiary
Singapore	22.5	30.6	30.5	11.3	5.1
Taiwan	7.8	33.2	45.9	7.2	5.9
S. Korea	22.7	46.5	23.1	1.7	6.0
Hong Kong	11.0	37.3	40.6	5.6	5.5
Japan	0.0	0.0	60.2	12.3	27.5
US	1.2	7.1	55.6(a)	-	36.1

(a) Includes both secondary and post-secondary statistics

Source: Straits Times, 2 March 1988

Table 5.7
Labour Force Participation by Educational Level

	1966			1970		
	All	Male	Female	All	Male	Female
No Qual.	46.5	85.1	19.7			
Primary	44.5	60.5	18.7	42.4	65.4	19.8
Secondary	77.5	88.8	58.6	77.6	78.5	64.8
Post-Sec	80.8	93.9	35.5	88.5	93.1	83.4
Tertiary	92.3	97	84.6	86.8	93.8	66.7
Total	42.3	64.4	19.8	45.6	67.3	23.6

	1980				1988		
	All	Male	Female		All	Male	Female
No Qual.	35	55.9	19.9	*	60.3	80.7	38.4
Primary	62.2	75.7	44.9	**	62.7	78.8	43.7
Secondary	76.8	81.5	71.9		72	78.9	65
Post-Sec	83.4	89.7	74.3		77.7	85.3	68.6
Tertiary	89.7	97	74.3		89.7	96	79.8
Total	55.9	72	39.3		62.9	78.5	47.8

* refers to those who have not been to school and those who left without the Primary School Leaving Certificate
** Includes post primary - refers to those who have obtained another certificate such as the Preparatory Vocational School Certificate or Artisan Certificate after having obtained the Primary School Leaving Certificate or its equivalent.

Sources: 1966-1980 data from Labour Force Trends 1957-1980 (1982); 1988 data from Report on the Labour Force Survey of Singapore 1988

5.3.2. Education and Labour Force Participation

Those without qualifications traditionally have the lowest rates of participation. Males are also more likely to enter the labour market. Participation rates for tertiary-educated females have declined while those that for those with no or just primary education have risen significantly (Table 5.7). 45% of those with no more than primary education were active in 1980 and although this fell back to 44% in 1988, this was well up on the 19% rate of 1966. On the other hand, the participation of females with tertiary qualifications fell from 85% in 1966 to 80% in 1988. On the whole, women with higher qualifications are more likely to enter the workforce.

The next section examines the structure of wage differentials and the clues that suggest some sort of gender segmentation in the labour market.

5.4. Educational and Occupational Wage Differentials

Lim's (1988) study of earnings for different categories of educated manpower based on Labour Force Survey data found that nominal earnings of workers with tertiary education rose by 19% per annum compared with 9% to 13% rates for other groups. Wage differentials between tertiary and other groups was observed to be more than four times in the period 1974-1985.

Lim's inspection of occupational differentials showed that earnings of "professional, technical and related workers" and "administrative and managerial workers" grew much more rapidly than other groups in the 1980s. "High-level" workers were remunerated 2.7 times more than other workers, and the unemployment rates for the former for 1974-1985 were about half of the average unemployment rates for all occupational groups (Table 5.9)

Table 5.8
Nominal Income Growth Rates by Education 1973-1985

Group	1973-78	1979-81	1982-85
Primary	10.8	10.1	10.4
Post-primary	0.8	12.5	13.1
Secondary	8.1	11.6	10.6
Post-Secondary	12.4	13.3	9.1
Tertiary	4.4	8.7	18.5

Source: Lim (1988), p.195

Table 5.9
Nominal Income Growth Rates by Occupation 1973-1985

Occupation	1973-78	1979-81	1982-85
Professional, Technical & Related Workers	4.2	13.9	17.5
Administrative & Managerial Workers	2.5	12.9	20.2
Clerical & Related Workers	10.6	5.3	10.7
Sales Workers	9.8	12.1	13.7
Service Workers	11.6	18.7	4.4
Agriculture & Related Activities	6.4	19.8	8.0
Production, Related Workers, Transport Equipment Operating Workers	10.6	10.4	10.5
Total	8.0	12.8	15.2

Source: Table 7.11, Lim (1988),

As it is plausible to suppose that there is a close correspondence between tertiary qualifications and workers represented in professional/executive occupations, Lim's evidence indicates an insufficient supply of tertiary-educated manpower in Singapore.

Several explanations were put forward. The British colonial government had not actively encouraged human capital investment and the elitist education policy pursued since independence resulted in a very small percentage of the workforce acquiring tertiary education.

The resultant premium paid for this type of manpower reinforced already higher pay of managerial and professional workers. On the other hand, the influx of less skilled and unskilled foreign labour restrained wage growth at the other end of the scale.

Lim's estimates were calculated from Labour Force Survey earnings data which unfortunately does not permit the unambiguous calculation of average earnings. The 1987 earnings data table is in Appendix 8. His conclusions were based on estimates derived from the Pareto interpolation method which was apparently adopted because the mean incomes for the different educational categories were not known. Although Lim concedes that these estimates are sensitive to the assumptions inherent in this method,[12] these specific assumptions were not identified. No further theoretical justification was given for using this method in preference to the simple mean, nor was the exact methodology set out. In view of this ambiguity, growth rates were recalculated with the same set of raw data using the simple arithmetic mean.

My results in both real and nominal terms are set out in Table 5.10. Not only are growth rates much lower than those cited earlier, wages of workers with tertiary qualifications grew the slowest of all the groups for most of the 1980s while wages for those with post-primary and secondary qualifications increased the fastest during the same period. These figures imply that the rate of growth of demand for labour with post-primary, secondary or vocational qualifications outstripped growth in supply and exerted upward pressure on wages.

Wage growth by occupation were also recalculated in Table 5.11. The marked difference in the rates of wage growth between professional & administrative

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12. See footnote to Table 7.11 in Lim, (1988)

workers and all other groups, as purported by the earlier study, is not evident. In contrast, wage growth for those in production-level jobs has been marginally more rapid. In 1979-1988 it seemed that shortages prevailed in all occupational groups, particularly in production. These estimates suggest that despite incentives to induce mechanization and automation to reduce dependence on unskilled and semi-skilled manpower, the demand for low level labour is unabated.

The result that there is continued strong demand for unskilled and semiskilled production-level labour is corroborated by findings obtained from a survey of employers conducted by the writer on the state of the labour market.[13] Several manufacturing employers stated that while engineers to maintain sophisticated machinery were difficult to come by, they experienced greatest difficulty in recruiting production workers, a problem exacerbated by the tight controls on the importation of foreign labour.

Occupational differentials are graphed for males and females in Figures 5.3 a&b. Administrative and managerial workers have markedly higher levels of remuneration than those in professional and technical occupations, so much so that the Manufacturing Subcommittee has cautioned that the high wages paid to managers and executives may reduce Singapore's chances of attracting high-technology investments (Straits Times 21 Jan 1986), the demand for which is predicted to accelerate with restructuring. As this group accounts for 45% of the total labour cost while comprising only 20% of the working population, it will become increasingly costly for firms requiring them in large numbers to continue operating here. As a result Singapore's aspirations as a regional services centre may suffer. A delicate balance will have to be struck: wages need to be high enough to attract the necessary manpower into these occupations but cannot be too high to make it unprofitable for firms to operate here.

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13. The survey methodology and other findings are discussed in Chapters 4 and 9.

Table 5.10
Earnings Growth by Education 1973-1988

Real S$	1973-79	1979-82	1982-85	1985-88	1979-88
Primary	3.5	4.4	7.4	2.4	4.7
Post-Pri	0.0	8.7	9.7	-1.4	5.6
Secondary	1.6	5.7	8.8	1.6	5.3
Post-Sec	0.0	7.8	5.7	1.0	4.8
Tertiary	0.0	2.3	3.0	-0.9	1.5

Nominal S$	1973-79	1979-82	1982-85	1985-88	1979-88
Primary	9.2	11.5	8.9	2.6	7.6
Post-Pri	0.0	16.1	11.3	-1.2	8.5
Secondary	7.2	13.0	10.3	1.9	8.3
Post-Sec	5.9	15.2	7.3	1.3	7.8
Tertiary	5.9	9.5	4.5	0.0	4.4

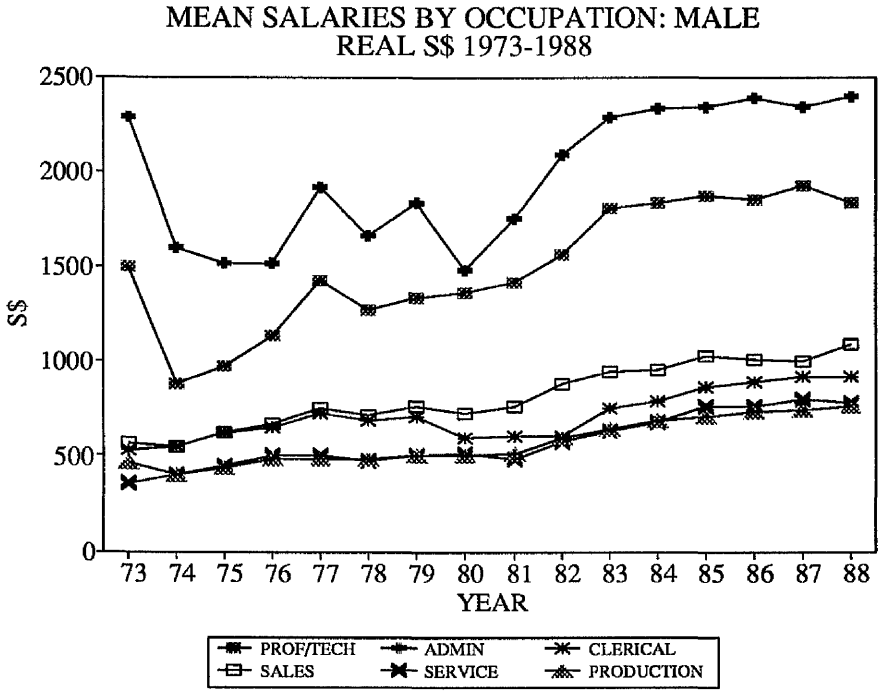
Table 5.11
Earnings Growth by Occupation 1973-1988

Real S$	1973-79	1979-82	1982-85	1985-88	1979-88
Prof/Tech	-0.6	5.8	7.6	-0.7	4.2
Admin	-3.4	3.3	4.4	0.4	2.6
Clerical	3.0	1.3	7.9	2.8	4.0
Sales	4.4	5.9	5.3	2.7	4.6
Service	5.8	3.4	6.7	1.3	3.8
Agric	7.0	8.5	6.3	-2.0	4.3
Production	2.0	5.7	6.7	2.0	4.8
Total	2.6	6.5	7.5	2.4	5.4

Nominal S$	1973-79	1979-82	1982-85	1985-88	1979-88
Prof/Tech	4.9	13.0	9.1	-0.4	7.1
Admin	2.0	10.4	5.5	0.7	5.5
Clerical	8.7	8.2	9.4	3.0	6.8
Sales	10.2	13.2	6.7	2.9	7.5
Service	11.6	10.5	8.2	1.5	6.7
Agric	12.9	16.0	7.8	-1.4	7.2
Production	7.5	13.0	8.2	2.3	7.7
Total	8.3	13.8	9.0	2.6	8.4

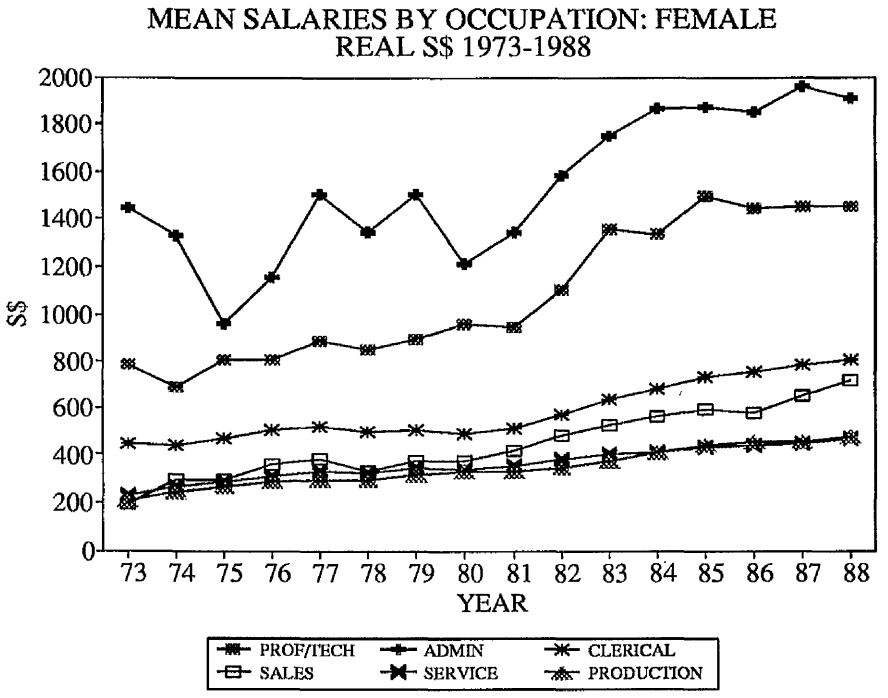
Source: Singapore, Report on the Labour Force Survey of Singapore, Ministry of Labour, various years

Figure 5.3a



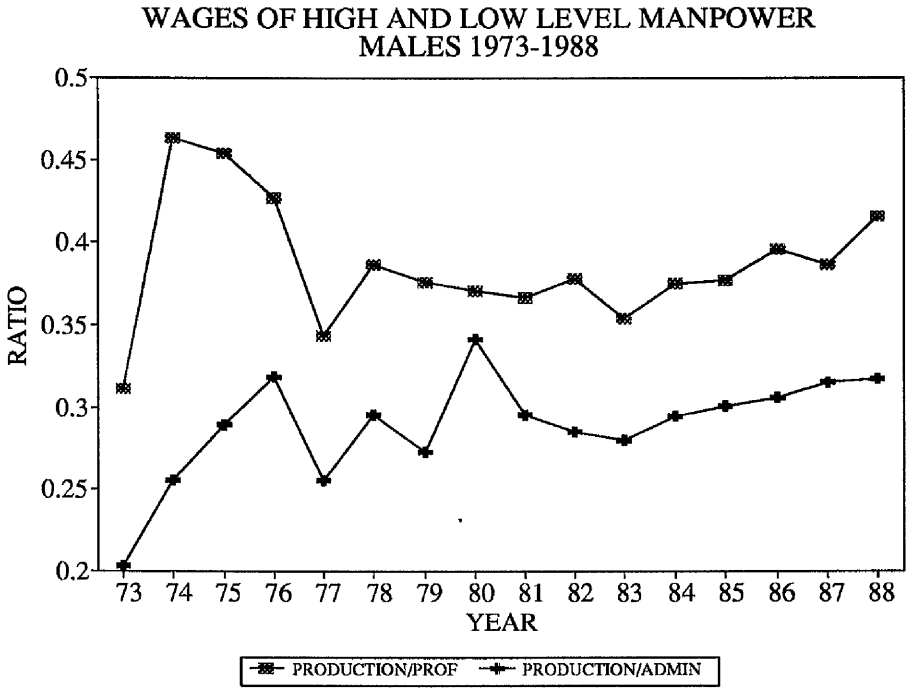
Source: Singapore, Report on the Labour Force Survey of Singapore, Ministry of Labour, various years. Graphed by author

Figure 5.3b



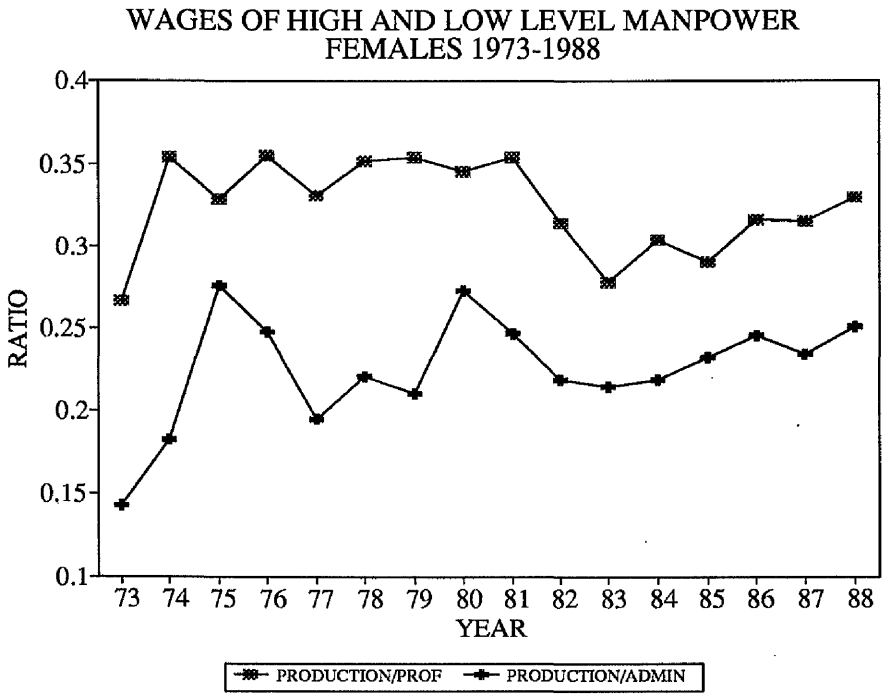
Source: Same as Figure 5.3a. Graphed by author

Figure 5.4a



Source: Same as Figure 5.3a. Graphed by author

Figure 5.4b



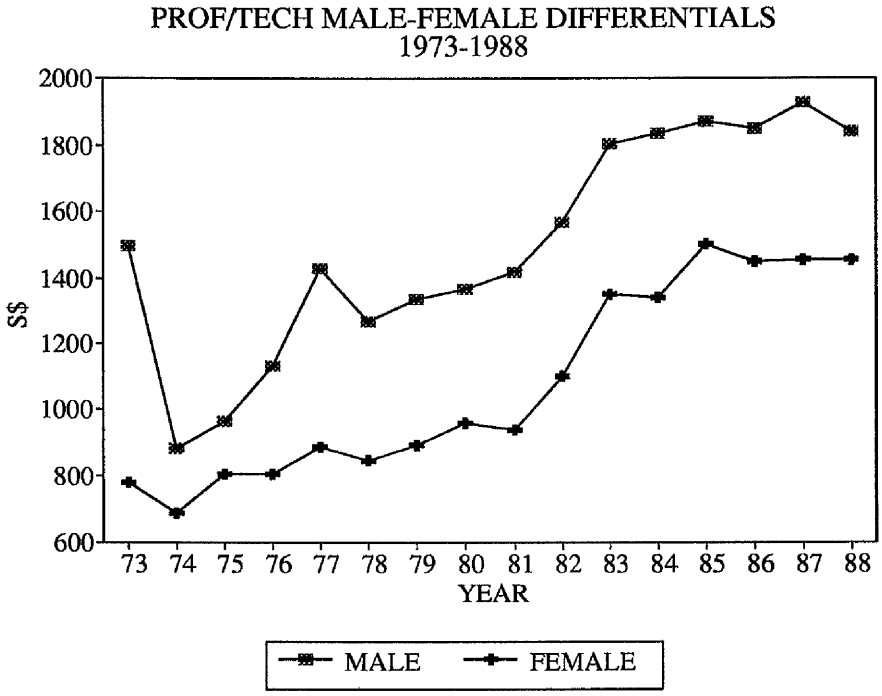
Source: Same as Figure 5.3a. Graphed by author

The differentials between high level (professional and administrative/managerial) and low level (production) manpower are graphed in Figures 5.4 a & b. Wages for both male and female production workers seem to have increased with respect to administrative/managerial workers. The trend with respect to professional and technical workers is less clear cut. Wages for female production workers fell sharply from 1981 to 1983 as did wages of male workers. However since 1982, production wages have been rising steadily, indicating again the strong demand for unskilled and semi-skilled workers.

5.4.2. Gender Differentials and Women in the Labour Market

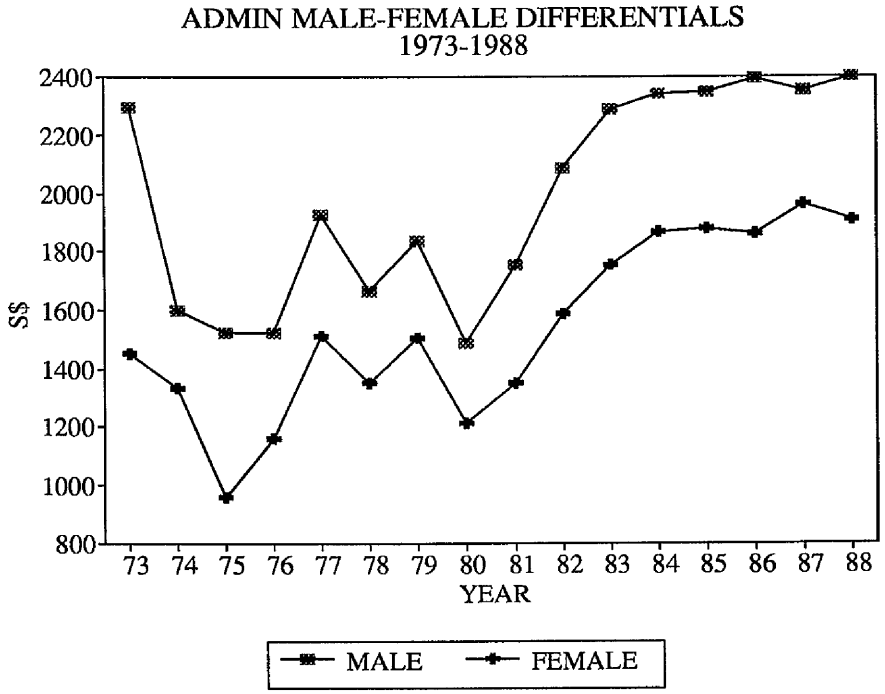
Gender differentials have widened perceptibly since the early 1980s. In 1980, female workers earned an average of 63.5% of male income, the disparity being the greatest among production workers: in manufacturing females received only 44.8% of the mean income of their male colleagues (Linneman 1987). Through the 1980s the pattern has become most marked for administrative and managerial, and clerical and service occupations (Figures 5.5a-f). Widening sex differentials may reflect the different supply elasticities of male and female labour. The traditional high rate of male participation makes their supply inelastic whereas female participation, which currently stands at 48%, reflects a large economically inactive female population that has not been tapped. A more elastic supply of female labour means that an increase in wages resulting from a given increase in demand would be less than the equivalent increase in wages for male workers. Elasticities aside, there is *a priori* evidence that women lag behind in terms of remuneration. Table 5.12 shows that 85% of all employed persons earning more than $3,000 a month are men. This is despite the fact that almost an equal percentage of men and women are in administrative and managerial occupations, and an equal percentage again have at least the equivalent of "A" level qualifications.

Figure 5.5a



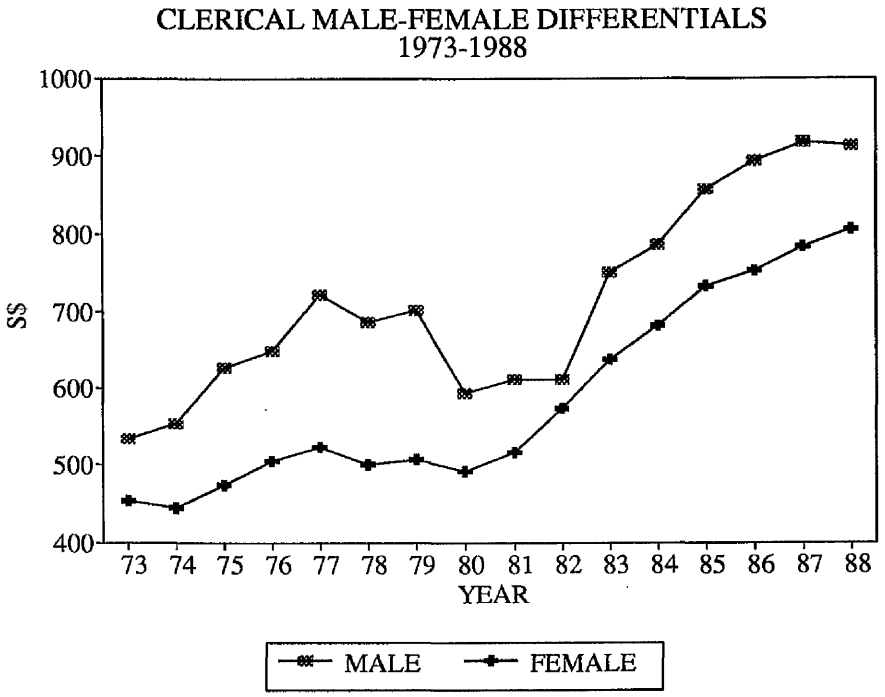
Source: same as Figure 5.3a. Graphed by author

Figure 5.5b



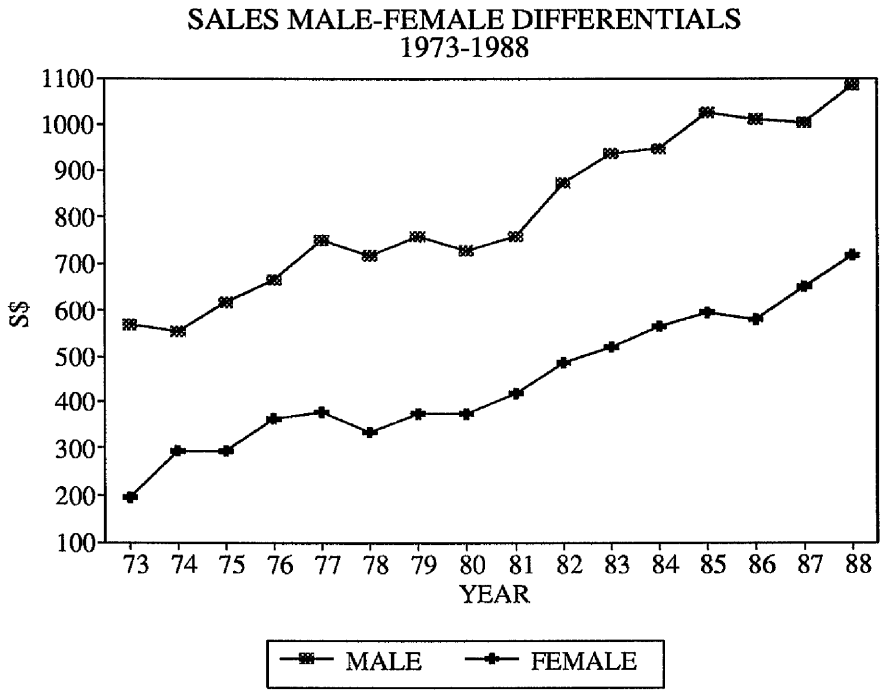
Source: same as Figure 5.3a. Graphed by author

Figure 5.5c



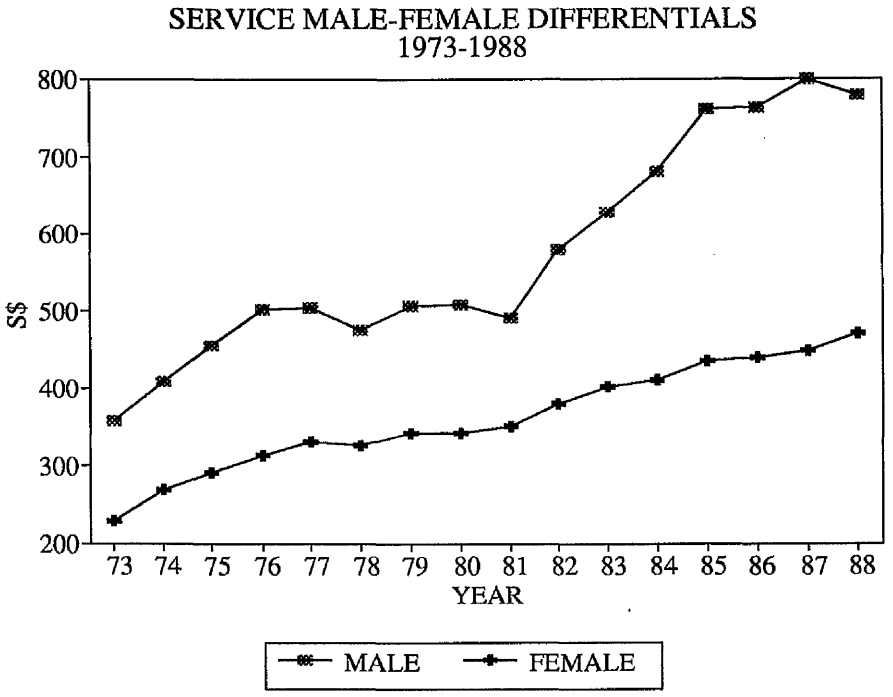
Source: same as Figure 5.3a. Graphed by author

Figure 5.5d



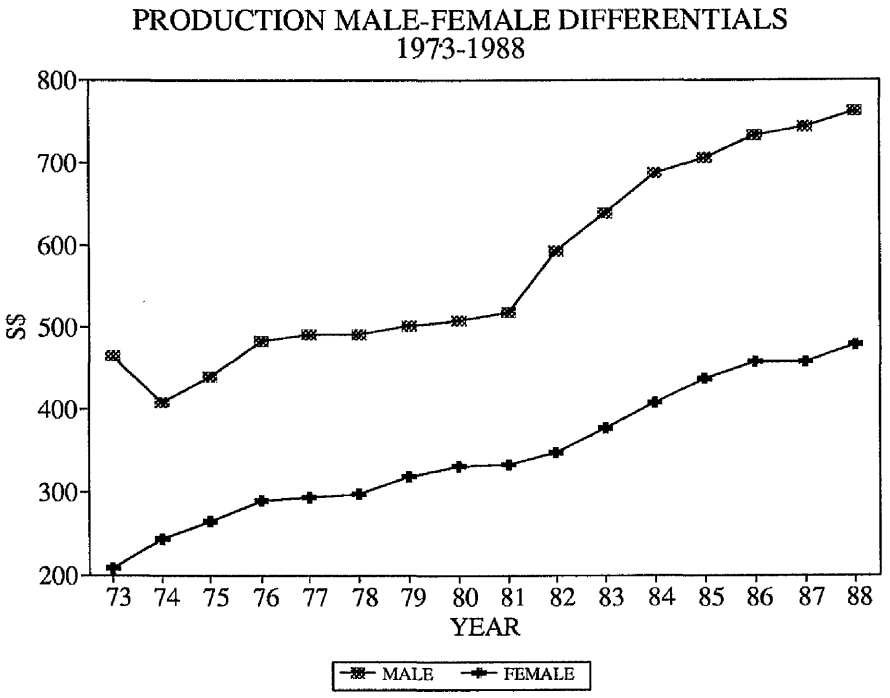
Source: same as Figure 5.3a. Graphed by author

Figure 5.5e



Source: same as Figure 5.3a. Graphed by author

Figure 5.5f



Source: same as Figure 5.3a. Graphed by author

There are two possible explanations. The simple one is that women are paid less as a result of pure discrimination. The other is linked to the issue of fertility and childbearing. More women, especially those with higher education, have been entering and remaining in the workforce. Based on the pattern highlighted in Table 5.2, these same women are also prevailed upon to have more children to arrest the declining fertility. Childbearing and childrearing require temporary but disruptive absences from the workforce which employers may anticipate and attempt to forestall by favouring men for high-level positions. These temporary absences may have a negative effect on female human capital accumulation and subsequent earnings levels (see discussion in Chapter Three). Either reason calls into question the benefits of future expansion of education for women, particularly at the higher levels.

The experience of Korea in this respect is illustrative. While gender inequality at all levels of schooling declined with increasing female participation especially at the secondary and tertiary levels, and an increased proportion of working women were in the 25-29 childbearing age, the male female wage gap in 1980 was wider in Korea than in any other country for which data was available from the International Labour Organization (Amsden 1989). About 60% of the male female gap in Korea could be explained by differences in human capital. It was estimated that 27.6% of the gap is due to differences in education and 31.8% due to differences in experience as women have been forced to leave paid employment when they marry. The wage differential between the sexes is rooted in discrimination both before and in the labour market. There are almost no women in managerial positions in the primary manufacturing sector. Amsden cited this as one of the reasons why Korea was able to maintain her competitiveness in labour-intensive manufacturing activities which employed primarily females.

Table 5.12
Profile of High-Income Earners
(defined as those who earn over $3000 a month)

Number of people earning $3000 plus		
$3000 plus monthly	65902	
% of total employed	5.4%	
Those who are men	55875	
As % of high-income earnerse	84.8%	
Those who are women	10027	
As % of high-income earners	15.2%	
Those who are Singaporeans	49252	
As % of the total	74.7%	
Those who are Non-Singaporeans	16650	
As % of the total	25.3%	
Nature of job held	% Men	% Women
Administrative, Managerial/Executive	50.0	51.9
Professional/Technical	31.0	36.4
Sales	10.2	7.0
Others	8.7	4.8
Employment Status		
Employees	73.9	84.2
Employers	22.9	12.8
Self-employed	3.2	2.9
Highest Qualification Attained		
Never attended school	0.7	1.9
No Qualification (below PSLE)	1.7	0.5
PSLE or equivalent	5.3	2.9
O" or "N" level or equivalent	18.0	18.7
"A"-level or equivalent	25.5	20.1
University degree	46.6	52.4
Other Qualification	2.2	3.5

Sources: The Straits Times 24 May 1989, based on the Report of the Labour Force Survey of Singapore 1988

If Singapore women do have more children, increased demand for childcare facilities and childminders is unavoidable.[14] At present, foreign maids from Malaysia, the Philippines, Thailand and Sri Lanka form the bulk of childminders. Pronatalist policies and the resultant increased demand for them, *ceteris paribus*, is inconsistent with the policy to reduce the number of unskilled foreign workers in the economy.

The government will have to decide on the tradeoff between increasing female labour participation on the one hand and raising fertility levels on the other. If emphasis is given to increasing fertility, the potential conflict between the need for foreign childminders and the aim of reducing dependence on all foreign workers will need to be addressed. The solution would appear to lie in greater public investment in childcare facilities.

5.5. Foreign Workers and Immigration Policy

The issue of working women is closely tied to foreign worker policy. This is the area where government and industry diverge the furthest and where there have been the most contradictions and reversals.

5.5.2. Participation of Foreign Workers

Most foreign workers come from Malaysia, Thailand, Sri Lanka, the Philippines and India. Since non-residents come primarily to work, their participation has been high, rising from 48.2% in 1970 to almost 70% in 1980. In 1988, 72% of foreign workers were economically active compared with 63% of the resident population. The participation rate for non-resident males was 87.4% in 1988

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14. The government has suggested alternatives to childminders such as stopping work after the birth of the child, help from relatives and neighbours, creches and foster care and part-time local domestic help. The implications of the first have already been touched on.

compared with 78.5% for local males. 62% of non-resident females were economically active compared with 48% of the female citizen population.[15]

5.5.3. Sectoral Distribution[16]

In 1980, the majority of non-resident workers were employed in the manufacturing sector. The non-resident percentage of that workforce rose from 3.5% to 11.3% from 1970 to 1980 (Tsao 1985). Their dominance very likely perpetuated inefficient labour utilization and probably contributed to the low productivity growth which slowed to 2.8% in the 1970s after averaging 8% in the 1960s.[17]. The construction industry displaced the services sector to emerge as the second largest source of employment, accounting for 20.2% of the non-resident workforce in 1980. Trade and transport & communications were the third and fourth largest sectors of employment of non-resident foreign workers respectively. While they accounted for 11% of all workers in Singapore in 1980, they comprised 27% of all construction, 16% of all manufacturing and 16% of all quarrying workers. They also made up 21% of all personal and household service workers.

5.5.4. Education and Earnings of Foreign Workers

Foreign workers were better educated local workers and were disproportionately represented among the tertiary-educated. In 1980, 11% of non-resident workers had tertiary qualifications compared with only 3% of Singaporean workers. Foreigners accounted for nearly a third of all tertiary educated workers in Singapore (Pang and Lim 1981). In 1988, they constituted 15% of all workers earning more than S$3,000 a month (Table 5.2).

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15. Figures for 1970 and 1980 were obtained from Economic Research Centre, Labour Force Trends 1957-1980. 1988 figures were calculated from Table 9, Report on the Labour Force Survey of Singapore 1988

16. Figures for 1988 are not available.

17. According to Tsao, the foreign worker hypothesis is one of three hypotheses accounting for the low productivity in Singapore manufacturing in the 1970s, the others being the absence of technological adaptation by foreign investors, and a relatively low technological capability and lack of domestic entrepreneurship. See Tsao (1985)

Male and female non-citizen workers earned more than citizen workers. In 1980, a secondary educated non-citizen male earned 2.5 times the mean income of a similarly educated citizen male and nearly as much as a tertiary educated citizen male, who earned only 58% of a similarly educated non-citizen male (Lim and Pang 1981).

5.5.5. Reasons for reducing dependence on foreign labour

Of late, sources of foreign workers have been drying up. The establishment of labour-intensive manufacturing industries in neighbouring countries has expanded employment opportunities and workers who would have come to Singapore to work are increasingly finding jobs at home.

With hindsight, easy access to foreign labour together with low wages retarded economic adjustment and upgrading to more capital-intensive methods of production and perpetuated industries that could never have been supported by local manpower and skills. It discouraged the hiring of older workers which under the present wage system would also have raised costs substantially. This is discussed in detail in Chapter Six. Large numbers of foreign workers also increases the need for housing, public transportation social services and recreational facilities. Large foreign enclaves may breed social tension within the citizen community. The government has attempted to reduce demand for foreign workers by increasing their price and also by quantitative restrictions.

i. Quantitative restrictions

Until early 1990, work permits were granted only to workers engaged in those industries and companies deemed to contribute most to the country's exports, industrial upgrading and economic growth[18]. A policy reversal that year allowed foreign workers into all sectors of the economy where they can make up a maximum of 40% of the workforce in manufacturing establishments and 10% in service

18. Straits Times, 1 September 1989

enterprises. For the economy as a whole, foreign workers cannot exceed one quarter of the workforce.

Following the "wage correction policy", the rate of increase of the foreign workforce slowed to 6% from 14% between 1970 and 1980. In 1988, there were 124,082 non-resident workers in the economy, comprising about 10% of the employed population. This suggests, *prima facie*, that quantitative controls have been effective.

ii. Raising the Cost of Hiring Foreign Workers

The government has imposed a tax on employers for every foreign worker hired to ration the available supply among those firms and industries that can afford the higher cost. It is also intended to spur capital-labour substitution by raising the cost of hiring an unskilled relative to a skilled worker. The levy structure is set out below.

Table 5.13
Foreign Worker Levies

	Domestic Services	Manufacturing	Construction
1984	$ 120	$ 170	$ 200
Jan 1, 1989	$ 160	$ 220	$ 220
July 1, 1989	$ 200	$ 250	$ 250

Source: The Straits Times, various issues

Nevertheless the information garnered by this writer from interviews with firms suggests that excess demand for foreign workers persists. Casual and survey evidence suggest that firms, particularly in labour-intensive, technologically stable industries, are finding it difficult to find viable substitutes to unskilled and semi-skilled foreign labour. Citizen workers are not interested in performing the menial, blue-collar tasks that are presently being undertaken by foreign workers. Moreover the extent of capital-labour substitution, determined by technological

possibilities, may be constrained by increasingly shorter product life cycles and customized production.

5.5.6. Demand for Skilled Foreign Labour: A Selective Immigration Policy

On the other hand, professionals and skilled workers are welcome. They are usually recruited on longer term contracts with an offer of permanent residence and eventual citizenship. Skilled foreign workers are needed to augment domestic supplies and to replace those who have emigrated. In the last few years, 3000-4000 citizens have emigrated, 40% of whom had at least post-secondary qualifications and 30% were tertiary graduates.[19]

The most recent attempt to counteract this drain was promulgated in July 1989. A new selectively liberalized immigration policy opened the door to technicians, craftsmen and skilled workers. Previously, those who sought permanent residence in Singapore had to fulfil fairly stringent length-of-stay requirements and entrepreneurs had to invest in a venture capital project approved by the EDB.[20]

Now, prospective immigrants need to have at least a secondary education, earn at least S$1,500 a month and worked for 5 years. Alternatively they need to have at least five GCE "O" levels or an acceptable trade certificate. The new policy applies to immigrants from all sources, regardless of ethnic origin, provided they can be integrated into Singapore society without upsetting the balance in the multiracial character (Straits Times July 11, 1989).

Because of the special conditions in Hong Kong, qualified Hong Kong applicants will be granted in-principle approval for permanent residence valid initially for five years. This arrangement gives prospective immigrants the option of becoming permanent residents at a time of their own choosing. Of the 16,000 who have been granted permanent resident status since July 1989, 588 have taken up residence.

---

19. Straits Times, 30 July 1989
20. The current investment requirement is S$1 million.

5.6. Conclusion

The finding that the labour market is segmented against women is one that requires further investigation, particularly within the context of the dual role that women are expected to play. If women are not receiving returns in the labour market on par with their male counterparts, greater benefit may be obtained at the margin by investment in childcare to encourage higher fertility, rather than by additional investment in education, especially at the higher levels.

Published labour market data and an independent survey conducted by the author confirm the continued strong demand for unskilled and semiskilled workers. Because of shrinking labour force growth, limited substitution possibilities between foreign and local workers, and narrower substitution potential between capital and unskilled labour due to the increasingly customized nature of production, it is envisaged that this demand will persist in the foreseeable future.

This small number of skilled professional workers who have actually taken up residence in Singapore sounds an ominous note in the selective immigration programme and is but one reason to appraise the policy that manufacturing should continue to be the bulwark of the economy. The case for services, with respect to manpower demands and in the light of the recession, is examined in the next chapter.

CHAPTER SIX:
WAGES, RECESSION AND ADJUSTMENT

In this chapter, statistics are manipulated to evaluate the effects of the recession in 1985. It was found that wage rigidities magnified the intensity of the collapse in demand. The aftermath of the downturn witnessed a resurrection of the manufacturing vs. services debate, particularly with respect to their respective manpower implications.

6.1. The Regulation of Wage Setting

Wage policy exercised through the National Wages Council (NWC) was instrumental in maintaining full employment and Singapore's comparative advantage in labour-intensive manufacturing in the 1970s. Although the guidelines were not mandatory, they were in practice adopted by all major bargaining groups and in effect, set a floor to annual wage increases. The recommendations are set out in Table 6.1. All are in nominal terms.

The 1970s recommendations were modest and undifferentiated by skill, performance or sector.[1] Figures 6.1a and 6.1b depict the wide variation in productivity between sectors but the 1979 coefficient of variation of inter-industry earnings, 0.209, was not significantly different from the 1972 figure of 0.203 (Pang 1981). This pattern is brought out in Figure 6.2. The NWC guidelines restrained adjustment of labour supply to changing patterns of demand (Pang and Quek 1980).

6.1.2. Repercussions

The low wages encouraged inefficient labour utilization and probably contributed to manufacturing's poor productivity performance in the 1970s (Tsao 1985). A "corrective wage policy" involving significantly higher NWC wage guidelines for the years 1979-1981, was designed to boost productivity through capital-labour substitution and thereby lift the economy out of the "low wage trap". Grubel (1989)* observed that this "low wage trap" was not a case of market failure, but the unfortunate outcome of an unsuccessful attempt at centralized wage setting. He

---

1. The 1980 and 1981 guidelines recommended a two-tier system of wage increases to reward above average workers. These were later discarded because of the difficulties in evaluating performance and the detrimental effect on morale.

* Grubel, Herbert G. (1989) "Singapore's Record of Price Stability 1966-84", Management of Success: The Moulding of Modern Singapore, Kernial Singh Sandhu and Paul Wheatley eds., Singapore: Institute of Southeast Asian Studies

Table 6.1
NWC Wage Recommendations

YEAR	
1972	8%
1973	9%
1974	10%+$40
1975	6%
1976	7%
1977	6%
1978	6%+$12
1979	7%+$32
1980	7.5%+$33+3%
1981	6-10%+$32+2%
1982	2.5-6.5%+$18.50
1983	2-6%+$10
1984	4-8%+$27
1985	3-7%
1986	Wage restraint
1987	Wage restraint
1988	Total wage increase should be given in two parts: a moderate basic wage and a productivity linked variable payment

Source: Singapore, Ministry of Labour Yearbook of Labour Statistics 1988

believed that in the absence of NWC guidelines, workers' wages would have risen more quickly, capital-labour substitution would have gone on continuously, labour productivity would have grown correspondingly and the pressure to allow foreign workers would have been smaller. There would have been no "low wage trap" and no need for subsequent "wage correction". As a result of a comparison of the behaviour of real wages and productivity changes between 1973 and 1984, he concludes that NWC wage setting either undershot or overshot productivity growth, although he concedes that no one knows what the pattern would have been otherwise.

The 1979-1981 wage reversal affected the sectors differently. Where wages accounted for a lower proportion of total costs and where capital-labour substitution was technically feasible as in manufacturing, wages rose by 19% between 1979-1982. The impact was less than in the non-traded services sector where wages formed a far greater percentage of total costs and where there was less scope for automation. Wages in manufacturing rose by 19% between 1979 and 1982, while in

the tradable finance & business, and transport & communications sectors, wages rose by 15% and 18% respectively. The impact in these sectors was diffuse partly because these activities were already reducing their manning ratios (Economic Research Centre 1980). In non-traded services where small low-wage labour-intensive firms proliferated, real wages increased by 27% over the three year period, most of which were passed on to the consumer. Earnings in construction rose by 21%. Wages in trade and manufacturing rose most rapidly because the fixed quantum favoured the high proportion of low salary workers.

6.1.3. Perpetuation of Wage Rigidities

Centralized wage setting exacerbated the already weak link between workers' wages and productivity. Wages and salaries in the Singapore system were governed largely by length of service which did not adequately reflect changing company and economic conditions.

The Report of the National Wages Council Subcommittee on Wage Reform (1986) listed the following sources of rigidity:

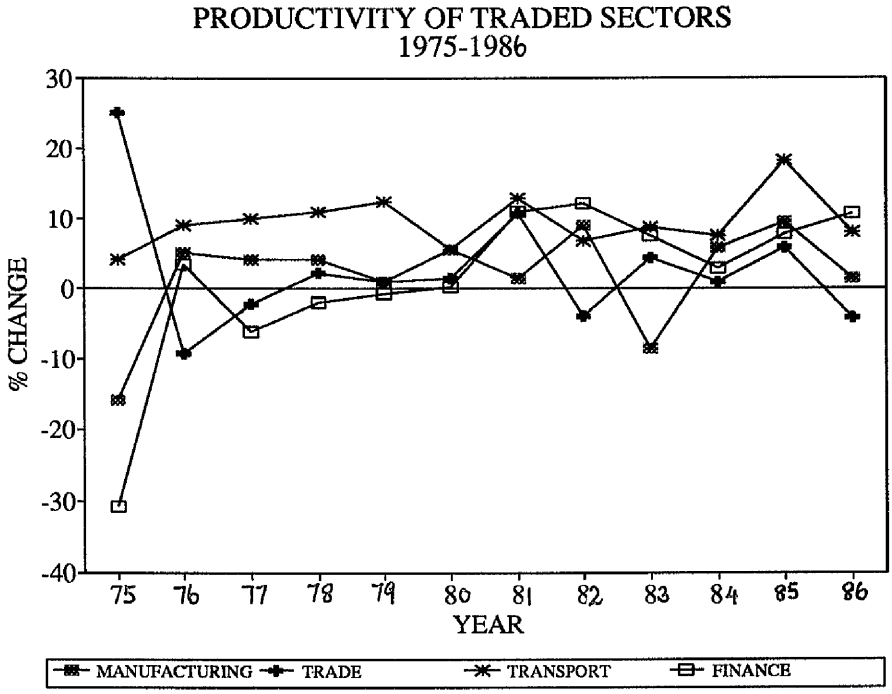
> Annual increments were determined in collective agreements for 2 to 3 years.
>
> NWC guidelines did not take sufficient account of company and individual performance. The guidelines were used to top up annual increments when the guidelines were higher.
>
> More importantly, all annual increments and NWC wage adjustments, once granted, were permanently built into the salary structure. The annual wage supplement was not adjustable and its payment based on the quantum frozen by law as at 1st July 1972.

Setting annual increments for the duration of collective agreements provided security of income but meant that wage increases, once given, were incorporated into the basic salary and difficult to adjust downwards. The wage system thus had a "ratchet effect".

Seniority was overemphasized. Theoretically, a worker's pay should increase according to his productivity. This productivity growth will diminish towards the end of his working life and the rate of growth of his wages should reflect this. In practice, annual increments were expected to be maintained, if not increased with every new collective agreement. This meant the the wedge between wages and productivity grew larger towards the end of working life.

Figure 6.3 shows the wage differential between the maximum and minimum of a typical salary scale for male manual workers in the manufacturing sector in various countries. The salary ratio for European countries is less than 1.3. For Japan the salary ratio is 1.8. On the other hand the salary ratio in a typical Singapore electronics company is 2.2 while that for a clerk in the same company is 2.8.

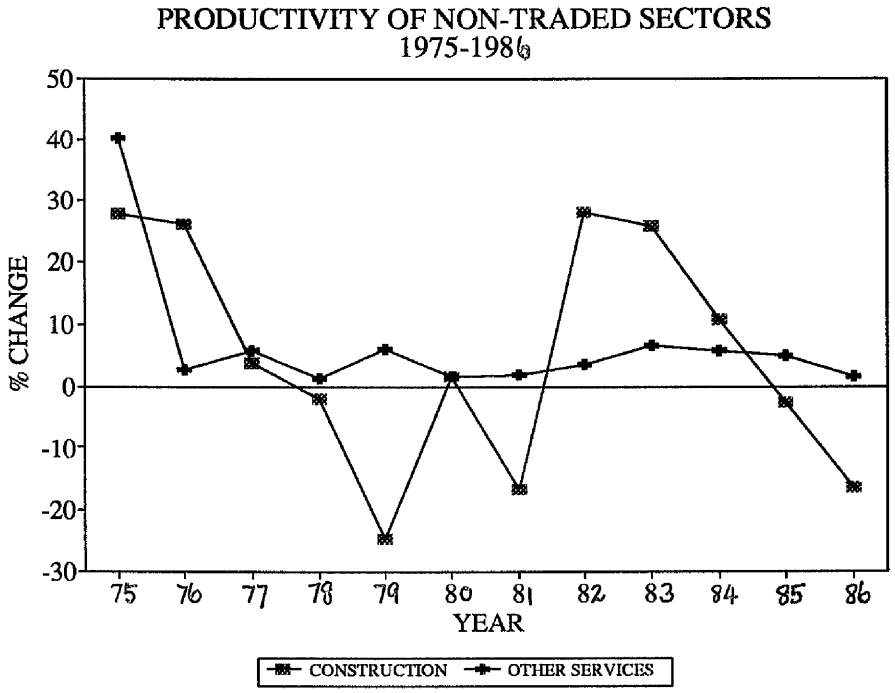
Figure 6.1a



Notes: Productivity = GDP 1968 factor cost/Employment

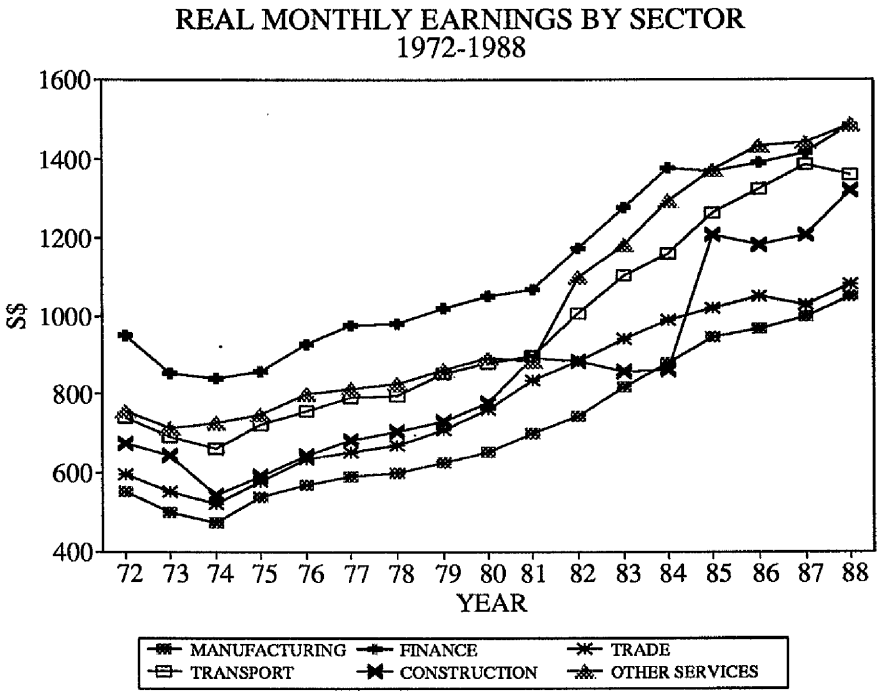
Source: Economic and Social Statistics 1960-1982
Economic Survey of Singapore 1986
Graphed by author

Figure 6.1b



Other Services include Public Administration, Community, Social and other services.
Notes and Sources: same as Figure 6.1a. Graphed by author

Figure 6.2



Notes and Sources: Same as Figure 6.1b. Graphed by author

6.1.4. Rise of Real Unit Labour Costs

Although "wage correction" was intended to be a one-off affair, the high recommendations generated expectations of further increases. In a world of rational expectations, sudden wage increases would have had little or no real effect on wages but imperfect information and sharp changes produced an upward effect on expectations, and these were translated into higher costs.

From 1979 to 1981 increases in total labour costs (which included wages, CPF and other wage-related costs) exceeded productivity growth by an average of 3% points per annum, and the gap increased to an average of 9% points for 1982-1984 (Table 6.2). Real hourly earnings for 1979 to 1984 grew by 7.1% in real terms while productivity only managed to grow by 4.9% annually.

As a result, unit labour costs in manufacturing rose by 40% over the 6-year period between 1980 and 1985 (The Singapore Economy: New Directions 1986, p. 41). These increases eroded competitiveness by 50% against Hong Kong, 15% against Taiwan and 35% against South Korea. The rate of return on capital in the private sector declined from 22% on 1980 to 18% in 1984, and that in manufacturing was halved from 33% to 16.5% over the same period.[2]

Table 6.3 shows the indices of unit labour costs of the Asian Newly Industrializing Countries (NICs). It is clear that by 1985, unit costs in Singapore far exceeded her competitors.

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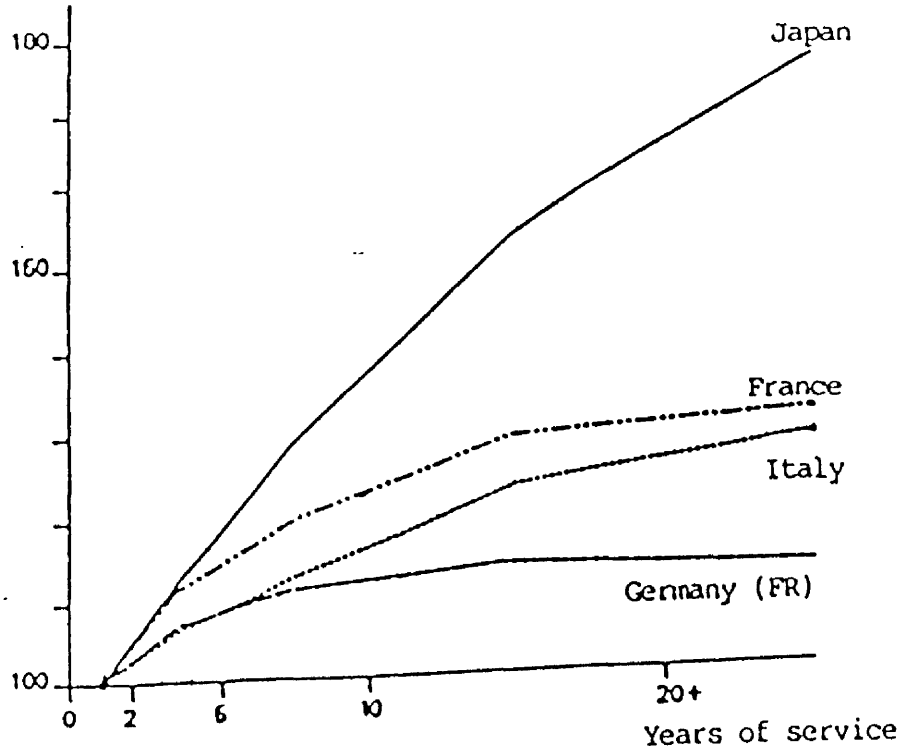
2. The rate of return on capital in the private sector is the ratio of gross operating surplus to gross capital stock in the private sector. The Singapore Economy: New Directions, 1986, p. 43-44

Figure 6.3
Wage Index of Manual Workers in Manufacturing by Length of Service in Selected Countries.



Japan: Gross monthly earnings less bonus payments. Other countries: Gross hourly earnings
Source: Figure 2.1., Report of the National Wages Council Subcommittee on Wage Reform

Table 6.2
Wages, Total Labour Costs and Productivity
1973-1985

	Average Monthly Earnings		Total Labour Costs		Real Productivity Growth
	Nominal	Real[1]	Nominal	Real[2]	
Av 1973-78	9.7	1.7	9.1	1.2	2.7
Av 1979-81	11.9	4.7	14.4	7.4	4.8
Av 1982-84	11.2	8.3	12.5	12.8	4.3
1985	3.0	2.5	-0.2	-0.5	3.0

Notes: 1. CPI was used as the deflator. 2. A separate deflator that measures the product price of each sector was used.

Source: Table 2.1, The Singapore Economy: New Directions

Table 6.3
Indices of Unit Labour Costs of Asian NICs taking into account Productivity Levels (Manufacturing)

Country	1980	1981	1982	1983	1984	1985p
Singapore	100	109	127	137	139	140
Taiwan	100	115	115	110	115	111
Hong Kong	100	95	100	79	69	78
South Korea	100	97	105	106	98	101

p=preliminary

Source: Table 2.1 Report of the National Wages Council Subcommittee on Wage Reform 1986.

6.2. Recession and Adjustment: Wages, Productivity and Employment

Since 1979 the divergence between wages and productivity[3] was most pronounced in manufacturing (Figure 6.4), a situation exacerbated by the strong Singapore dollar which at the time moved more or less together with the US dollar.[4]

---

3. Productivity is defined as the ratio of physical output as measured by value added at 1985 prices contributed by each worker.

4. In 1981, there was a shift away from monetary towards exchange rate targetting, coinciding with an emphasis on a strong exchange rate to stabilize domestic prices and to support the restructuring policy. Monetary policy was then aimed largely at maintaining a strong exchange rate for the Singapore dollar. The underlying rationale is that for an open economy like Singapore, the exchange rate is the relatively more important anti-inflation instrument. Price stability was the prime objective and the emphasis was given to a strong exchange rate policy.

As a result, Singapore's real effective exchange rate as measured by unit labour costs appreciated by nearly two-fifths between 1976-78 and 1984 (Balassa and Williamson 1987). Productivity dropped in 1982 when output fell as a delayed result of the global recession before recovering in 1983 and 1984 when the erosion of competitiveness was offset by a boom in construction and demand for computers and their peripherals. In 1985 demand in both these industries collapsed at the same time, construction by 14% and manufacturing by 4% with the decline being most marked in export-related industries. Output of petroleum industries fell as traditional suppliers began refining their own oil as did demand for oil rig construction. The running down of inventories of computers, peripherals and electronic components built up in 1984 meant there were fewer orders and output of the electronics industry fell by 6%. Industries engaged in the production of building materials also suffered a fall in output due to the slowdown in construction. Productivity slumped in the first stages of the downturn before rising sharply in 1986 with the rapid shedding of jobs in several industries together with moderated wage growth.

In finance and business, the wage-productivity gap also widened from 1982 (Figure 6.5). But in contrast with manufacturing, productivity continued to rise after that and peaked in 1985. Growth was led by international services, viz. transport, banking, communications, and financial and business services. Taken as a whole these services grew by 14% per annum in 1979-1984, and accounted for 33% of GDP in current prices in 1984, which was 1.5 times the share of manufacturing. Moreover the growth of these industries rested on a healthy average productivity growth of 9% per annum. The 1984 level of value-added per worker in these services, $48,000 in 1980 market prices was twice the national average.[5] In 1985 however, as overall demand for bank loans slackened, this sector expanded by a mere 3%, a vast slowdown on the 14% growth of 1984.

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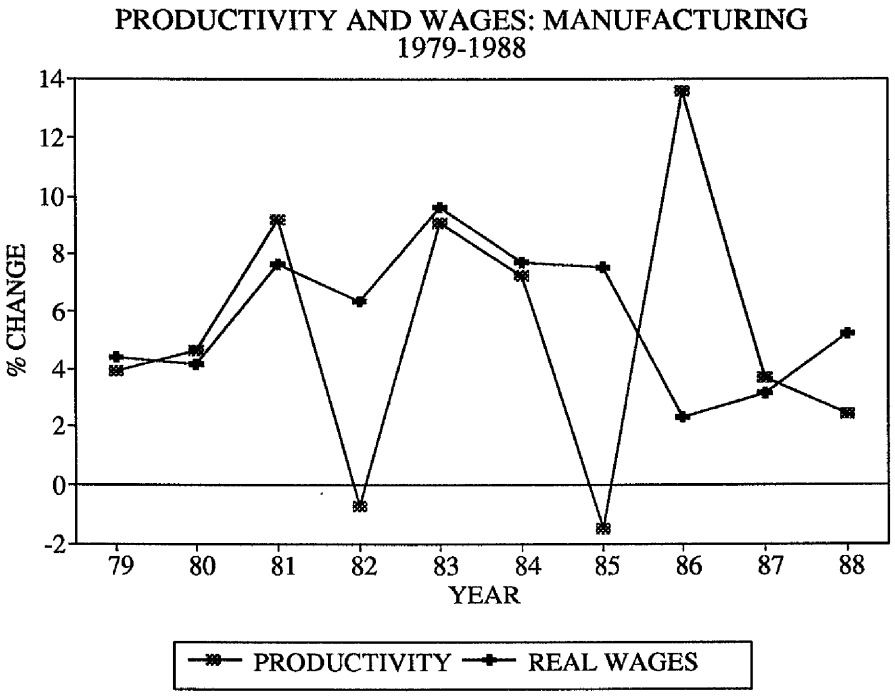
5. Singapore Economic Development Board, Economic Survey of Singapore 1985, p. 12

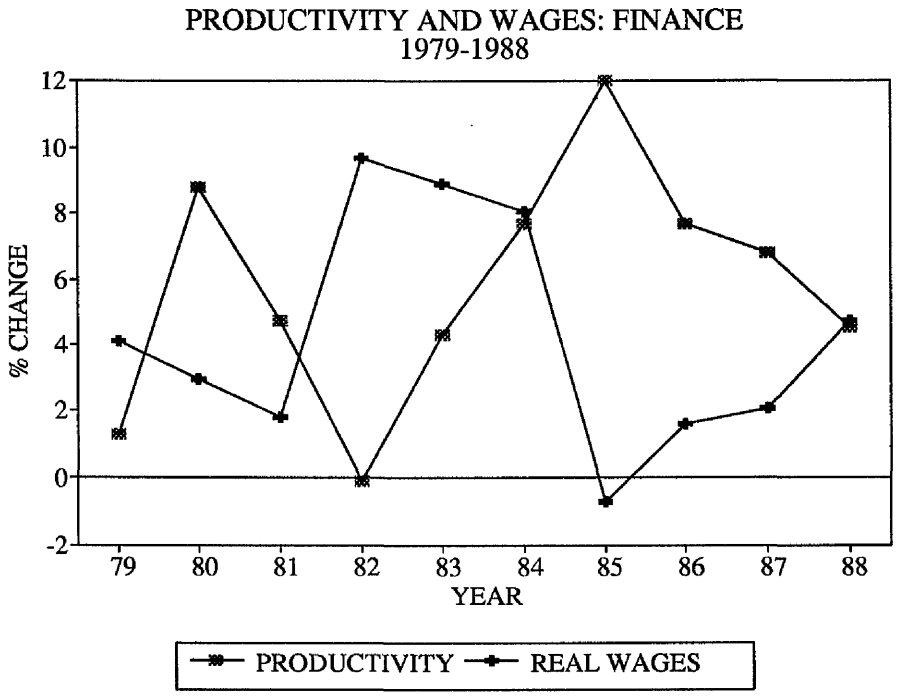
Figure 6.4



Notes: Productivity: Value added per worker at 1985 prices

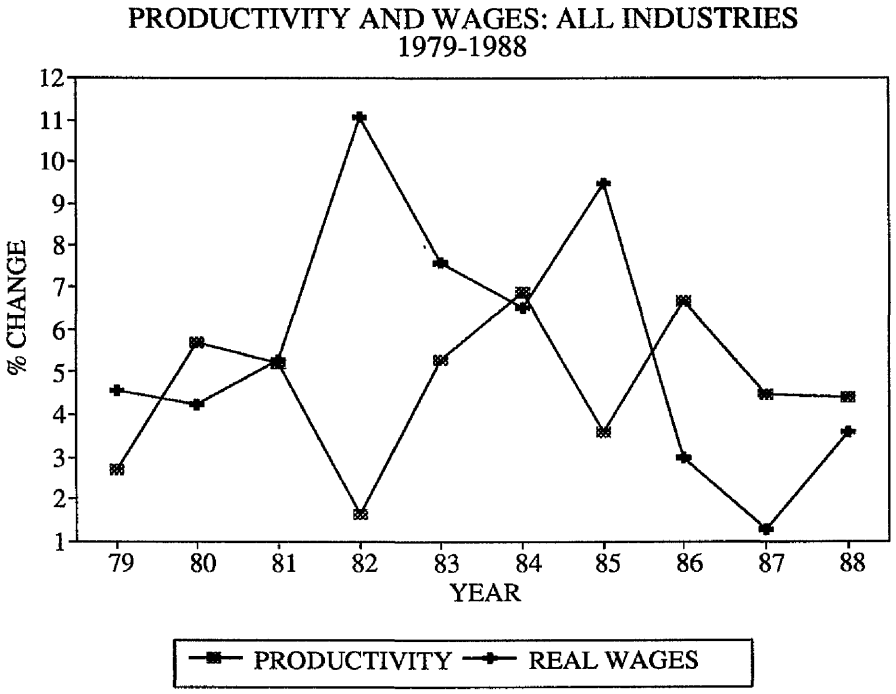
Source: Yearbook of Statistics Singapore 1988
Graphed by author

Figure 6.5



Notes and Source: same as Figure 6.4. Graphed by author

Figure 6.6



Notes and Source: same as Figure 6.4. Graphed by author

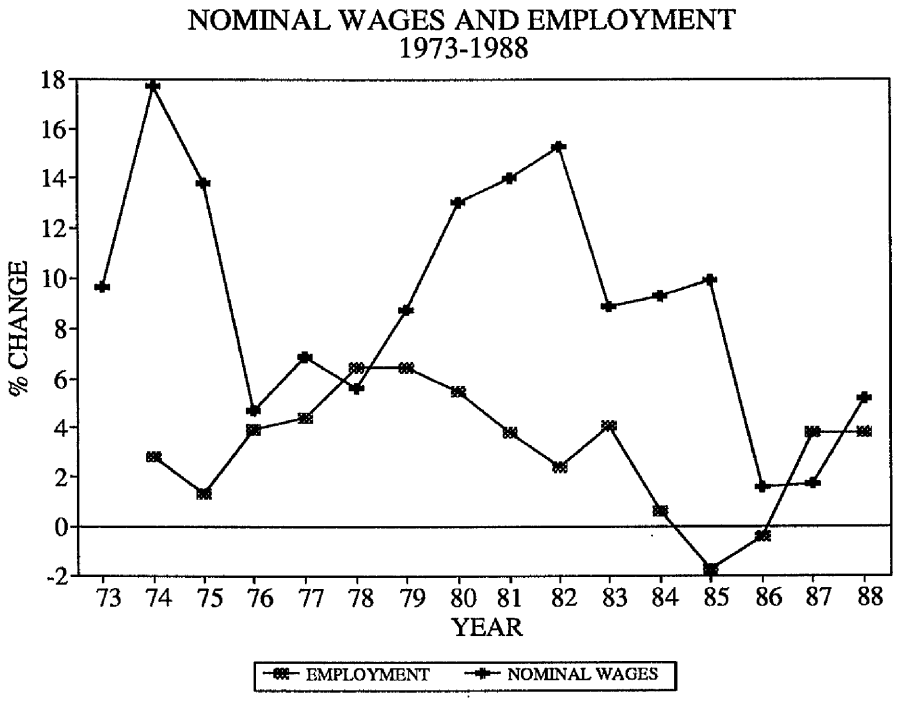
Economy-wide productivity levels, as measured by value added contributed by each worker at 1985 prices, has been equally volatile (Figure 6.6). The rate of wage growth exceeded productivity growth in both the 1982 and 1985 recessions. In 1985, GDP at current prices fell by 3.8% but workers continued to enjoy a real wage increase of 3%. The brunt of the recession was borne by employers whose profitability was squeezed by high wage costs and by those workers who lost their jobs. In the light of the collapse of the world market for electronics, the level of physical output was maintained which helped to boost the level of manufacturing value added in 1985. If productivity had not been maintained at these levels, it is likely that the employment shakeout would have been much worse. The trend was reversed in 1987 as wages resumed their upward climb in the wake of the economic recovery.

Graphs 6.7a and 6.7b trace the movement of wages and employment for the last 15 years. Real wages have been volatile, reaching its peak rate of increase in 1982, the final year of the "wage correction policy". They slid for the next two years and unexpectedly rose by 3% in 1985, the trough of the recession. Nominal wages also rose but only by about 1%. Wages continued falling until 1987 and then made a slight recovery. For the economy as a whole in 1985, employment fell significantly faster than wages. In the midst of a 1.6% decline in GDP and a total employment decline of 96,000, real wages continued to rise by 3%. Wages outstripped productivity even in a recession and only reached their trough in 1987 when the economy had picked up.

Figure 6.7a

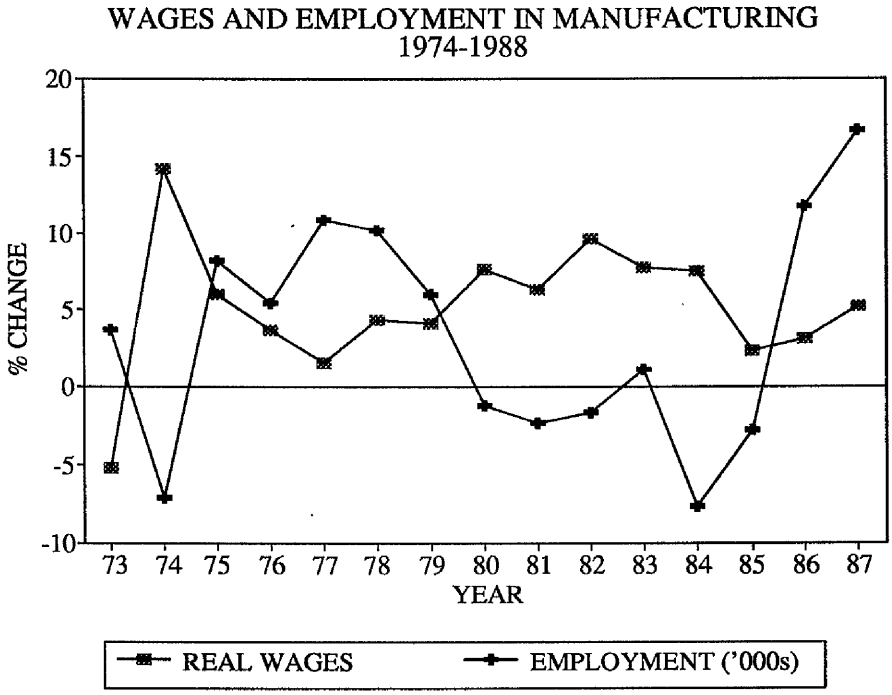
Source: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988
Graphed by author

Figure 6.7b



Source: same as Figure 6.7a. Graphed by author

Figure 6.8

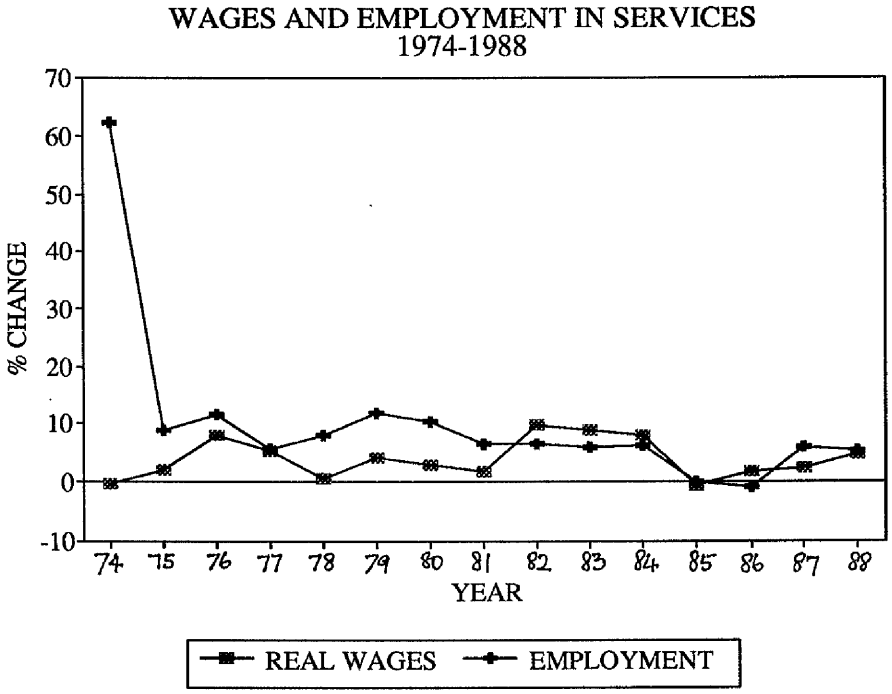


Source: same as Figure 6.7a. Graphed by author

The patterns of wages and employment highlight the different responses of financial & business services and manufacturing sectors (Figures 6.8 and 6.9). In the latter half of the 1970s, employment growth in manufacturing grew faster than real wages, indicating the positive impact of the low NWC guidelines on employment creation. From 1980 the trend reversed due to the wage correction policy with the rate of growth of real wages far surpassing that of employment. In 1985 employment fell first while wages followed a year later, reflecting the rigidities imposed by contractual wage agreements. In contrast, wage growth in finance and business did not diverge significantly from that of employment, indicating less pressure on wages. Both wages and employment fell sharply in 1985. The difference may be explained by the sectors' different skill profiles.

Unskilled and low-skilled workers form a far greater proportion of the workforce in manufacturing than in finance and business. According to figures supplied by the Singapore Ministry of Labour, workers with no and primary and post-primary qualifications on average constituted 60% of the workforce in manufacturing but only slightly more than 20% in services. The NWC guidelines, particularly the fixed quantum, raised the wages of the less skilled relative to the skilled and this differential was built into the wage structure. The finance and business sector seemed more able to respond to the changing conditions than manufacturing.

Figure 6.9



Source: same as Figure 6.7a. Graphed by author

6.3. Prospects for Restructuring

The recession should have cautioned against excessive government intervention in the market place. In fact, some (Lim and Pang 1984) have expressed doubt that the government can successfully create comparative advantage in high-tech manufacturing.

First of all, there are physical constraints. The lack of a domestic market means that output will have to be exported, the cost of which may well offset what other cost advantage Singapore may have *vis-a-vis* other competitive production centres. Because of the heavy capital and technology development costs, high technology industry is usually large scale and a small manufacturing sector like Singapore's may not be able to provide the diversity and depth of industrial linkages required by high technology manufacturing. Moreover these industries are material and energy-intensive, favouring locations with natural resources. While Singapore has access to imported fuel by virtue of its role as a major refining centre, it has to import all its material inputs and most of its capital goods.

6.3.2. Manpower Implications of Industrial Restructuring

More important are the manpower constraints. The restructuring programme rests on two assumptions:

> that restructuring will help to reduce what is regarded as an unhealthy dependence on unskilled foreign labour;
>
> that upgrading the average capital-intensity of industry will shift in demand from unskilled and semi-skilled, predominantly female labour to professional and skilled personnel.

Have these assumptions been borne out by the experience of the last ten years?

Strong demand for and limited supply of high level professional manpower worldwide will make it difficult for Singapore to attract the "critical mass" required to sustain a viable high technology manufacturing base. Singapore will have to compete with the developed industrialized countries for skilled and professional

labour by raising wages. At the same time, an increased supply of skilled foreign workers, *ceteris paribus*, may depress wages commanded by citizen workers. This may prompt the emigration of skilled and professional citizen workers who find that their skills are more amply rewarded elsewhere.

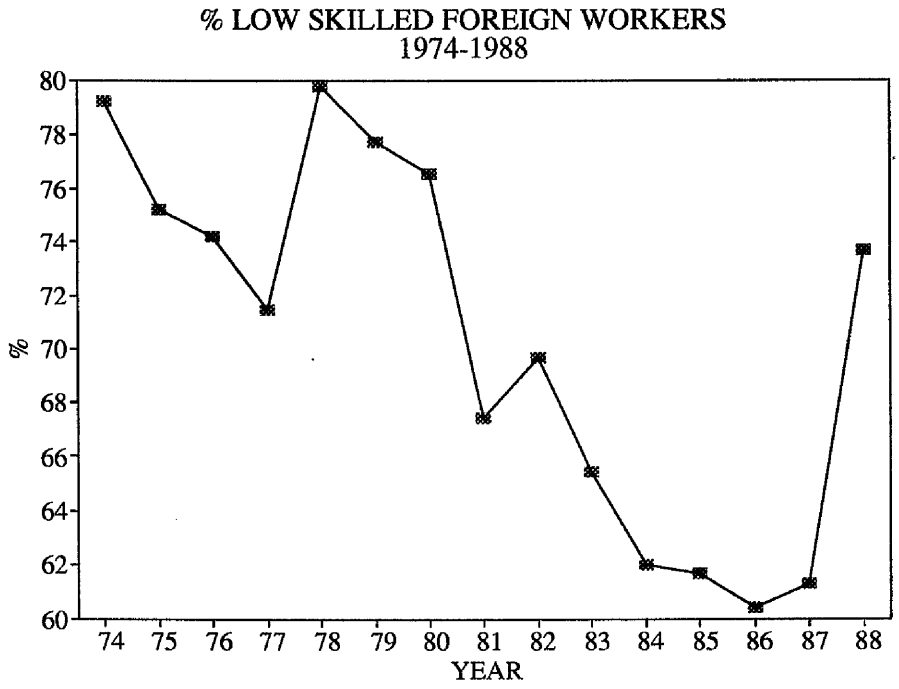
The task of reducing demand for unskilled foreign workers will take much longer than the initial timetable policy makers set out. The percentage of foreign workers engaged in lower wage occupations as a percentage of the total foreign labour force has only declined slowly[6] (Figure 6.10a). The percentage of low skilled foreign workers fell in 1980 but jumped sharply in 1982 after the end of the wage correction policy (Figure 6.10b).

Reduction in demand may be limited by finite substitution possibilities. While there is some evidence that physical capital is more easily substitutable for unskilled than for skilled labour (Griliches 1969, Hammermesh and Grant 1979, Grant 1981), Lim and Pang (1984) contend that the opposite may be true. Automation and computerization may have a "deskilling" effect where the skills demanded of machine operators are reduced. Shorter product life-cycles may work against investment in processes that generate returns over a longer period. Policy-makers may have underestimated these adjustment costs, which explains the decision to allow foreigners into all sectors of the economy to maintain output levels.

---

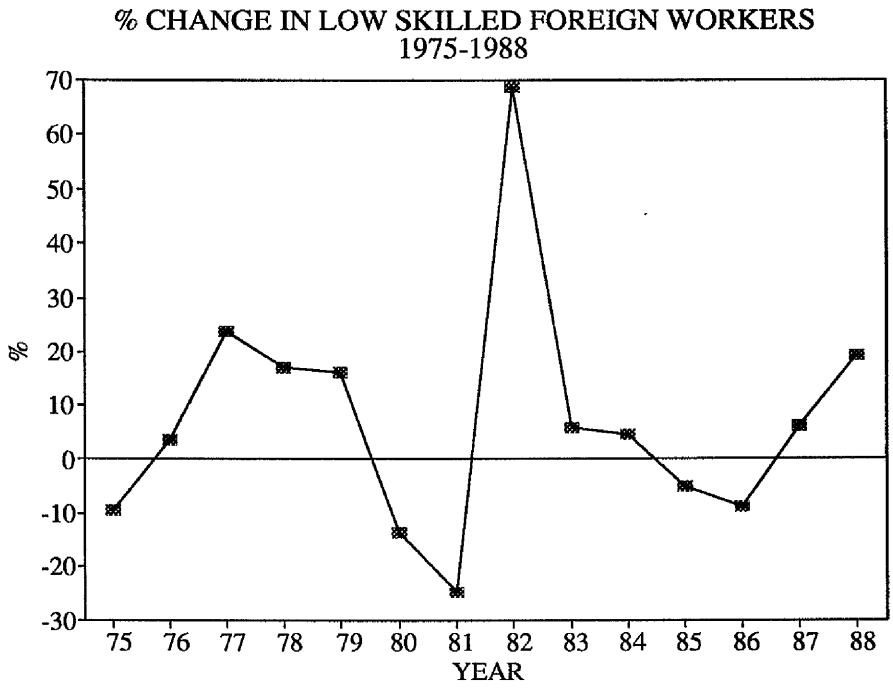
6. S$800 is taken to be the earnings cut-off for low-skilled workers. The cut-off for workers eligible for training grants is S$750 and S$800 was the closest available classification. Discussion of the training grant system is taken up in Chapter 9.

Figure 6.10a



Note: Low skilled foreign workers are defined as those earning less than S$800 a month.
Source: Singapore, Report on the Labour Force Survey of Singapore, various years.
Graphed by author.

Figure 6.10b



Note and Source: same as Figure 6.10a. Graphed by author

6.4. Services vs. Manufacturing

In a situation of inadequate domestic supplies and uncertain foreign supplies of labour, it is imperative to concentrate resources in those sectors where productivity and comparative advantage are the greatest. In Singapore, these would be the traded services sectors, not production-oriented manufacturing. While policy-makers continue to affirm the commitment to manufacturing, it has also been acknowledged that the greatest promise may lie in services.[7] The Economic Committee itself recognizes that

> "World service trade has in recent years been growing twice as fast as merchandise trade. This trend is likely to continue. This trend is important to Singapore. Our comparative advantage in exporting services is greater than our comparative advantage in exporting goods."
>
> -Report of the Economic Committee
> Ch.1 p.11

It goes on to say that the high GDP growth in the first half of the 1980s was generated by strong growth in international services which as a whole grew by 13% per year. International services accounted for 33% of GDP, about 1.5 times the manufacturing share.

Although labour-intensive manufacturing was the leading sector in the 1970s, the services sector as a whole enjoyed higher productivity increases than manufacturing. For 1970-1978 the average annual rate of labour productivity in manufacturing was 2.3% against 4.8% in the tertiary sector (Pang 1980). Between 1981 and 1988, productivity growth in services was on average 6.5% compared with 4.7% for manufacturing.[8] The 1986 level of value added per worker at 1980 factor cost in these services was $48,000, twice the national level. Moreover these were gained without the many advantages that manufacturing enjoyed. Of every Singapore dollar invested, the financial sector accounted for more than 50 cents in the mid-1980s compared with little more than 33 cents in the early 1970s.[9]

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7. Straits Times, 9 March 1985
8. Straits Times, 26 April 1989
9. Straits Times, 11 May 1985

The finance and business sector employs more skilled workers than any other sector. Out of every 100 workers, more than 25 are highly skilled compared with the national average of 15. In terms of value added the average Singaporean worker adds $14,000 but the finance worker adds more than double that.[10]

While manufacturing is the sector most dependent on foreign labour, the local content of the services sector is 75%, the highest of all sectors.[11] Two other factors will mitigate the skilled labour shortage under services. Foreigners of higher quality will probably be easier to import because Singapore is more likely to be world-competitive in the provision of traded services than intermediate manufacturing.

Furthermore, because productivity in the traded services sector has been higher than in manufacturing,[12] less labour would be required to achieve a given rate of output and income growth. Concentration on these services would reduce the overall level of labour demand for the same target rate of GDP growth by releasing unskilled labour for the labour-intensive non-traded services sector and skilled labour for professional jobs in the traded services sector.

That Singapore's competitiveness is shifting towards service rather activities is borne out by its gradual evolution into a "Total Business Centre". MNCs have begun to set up their operational headquarters (OHQs), international procurement centres (IPCs) and R&D centres in Singapore to carry out activities such as testing, quality control, purchasing, warehousing, sales and R&D. So far about 20 companies have established their regional OHQs in Singapore. A Singapore specializing in industry-oriented services would complement the labour-intensive production activities of her South-east Asian neighbours.

Despite acknowledgement of the comparative advantage of the services sector, manufacturing apparently retains its primacy in development strategy.

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10. Straits Times, 11 May 1985
11. Straits Times, 12 June 1986
12. see footnote 10

The Economic Committee believed that services could not plausibly replace the 50% contribution of manufacturing to the foreign exchange coffers. It felt that service activities such as finance & banking, and transport & communications were underpinned by a healthy manufacturing sector.[13] It further argued that the large percentage of the workforce employed by manufacturing could become more productive through training and earn more than they could do in services. It also contended that manufacturing was more amenable to automation, thereby presenting greater possibilities for optimizing on the use of scarce labour resources.[14]

The effort to encourage high value-added industry has sparked off a trend where labour-intensive firms have relocated their production facilities to Malaysia while retaining only their service facilities and headquarters in Singapore. In 1987, 58 projects worth M$135m relocated to Malaysia with 24 of these projects in Johor worth M$42. In 1988, 134 projects worth M$172m moved to Malaysia with 78 of these worth M$102m in Johor.[15] Many of these are engaged in textiles & garments, electronic and electrical goods and rubber processing.

The government has given its tacit approval to these moves as part of the strategy to "farm out" the most labour-intensive operations to neighbouring labour-surplus countries. But some observers have warned that while high technology industries command higher prices for its output and have the ability to pay more, they also tend to be more volatile, a drawback highlighted by the sudden world-wide downturn in the computer/electronics industry in 1985. While high-technology industries may and should be actively encouraged, this should not mean that industries at the lower end of the technology spectrum must be discarded. Both types of industries can and should co-exist to enlarge the economy's manufacturing and export base, provided they can pay for the skills they need.

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13. Although this is desirable, it is not a requisite. For example, Britain's banking sector is thriving despite a relatively weak manufacturing sector.
14. Singapore, The Singapore Economy: New Directions, 1986, Ministry of Trade and Industry
15. Business Times, 23 May 1989

6.5. Conclusion

This chapter has examined the effects of wage correction policy of the restructuring programme. Spiralling unit costs together with concomittant falls in both internal and external demand triggered off the most serious recession in Singapore's development history. The adjustment process highlighted rigidities in the wage structure which has implications for attempts to encourage firms to raise the retirement age of their workers voluntarily as well as for the amount of specific training that is undertaken by firms. A discussion on the latter takes place in Chapter Nine.

The manpower constraints and evidence hitherto seems to favour services over manufacturing as the bulwark of future economic growth. However, regardless of which eventually develops as the engine of growth in the next century, both will rely on an upgraded, flexible and skilled workforce. The policies for education and training, taken up in the following chapters, are examined in this light.

CHAPTER SEVEN:
THE PROFITABILITY OF EDUCATION

Cost-benefit techniques are used to assess the returns to the various levels and types of education. The following results are derived:
1. Engineering is the most lucrative field from the private point of view but is superseded by business and accountancy in terms of profitability for society as a whole.
2. The results also support the recent trend among school leavers favouring technical over academic training.
3. Pang's (1979) result that vocational education has little impact on earnings needs to be qualified, as it appears that its social profitability rose in the latter half of the 1980s.

7.1. Government Expenditure on Education

Figure 7.1 shows that expenditure on education was fairly stable from the early 1970s until the early 1980s. As a percentage of GDP, it remained stable at around 3% for 10 years before surging in the first half of the 1980s to peak at 5% in 1985. From 1970 to 1980, education expenditure grew at an average annual rate of 7.2%. The equivalent rate for 1980-1988 was 9.8% with the first five years of the decade registering an average annual growth rate of 17.1% (Appendix 5, Table 1). Increases in development expenditure accounted for the rise in the total. This was no doubt a direct result of the educational output targets outlined in the 10-year Development Plan for the 1980s which were discussed in Chapter 3.

7.2. Cost Structures: Fees and Subsidies

Table 3 in Appendix 5 shows that since 1981 the real cost of training has risen substantially for all courses under consideration. The cost of producing tertiary business and accountancy graduates escalated by 23% per year while that for arts and engineering rose by 11% and science, by 13%. In contrast, the cost of training at the polytechnics rose by slightly less than 9% while the real overall cost of training at the vocational institutes only rose by 2% in the period 1980-1988.[1]

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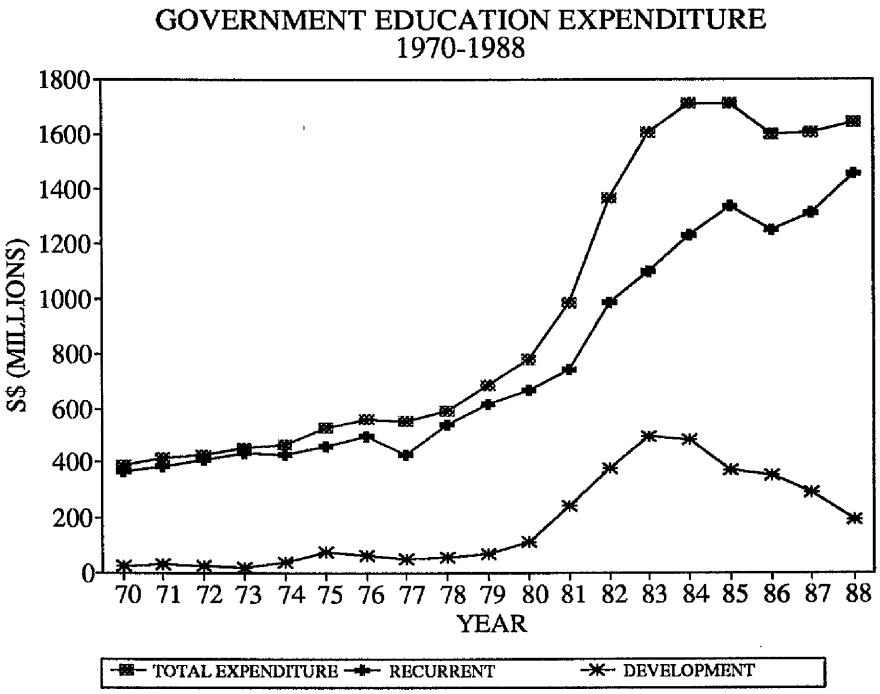
1. A brief outline of the educational system is provided in Appendix 6.

Figure 7.1



Sources: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988. Graphed by author

Figures 7.2 and 7.3 show that real costs declined slightly in the first half of the 1980s. They rose sharply in 1984 due to the implementation of expansion plans recommended by the Council for Professional and Technical Education (CPTE) in 1979. Fees however, were only increased slightly that year as subsidy percentages rose to beyond past levels but have since started to decline gradually. It was in 1987 that tuition costs climbed steeply. The sharp increase reflected a new policy line - that fees borne by university students should better reflect the true cost of that education. Table 7.1 shows the breakdown of the government education bill. In 1986, universities accounted for only 3% of the total student population but consumed 20% of recurrent expenditure.[2] In 1988, S$13,000 was spent educating a university student against S$2,300 for each pupil in all other levels, the polytechnics and the VITB.[3] The long term aim is reduce subsidies to between 60% and 70% of operating costs.[4] But the government has categorically stated that no student who is capable of successfully acquiring a university education shall be denied one because of fees and has made available a wide range of scholarships and bursaries. For the 1988/89 academic year, 17% of the total undergraduate population applied for government loans. 2% of the undergraduate population, needed additional help from the universities.

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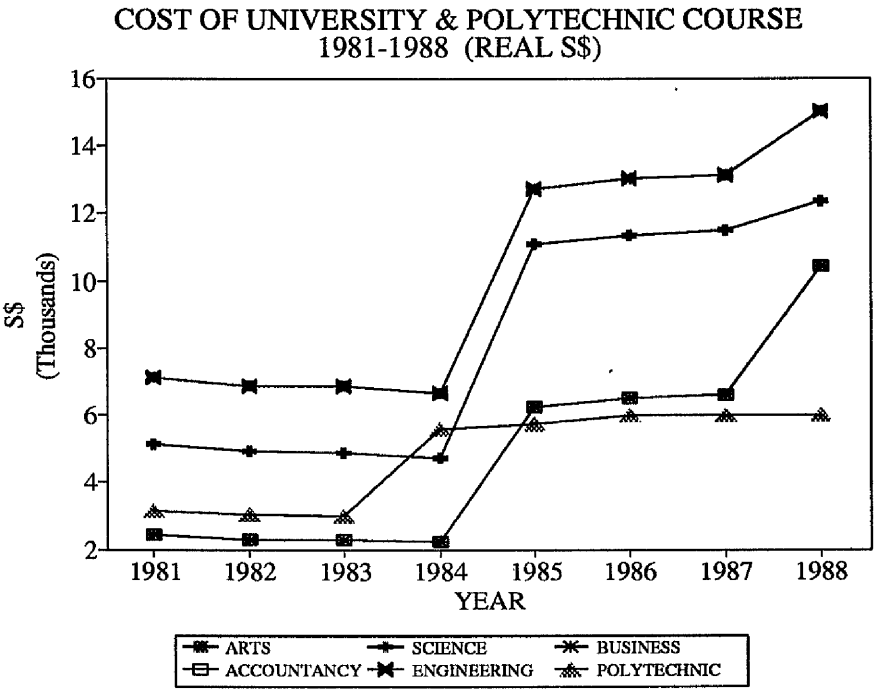
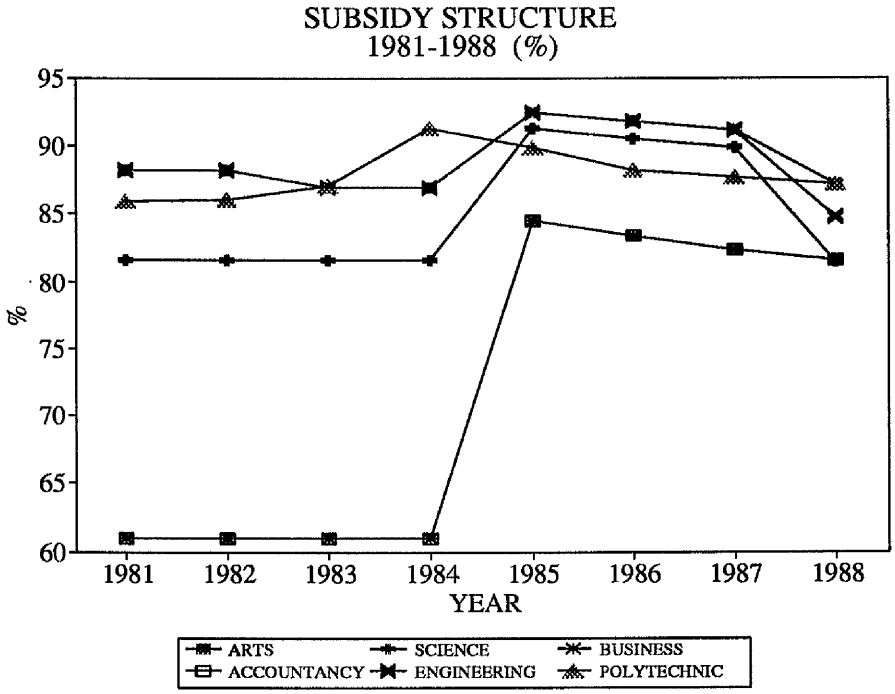
2. Straits Times, 5 March 1987. The Minister for Education, Mr. Tony Tan also explained that the government was also in the process of implementing its proposal to turn all secondary schools into single session schools. This meant the building of another 40-50 schools costing over S$1 billion, excluding running costs. In addition the aim of reducing class sizes necessitated the training and employment of an additional 3,500 teachers, which would amount to an increase of S$150 million in annual recurrent cost.
3. Straits Times, 18 March 1989
4. Ibid.

Figure 7.2



Sources: same as Figure 7.1. Graphed by author

Figure 7.3



Sources: same as Figure 7.1. Graphed by author

Table 7.1
Government's Education Bill 1986

	Recurrent Expenditure	Enrolment
Schools and Junior Colleges	66.5%	90.7%
Technical Institutions (Polytechnics & VITB)	13.6%	6.2%
Universities (NUS & NTI)	19.9%	3.1%
Total	S$ 1,196.2 million	523,235 students

Source: Straits Times, 5 March 1987

The most highly subsidized courses are the Arts and Social Sciences and Engineering (Figure 7.3) whose grants have risen by around 11%. However it was the two business courses which registered the highest rate of growth in subsidies (Table 7.2).

Rising at an annual rate of just under 10%, the cost of technician training at the polytechnics almost doubled since the beginning of the decade with the level of subsidy remaining fairly constant (Appendix 5,Table 3).

Table 7.2
Rates of Growth of Fees, Grants and Total Costs %

	Fees	Grants	Total
ARTS	12.5	11.1	11.3
SCIENCE	13.6	13.4	13.4
BUSINESS	10.7	28.6	23.3
ACCOUNTANCY	10.7	28.6	23.3
ENGINEERING	15.5	10.7	11.3
POLYTECHNIC	8.3	9.9	9.7
VITB			2.2

Source: calculated from Table 2, Appendix 5

The cost of training a skilled worker (National Trade Certificate level) at the Vocational and Industrial Training Board was almost as great as that for

training a technician. The real overall cost of training rose by 70% between 1980 and 1984 and fell after that (Appendix 5, Table 4). The sharp rise in costs was due to the massive expansion of institutional training capacity recommended by the CPTE. Development projects at the close of the 1982 financial year included the building of three vocational institutes and the re-equipping and expansion of the existing institutes.[5] The fact the vocational training is subject to economies of scale may have contributed to the high unit costs (Moura Castro 1987). The launching of the automatic registration scheme[6] to increase the rate of progression of school leavers into vocational training helped to boost the intakes but the problem of successively smaller cohorts is a difficult one to overcome.

The level of government subsidy for vocational education has been declining slowly but nevertheless is still higher than that for the university and polytechnics. Many studies (Fuller 1976, Borus 1977, Levine 1979) have concluded that vocational schooling is not cost-effective and offers no earnings advantage, even in the longer term, over cheaper job-related training programmes (see Chapter 3 for a fuller discussion). The next section addresses these and other issues in the Singapore context.

7.3. Cost-Benefit Analysis: The Payback Period

Rates of return to education were discussed in Chapter 3 together with the latest study which used 1980 Census data. The data needed to construct fresh age-earnings profiles will not be available until the 1990 Census of Population is published. Moreover the nature of tracer study data precluded their use for this purpose. Other ways had to be found to evaluate the profitability of education. One possibility is the comparison of payback periods based on starting salaries derived from tracer studies.

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5. For more details, refer to Law Song Seng, VITB Papers 1-4
6. Under this scheme, all school leavers eligible for vocational training are automatically registered at a vocational training centre near their home.

7.3.2. The Payback Period

The payback period measures how quickly the incremental benefits that accrue to an initial investment project "payback" the initial capital invested, with benefits normally defined in terms of after-tax cash flows. It is customarily used to guide investments in two ways. When faced with a straight accept-or-reject decision, it provides a rule where projects are only accepted if they pay back the initial investment outlay within a certain time period. It also provides a rule when a comparison is required of the relative desirability of several mutually exclusive investment projects. In this instance, projects are ranked by speed of payback with the fastest paying back project being the most favoured, and vice versa. But this method can lead to ambiguous results. The following example is taken from Lumby (1984)

When the investment outlay is not concentrated at the beginning but interspersed with periods of positive cash inflow, the definition of the initial investment outlay of the project becomes hazy. Compare two projects A and B: Is Project A's outlay $10,000 or $12,000? Is Project B's outlay $10,000 or $5,000? The terminology does not allow for an unambiguous ruling and this ambiguity extends to the definition of the payback period. Suppose that Project B will only be accepted if it pays back within three years. Does this mean three years since the beginning of the project or three years after the completion of the outlays?

	Project A		Project B
Year	Cash Flow	Year	Cash Flow
0	-$10,000	0	-$5,000
1	+$ 5,000	1	+$1,000
2	+$ 5,000	2	-$5,000
3	+$ 5,000	3	+$3,000
4	-$ 2,000	4	+$3,000
		5	+$4,000

If the first, the project should not be accepted; if the second it should be accepted. The rules for determining the payback period are arbitrarily set. More importantly, the decision is based solely on the cash flows that arise within the payback period.

Those that arise outside the specified period are ignored. For projects that take a long time to generate returns the validity of this measure is dubious.

Where schooling is concerned, most, if not all expenditure is concentrated at the beginning, with returns generated only after all expenditure has been completed. Although returns to schooling are generated over a long period and the payback criterion will exclude those beyond the set cut-off point, these in any case are heavily discounted in any case under both present value and rate of return criteria.

In addition there is a rough correlation between the payback period and the rate of return. Generally the higher the rate of return, the shorter the payback period. Since there is inadequate information for computing the more conventional rate of return, these can roughly be proxied by payback periods. Furthermore the ranking and the trends are in many ways more pertinent than the absolute magnitudes.

7.4. Advantages of Using Starting Salaries

These are enumerated in Freeman (1971) and Miller and Volker (1982) and are summarized below.

1. The salaries of new entrants to the labour market are less dispersed around the mean than those of older workers. Starting salaries are less contaminated by effects such as seniority-based wage rates and public sector time scales and so should be more meaningful indicators of the returns to specialized training. This is an issue especially pertinent to Singapore (see discussion in section 4.3).

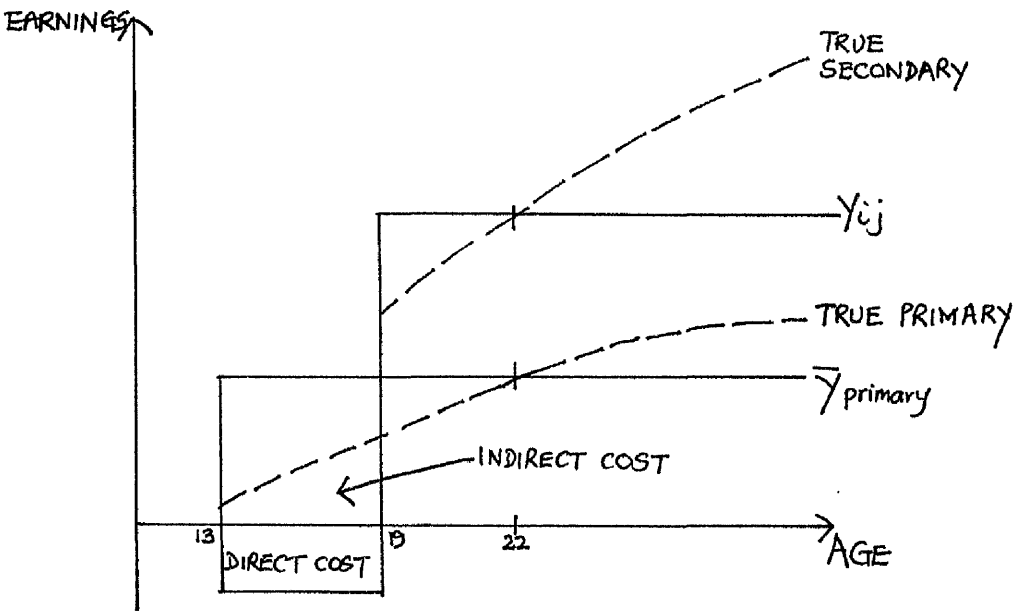
2. The salaries of recent graduates are, in any case, given more weight in the calculation of discounted lifetime earnings.

3. The experiences of recent graduates are particularly significant in the formulation of current students' expectations.

4. If age-earnings profiles and earnings differentials are relatively stable and constant over time, then starting salaries give a good indication of earnings over the working life (Figure 7.4).

5. Moreover, students' investment horizons may be short because of a high degree of uncertainty (Schultz 1967). Thus graduate starting salaries provide information fundamental to the individual's educational calculus.

Figure 7.4
The Flat-Earnings Equivalent Assumption



Source: Figure 3.7, Psacharopoulos and Woodhall (1985)

7.5. Definition of Variables

The private costs of a year's increment in schooling are foregone earnings and direct costs such as tuition and "incidental" expenditures on books and travel. As no data on incidental costs were available, this variable was omitted.

The social costs of an additional year of schooling are the public recurrent expenditures and capital costs of providing that schooling, together with foregone earnings of the student who would otherwise be working and contributing to national income. The cost figures used in the exercise are the average total (recurrent

and capital) cost for each student. It should be noted that fees for all polytechnic courses are the same whereas those for the university vary from course to course.

The components of the benefits variable used in computing the payback period are slightly different from those used in calculating the rate of return. The former uses average monthly earnings whereas rate of return computations rely on the increment in earnings associated with the incremental year of schooling. It must be noted that in addition to the observable pecuniary benefits, education produces both spillover effects and non-pecuniary returns (see Chapter Three). Education raises an individual's quality of life and helps in the creation of a more informed electorate. While some attempts have been made to quantify these effects, methodologies remain controversial (for a survey see Michael 1982). One thus needs to bear in mind that the returns to education as measured by observed earnings differentials underestimate the true benefits associated with it (Psacharopoulos 1972).

On the costs side, foregone earnings are measured by the average yearly salary of a worker with the next highest level of education. The foregone earnings of a university student are taken to be the average earnings of a worker with post-secondary education; similarly the foregone earnings of a polytechnic student are the average earnings of a worker with secondary education.

An adjustment was made for the foregone earnings of a vocational trainee. The education system outlined in Appendix 6 suggests that those undergoing vocational training tend to be those who have not done well enough to go further successfully in the academic stream. So while a trainee may be enrolled in a course requiring at least some lower secondary schooling, the wages the trainee would have commanded in the labour market may not have been as high as the earnings of one with post-primary education. The foregone earnings of the vocational trainee are thus taken to be the average of earnings of workers with primary, post-primary and secondary education.

The relevant education-earnings variables were computed from the Labour Force Surveys. It should be noted that the earnings used are averaged over all workers with that level of qualification but with various levels of experience. The data does not distinguish workers by number of years in the labour market. None of the salary data are adjusted for taxes.

Table 7.3
Payback Periods

Year	Arts		Arts Honours		Engineering	
	Pte	Social	Pte	Social	Pte	Social
1981	0.73	1.11	0.52	0.79	0.40	0.71
1982	0.75	1.09	0.54	0.78	0.42	0.70
1983	0.56	0.86	0.44	0.67	0.34	0.61
1984	0.88	1.16	0.74	0.98	0.53	0.78
1985	1.03	1.81	0.71	1.26	0.58	1.10
1986	1.23	2.14	0.87	1.51	0.64	1.18
1987	1.11	1.92	0.75	1.30	0.66	1.22
1988	1.16	1.97	0.79	1.35	0.68	1.25

Year	Science		Science Honours	
	Pte	Social	Pte	Social
1981	0.63	0.96	0.52	0.79
1982	0.61	0.88	0.53	0.76
1983	0.58	0.89	0.45	0.69
1984	0.75	0.99	0.74	0.98
1985	0.89	1.56	0.82	1.44
1986	0.97	1.68	0.97	1.69
1987	1.04	1.80	0.78	1.35
1988	1.18	1.96	0.78	1.29

Year	Business		Business Honours	
	Pte	Social	Pte	Social
1981	0.57	0.68	0.45	0.53
1982	0.64	0.74	0.45	0.52
1983	0.51	0.60	0.40	0.47
1984	0.80	0.90	0.55	0.61
1985	0.94	1.31	0.60	0.84
1986	1.09	1.51	0.76	1.05
1987	1.08	1.49	0.78	1.08
1988	1.03	1.62	0.77	1.22

Year	Accountancy		Social Science Honours	
	Pte	Social	Pte	Social
1981	0.63	0.75	0.47	0.72
1982	0.66	0.77	0.49	0.71
1983	0.54	0.64	0.42	0.64
1984	0.85	0.94	0.63	0.84
1985	0.99	1.38	0.72	1.28
1986	1.06	1.47	0.79	1.37
1987	1.01	1.40	0.81	1.40
1988	1.00	1.58	0.81	1.37

Year	Polytechnics Pte	Polytechnics Social	Skilled Manpower (VITB) Pte	Skilled Manpower (VITB) Social	
1980	0.99				1.62
1981	0.87				1.53
1982	0.86	1.21	0.84		1.48
1983	0.50	0.75	0.89		1.12
1984	0.67	0.88	1.05		1.92
1985	0.88	1.40	1.25		2.06
1986	0.95	1.47	1.37		2.05
1987	0.94	1.46	1.33		1.93
1988	0.82	1.31	1.20		1.76

NUS: Salary = Median Average of Males and Females. Foregone Earnings = Median Salary of Post-Secondary School Leavers. Data for foregone earnings are derived from the Report on the Labour Force Survey of Singapore, various years.

Polytechnics: Salary = Weighted Means of Fresh and Demobilized Graduates of Ngee Ann and Singapore Polytechnics (Weights: Numbers employed). Foregone Earnings = Median Earnings of Secondary School Leavers.
Data for foregone earnings derived from the Report on the Labour Force Survey of Singapore, various years. Data on fees and tuition grants was provided by the Singapore Polytechnic, Finance Division

Vocational Graduates: Salary = Weighted Means of Median Salaries of Fresh Male, Female and Demobilized Graduates. Foregone Earnings = Median of Gross Monthly Salaries of Primary, Post-primary and Secondary Workers.
Data for Fees and Tuition Grants supplied by the VITB.

All computations done by author. (See Table 4, Appendix 5, pp. 244-246)

The private payback is defined as the time required to recoup the costs of education borne by the individual, the sum of foregone earnings and tuition costs. Similarly, the social payback is the time interval required to recover the social cost of education as measured by earnings foregone and the cost of education borne by both the state and the individual. The payback periods are calculated in Table 3 and graphed in figures 7.5 and 7.6.

7.6. Private and Social Payback Periods

All the payback periods support the general finding that social returns are considerably less than private returns, the difference being the subsidy. Both private and social payback periods have increased for all courses which reflect declines in the respective rates of return.

Of the three-year general degree programmes, the accountancy and business courses have the shortest private payback, representing a premium to those trained in the commercial disciplines (Figure 7.5a). The general arts and science courses have the longest private payback, signifying the lowest private return. The dip in 1983 reflects the then buoyant economic conditions as well as the public sector upward salary revision that was initiated in 1982.[7]

Vocational education was the least profitable from the individual's point of view. Since 1982, polytechnic education has become more profitable than any of the three-year degree courses, all of which have payback periods of at least one year. In contrast, all the four-year Honours programmes have payback periods of less than a year (Figure 7.5b) This represents a significant return to that extra year, irrespective of the field of study. Engineering has the shortest private payback of the four-year courses which gives credence to its image as the most lucrative field, as least from the private point of view.

The social payback periods tell a different story (Figure 7.6a & b). The payback periods of the Arts and Science three-year degrees increase significantly, exceeding that of vocational training. The profitability of polytechnic education is now reduced relative to tertiary business and accountancy courses.

Of the four-year degrees, Business Administration Honours is the most socially profitable degree, surpassing Engineering. The different ranking is due primarily to the difference in social costs. The average cost of training a business graduate rose twice as fast as that for an engineer. Yet in 1988, the cost of training an engineer was still 50% higher than the cost of training a business graduate. At the same time, starting salaries for engineers have generally not exceeded those of business graduates by as much (Appendix 5, Table 4). In 1981, the average salary of an engineer was about 11% more than a business graduate and 55% more than a fresh

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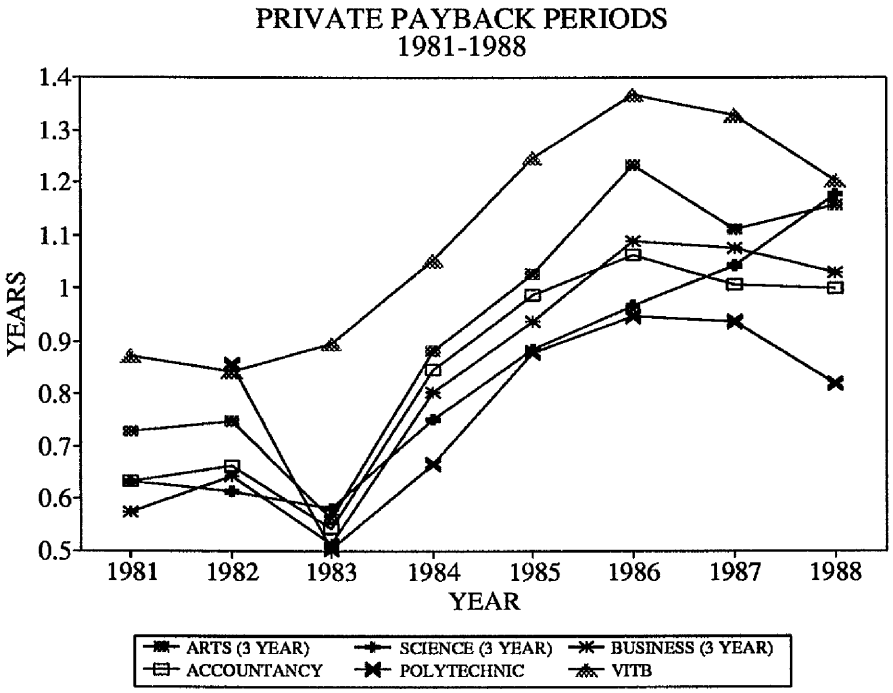
7. Straits Times, 21 February 1982. This was intended to bring salaries in the public sector into line with the private sector. A survey found that before the revision, graduates in the private sector earned on the average 42% more than those in the public sector.

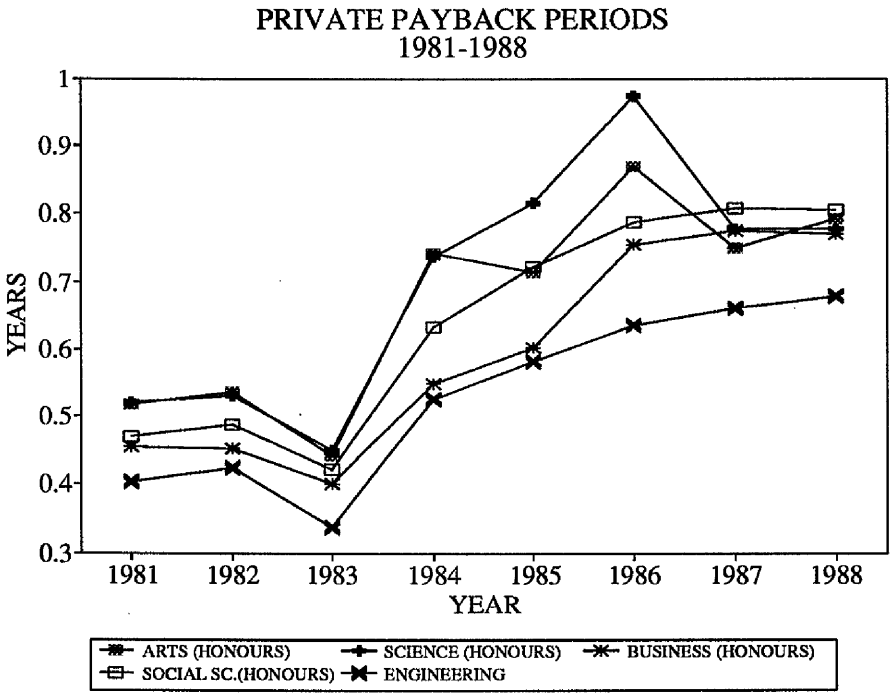
accountant. In 1988, the differential between engineering and business had widened to 17% and declined marginally to 52% between engineering and accountancy. The salary differentials were not great enough to offset the differences in costs and this is clearly reflected in the structure of social returns.

Figure 7.5a



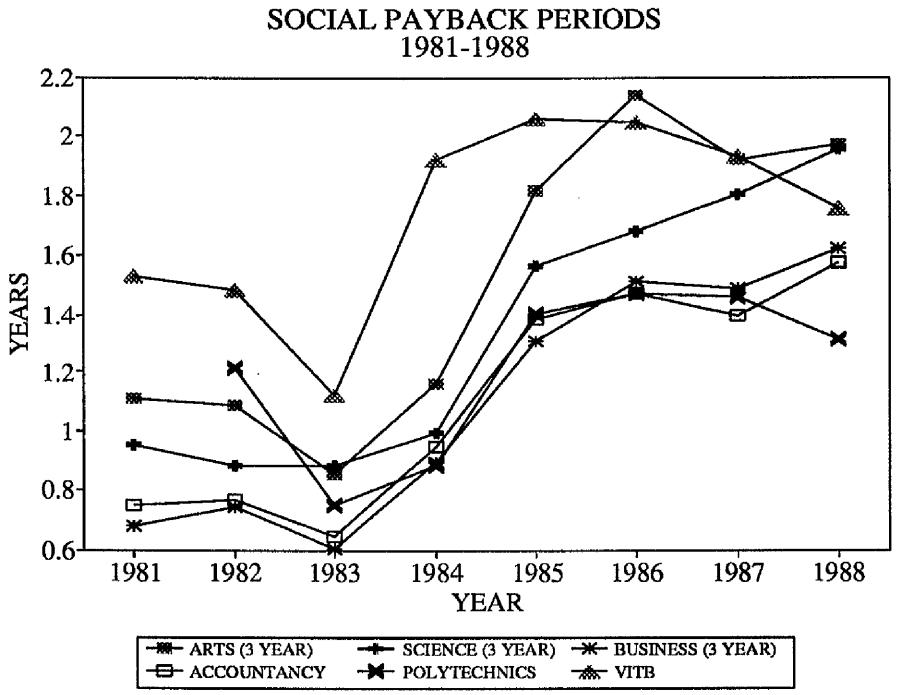
Source: Table 7.3. Graphed by author

Figure 7.5b



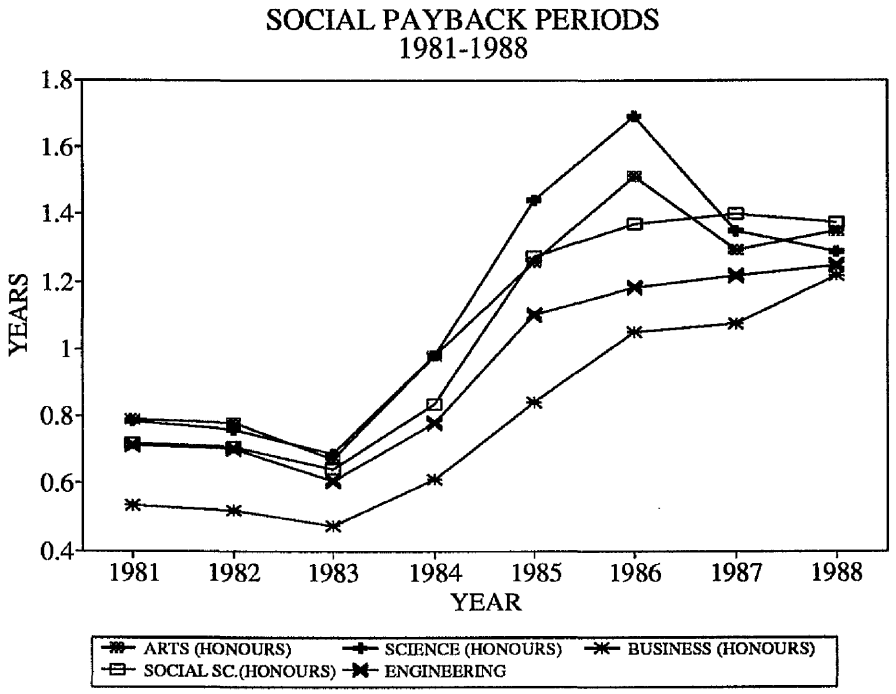
Source: Table 7.3. Graphed by author

Figure 7.6a



Source: Table 7.3. Graphed by author

Figure 7.6b



Source: Table 7.3. Graphed by author

7.7. Implications

i. Engineering vs. Finance and Business

While present government policy presupposes a critical role for engineers, there seems to be a *prima facie* case for concentrating on service and business related skills, the social payback to which were lower than those of engineering. This finding seems to support the argument that Singapore's evolving comparative advantage lies in finance and business-related activities.

It should be kept in mind however, that the finance and business sector enjoyed a boom in the 1980s with a concommitant rise in demand for workers with relevant training. A sudden increase in demand for a type of skill in the face of relatively inelastic supply will result in a short-run rise in the rate of return to that type of training (Siebert 1985). It is difficult to say if this relatively high return will be sustained in the long-run.

ii. Is Polytechnic Education Profitable?

In the past two years, policy-makers have been encouraging those who obtain marginal results in the GCE "O" level and "N" level examinations[8] to opt for polytechnic education rather than continuing in the academic stream.[9] The emphasis will shift to polytechnic and vocational training over the next few years in line with projected demand for engineering and technical manpower.[10] That the social and private payback to technical training have been lower than those for all the general degrees as well as the Arts, Social Science and Science Honours degrees seems to testify to its relative profitability but again, the results do not give any clear signal to favour its expansion relative to tertiary courses.

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8. General Certificate of Education "Ordinary" and "Normal" Levels (see Appendix 6).
9. Straits Times 14 April 1989 reported on a trend of able students opting for a diploma course at the polytechnic over junior college education.
10. Straits Times, 6 June 1989

iii. Review of Vocational Education

The private and social payback periods to vocational education were the longest of all the courses for much of the period under study. Its social profitability overtook both the three-year Arts and Science courses only in 1987. This seems to accord with findings for other countries that vocational education has a much lower payoff than other types of training, and that the benefits accruing to it do not justify the cost (see discussion in Chapter Three).

What is the situation in Singapore? Pang's (1979) study using 1974 data concluded that vocational education had little impact on earnings and recommended that its profitability be reviewed. At the same time he recognized that the majority of vocational graduates did not perform well in regular school and enrolled in vocational programmes as a means of continuing their education. This general finding was echoed by a study of high school graduates in Tennessee by Schriver and Bowlby (1971) which concluded that the rate of return of vocational education was highest for students with the lowest aptitudes. There could thus be a sizable externality and the latterly rise in the social rate of return may reflect this "spillover" effect. In addition, the pace of industrialization has generated demand for skilled manpower which would not have been present at the time of Pang's study.

7.8. Conclusion

The results indicate that contrary to popular belief, tertiary level finance and business courses were more profitable than engineering, but it is not known if this trend will continue. On the other hand, the findings support the emphasis on middle level technical training but suggest that lower level vocational skills training be kept under review.

CHAPTER EIGHT:
THE DETERMINANTS OF STARTING SALARIES

This chapter scrutinizes the determinants of starting salaries of fresh skilled graduates for the period 1973-1988. The following results were obtained.
1. The increase in the elasticity of demand suggests that the market for skilled labour has become more responsive in the post-restructuring period.
2. The significantly negative coefficient of the gender variable supports evidence put forward in Chapter Five that women earn significantly less than men, after controlling for the national service effect on male earnings.
3. The effect of NWC recommendations, while significant, was found to be small.

8.1. Earnings Determination: The Mincer Approach

Mincer (1974) specifies the schooling production function of the log linear form:

$$\ln y = \ln y_{oi} + e_i s_i \qquad (1)$$

where y_o and e_i are viewed as individual specific "ability parameters" of the ith individual. The parameter y_o can be regarded as the individual's basic earning capacity and the parameter e_i as his " learning ability" (Willis 1986). If schooling is treated as exogenously determined, then the model is estimated with the regression equation

$$\ln y_i = \beta_o + \beta_1 s + \mu i \qquad (2)$$

where the coefficients β_o and β_1 respectively are estimates of the average level of initial earnings capacity and the average value of the rate of return parameter in the population. That is, $\beta_o = E(\ln y_{oi})$ and $\beta_i = E(e_i)$. The residual term

$$\mu = (\ln y_{oi} - \ln \overline{y_o}) + (e_i - \bar{e})s_i + \delta_i \qquad (3)$$

where $E(\ln y_{oi}) = \ln y_o$ and $E(e) = e$ and δ represents the effects of measurement error and transitory income components. μ is heteroscedastic and its variance is an increasing function of schooling (Willis 1986)

Studies (Corbo and Stelcner 1983) which have examined the contribution of schooling to differentials in earnings have used some variation of equation (2) and generally included a proxy for years of experience. Blinder (1973) points out that the use of earnings as the dependent variable can result in biased estimates of the parameters, the direction and magnitude of which will depend on labour supply responses to wage rates (see Chapter Three). This type of earnings function only deals with the supply side of the human capital equation. Another issue that has not been adequately dealt with in the literature, the estimating procedure forms the theme of the subsequent sections.

$ß_1$ in (2) can be interpreted as the average rate of return to schooling, but how has this average been obtained and is it best linear unbiased? The fact that μ is heteroscedastic is a strong indication that workers with different levels of schooling have different characteristics that are captured by the error term. If this is the case, pooling all the data points and estimating the equation using a procedure, for example ordinary least squares (OLS), that does not recognize differences between groups, will give biased and inconsistent estimates.

8.2. Methodology

It is not the intention of this study to apply the human capital function described above. The studies by Clark and Pang (1970) and Ng (1988) have clearly indicated that human capital variables explain a sizable proportion of earnings differentials. The structure of the market for educated labour and their demand and supply determinants are the foci of this chapter.

The model is set up in the form of an earnings function with earnings as the dependent variable and demand and supply variables on the right-hand side.

Because of the relatively short time span (1973-1988) the data are pooled giving a time-series cross-section data set. The data are grouped according to educational level (Group 1 = tertiary, Group 2 = post-secondary/polytechnic, Group 3 = VITB).

8.3. The Model

The estimating equation is

$$COST = ß_0 + ß_1GDP + ß_2S + ß_3GENDER + ß_4DEMOB + ß_5NWCH + ß_6COST_{-1} \quad (4)$$

The dependent and independent variables are as follows:

COST: The total cost of hiring a worker was used instead of the usual salary variable to take into account compulsory contributions that employers have to make to the Central Provident Fund (CPF) whereby both employers and employees pay a percentage of the salary into a consolidated fund. This contribution forms a fixed and significant cost of hiring a worker. The contribution rates are set out in Table 1.2. The dependent variable is the worker's salary plus the employer's CPF contribution.

GDP: Gross Domestic Product at Factor Cost. Although both the real and nominal variables were tested, the results that are reported refer to real GDP.

S: This is the supply variable which denotes the number of fresh entrants into the labour market each year. The figures refer only to economically active graduates and have been adjusted for the number of National Service liable male graduates. Two alternatives were tested: the current year's (S) and the previous year's (S_{-1}) numbers.

GENDER: A dummy variable (females=1) is included to pick up gender based differences in the remuneration of tertiary graduates, the data for whom are segregated by sex. Data for vocational graduates are not distinguished by gender as there are insufficient data points for fresh male graduates.

DEMOB: The basis for segregation of vocational graduates should be whether graduates have undergone National Service. Demobilized National Servicemen are normally paid more than their fresh counterparts to compensate them for two to two-and-a-half compulsory absence from the labour market.

NWCH: The influence of the recommendations of the National Wage Council on wage differentials has been discussed and it is necessary to consider their effect on starting salaries. The short time period of 17 years precludes the setting up of an econometric model.[1] The alternative method is to compare the actual rate of wage increases with the recommended ones. NWCH is the series of hypothetical rates of wage increases using actual wage data in 1972 and the midpoint of the recommended ranges where applicable. Full details and calculations are set out in Appendix 7.

COST-1: This lagged dependent variable is included in the regression to proxy for the influence of lagged independent variables. The rationale is analogous to their use in macroeconomic Partial Adjustment Models (see Gordon 1981)

8.4. Estimation by Ordinary Least Squares (OLS)

Since the literature gives very little indication of the appropriate estimating procedure, the model will first be estimated by OLS. Equation (4) was estimated for 1973-1988 and separately for 1973-1979 and 1980-1988. The two subperiods coincide broadly with the pre and post restructuring periods. The pooled OLS estimates are reported in Table 8.1.

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1. Time series analysis customarily requires at least 30 data points ($n > 30$).

Table 8.1
OLS Estimates

1973-1988

COST = 0.19 + 0.03GDP + 0.00S + 0.02GENDER + 0.00DEMOB +
(1.36) (1.07) (0.10) (1.73) (0.71)

0.00NWCH + 0.89COST-1
(1.63) (45.53)

R2 = 0.846
F(7,420) = 392
P-Value = 0.00

1973-1979

COST = -1.09 + 0.33GDP - 0.02S + 0.03GENDER + 0.02DEMOB +
(-2.56) (3.32) (-1.92) (1.17) (1.81)

0.00NWCH + 0.89COST-1
(3.11) (27.12)

R2 = 0.878
F(7,129) = 163
P-VALUE = 0.00

1980-1988

COST = -0.45 + 0.17GDP + 0.01S + 0.02GENDER + 0.00DEMOB +
(0.78) (-0.58) (1.02) (1.72) (1.22)

0.00NWCH + 0.88COST-1
(1.05) (35.62)

R2 = 0.833
F(7, 284) = 243
P-VALUE = 0.00
(t-values in parentheses)

All the 1973-1979 coefficients regression have the correct signs and the demand coefficient is significant at the 1% level. The interesting features are the positive supply coefficients in the 1973-1988 and 1980-1988 regressions. This means that, say for 1980-1988, a 1% increase in supply would have given rise to a 0.013% increase in starting salaries, a ludicrous result in an equilibrium model. Moreover, none of the coefficients in these two periods are significant save those of the lagged dependent variable. These results give a strong hint that the equations have been misspecified.

What could explain the chaotic results obtained with OLS? The fact that three different types of educated labour - skilled workers, technicians and graduates - were grouped together without allowances for possible structural differences between them suggest that the pooling procedure is invalid.

Two statistical tests were carried out to test this possibility. The first, a one-way Analysis of Variance (ANOVA), tested the null hypothesis of no structural differences between the three groups. The result (F-statistic = 371.15, p-value = 0.0000) confirms that the structures of three groups are not the same. The second hypothesis, that no group-specific error components exist or conversely, that OLS was the correct specification was tested using the Lagrange Multiplier test (Breusch and Pagan, 1980). The hypothesis was rejected at the 1% level. These results confirm that the OLS estimates are biased and incorrect.

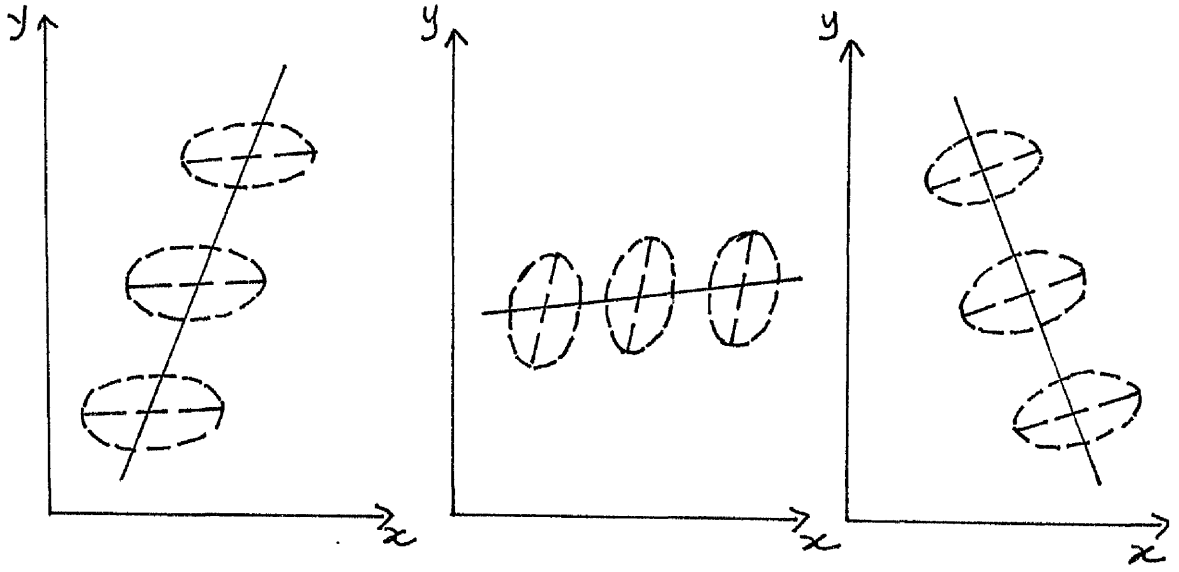
8.4.2. Possible Reasons for Invalidity of Pooling Procedure

Although it is not specified in the traditional manner, the present equation implicitly models Mincer's schooling equation (2).

The schooling equation is closely related to the age-earnings profiles. One general characteristic of the profiles is that the higher the level of educational attainment, the higher the initial earnings of workers at the start of their working lives (references and discussion in Chapter Three). In the present context, this suggests that *a priori* the three groups' starting salaries can be expected to differ significantly. In econometric terms, if different equations were specified for each of the groups, their intercepts would be significantly different.

The biases likely to arise from straightforward pooling in such a situation are illustrated in Hsiao (1986) and reproduced in Figure 8.1. In the graphs, the broken-line circles represent the point scatter for the individual/group over time and the broken straight lines represent the individual regressions. The solid lines are the regressions estimated using all the observations. A number of outcomes are possible, all with biases arising because of heterogeneous intercepts and the direction of the bias cannot be identified *a priori* - it can go either way. The remedy would be an estimation procedure that would take explicitly into account the differences in the structure of the three groups. In the following sections two alternatives are considered: the fixed effects and the error components models.

Figure 8.1
Possible Biases arising from Incorrect Pooling



(a) (b) (c)

Source: Hsiao (1986)

8.5. The Null Hypothesis[2]

The null hypothesis can be written as

$$Y_{it} = \bar{\beta}_1 + \mu_i + \sum_{k=2}^{K} \beta_k X_{kit} + e_{it} \qquad (5)$$

Where
$i = 1,2,.....N$
$t = 1,2,.....T$
X_k = kth explanatory variable

where $\beta_{1i} = \bar{\beta}_1 + \mu_i$ is the mean intercept for the ith group, β_i is the "mean intercept" and μ_i represents the difference from this mean for the ith group. The appropriate estimation procedure depends on whether the μ_i are assumed to be fixed or random. If the μ_i are fixed, equation (5) is a fixed effects model; if the μ_i are random, it is an error components model.

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2. For specification of the null hypothesis, refer to Judge et.al (1980)

A. The Fixed Effects/Dummy Variable Model[3]

For the ith group, equation 5 is

$$\mathbf{Y}_i = (\bar{\beta}_1 + \mu_i)\mathbf{j}_T + \mathbf{X}_{si}\,\beta_s + \mathbf{e}_i \qquad (6)$$

where $\mathbf{Y}_i = (Y_{i1}, Y_{i2},\ldots,Y_{iT})'$, $\mathbf{e}_i = (e_{i1}, e_{i2},\ldots, e_{iT})'$, $\mathbf{j}_T = (1,1,\ldots,1)'$ and is of dimension (T x 1) and $\mathbf{X}_{si}$ contains the values of the explanatory variables save the constant and is of dimension (T x K) where K = K-1. The intercepts $b_{1i} = b_i + \mu_i$ are assumed to be fixed parameters which along with the slope coefficients β_s need to be estimated. It is assumed that $E[\mathbf{e}_i]=0$, $E[\mathbf{e}_i\mathbf{e}_i'] = \sigma_e^2\mathbf{I}_T$ and that $E[\mathbf{e}_i\mathbf{e}_j']=0$ for $i \neq j$.

β_s is estimated using the "within estimator": if equation (5) is averaged over time and the result subtracted from equation (5), the following obtains

$$(Y_{iT} - \bar{Y}_i) = \sum_{k=2}^{K} \beta_k (X_{kit} - \bar{X}_{ki}) + e_{it} - \sum_{t=1}^{T} e_{it}/T) \qquad (7)$$

where $Y_i = \sum_{t=1}^{T} Y_{it}/T$. The within estimator $\mathbf{b}_s$ is the estimator obtained when least squares is applied to equation (6). The name stems from the fact that the estimator uses the variation within each group. Once $\mathbf{b}_s$ is found , the least squares intercepts can be found from

$$b_{1i} = \bar{Y}_i - \sum_{k=2}^{K} b_k X_{ki} \qquad (8)$$

Under these assumptions, the least squares estimator is best linear unbiased and for hypothesis testing, the normal least squares procedures are appropriate.

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3. For a fuller exposition of the theory and the matrix algebra involved, see Judge et.al.(1985)

B. The Error Components Model

Instead of assuming that the μ_i are fixed parameters, the error components model treats them as random variables with $E[\mu_i] = 0$, $E[\mu_i^2] = \sigma^2_u$ and $E[\mu_i \mu_j] = 0$ for $i \neq j$. The μ_i and e_{it} are assumed to be uncorrelated and for the ith group, the model is

$$\mathbf{Y}_i = \mathbf{X}_i \boldsymbol{\beta} + \mu_i \mathbf{j}_T + \mathbf{e}_i \qquad (9)$$

where $\mathbf{X}_i$ is of dimension (T x K) and includes the constant term and $\boldsymbol{\beta} = (\beta_1, \beta_2, \ldots \beta_k)'$. The assumption that the μ_i are random implies that the N groups can be regarded as a random sample drawn from some larger population and that the μ_i and the X_i are uncorrelated. The error components model can be regarded as one with a random intercept which is estimated by Generalized Least Squares.

The estimator for $\boldsymbol{\beta}_s$ here is a matrix weighted average of the within estimator $\mathbf{b}_s$, and the "between estimator" $\boldsymbol{\beta}^*_s$ which is obtained by applying least squares to

$$Y_i = \bar{\beta}_1 + \sum_{k=2}^{K} \beta_k \bar{X}_{ki} + \mu_i + \left(\sum_{t=1}^{T} e_{it}/T\right) \qquad (10)$$

which is equation (5) averaged over time. Under certain assumptions, the weights are the inverses of the covariance matrices of the respective estimators.[4] The GLS can be viewed as an efficient combination of the dummy variable estimator that uses variation within groups and the estimator that utilizes variation between groups.[5]

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4. Ibid., p. 523

5. For further discussion of this decomposition, see Maddala (1971), Nerlove (1971) and Swamy (1971)

8.6. Empirical Results

Estimates for 1973-1988

The estimates generated by the fixed effects and error components models are reported in Tables 8.2 and 8.3. Under the fixed effects model for the period as a whole, all coefficients are significant at the 5% level. The elasticity of starting salary with respect to demand was 0.08: every 1% increase in real GDP led to a 0.08% increase in real starting salary.

The lagged supply coefficient was significant in the 1973-1988 period stating that starting salaries in the current period declined 0.02% for every 1% increase in the number of economically active graduates in the previous period. The supply variable using the number of graduates in the current year generated a positive coefficient. As supply was relatively inelastic, it can be surmised that demand was the major factor affecting the level of starting salaries.

The significant negative GENDER coefficient for the entire period attests to the inferior remunerative position of female tertiary graduates vis-a-vis their male counterparts. Demobilized graduates earned a premium over fresh graduates, about 0.04% more. The NWC recommendations had a small but significant impact on actual starting salaries. A 1% increase in the recommended wage increases effected a 0.01% rise in actual starting salaries.

Table 8.2
The Dummy Variable/Fixed Effects Model

1973-1988

COST = 0.08GDP - 0.02S_{-1} - 0.04GENDER + 0.04DEMOB +
(2.84) (-2.07) (-2.76) (5.28)

0.00NWCH + 0.65COST-1
(2.32) (19.91) F(6,418)=131
P-Value = 0.00

1973-1979

COST = 0.26GDP - 0.03S_{-1} - 0.04GENDER + 0.05DEMOB +
(2.82) (-1.89) (-1.61) (4.26)

0.00NWCH + 0.65COST-1
(2.91) (11.74) F(6,127)=47
P-Value = 0.00

1980-1988

COST = 0.35GDP - 0.00S_{-1} - 0.05GENDER + 0.04DEMOB +
(2.29) (-0.47) (-2.66) (4.52)

0.00NWCH + 0.60COST-1
(2.29) (14.31) F(6,282)=80
P-Value = 0.00

TABLE 8.3
The Error Components/Random Effects Model

1973-1988

COST = 0.69 + 0.07GDP - 0.01S_{-1} - 0.03GENDER + 0.03DEMOB +
(4.79) (2.70) (-1.91) (-2.43) (4.94)

0.00NWCH + 0.67COSTM1
(2.27) (20.97) F(7,420)=1604
P-Value = 0.00

1973-1979

COST = -0.27 + 0.28GDP - 0.03S_{-1} - 0.03GENDER + 0.05DEMOB +
(-0.61) (2.96) (-1.95) (-1.17) (3.82)

0.00NWCH + 0.70COST-1
(2.98) (13.26) F(7,129) = 1076
P-Value = 0.00

1980-1988

$$\begin{array}{lll} \text{COST} = & -0.42 + 0.33\text{GDP} - 0.00S_{-1} - 0.04\text{GENDER} + 0.03\text{DEMOB} + & \\ & (-0.59)\ (2.13) \quad (-0.22) \quad (-2.20) \quad (4.01) & \\ & 0.00\text{NWCH} + 0.63\text{COST-1} & \\ & (2.13) \quad (15.66) & \text{F}(7,284)=1640 \\ & & \text{P-Value} = 0.00 \end{array}$$

The estimates generated by the error components model for the whole period are similar to the fixed effects estimates. In this model, starting salaries rose by 0.07% in response to a 1% rise in GDP and conversely fell by 0.02% when the number of economically active graduates rose by 1% in the previous year, and the latter is significant only at the 10% level.

Demobilized technical and vocational graduates were again estimated to have earned significantly more than fresh graduates. Female tertiary graduates were also estimated to have commanded significantly lower starting salaries than their male counterparts, strongly suggesting some form of discrimination in the labour market. Similarly starting salaries were estimated to have risen 0.01% in response to each 1% increase in the rate of NWC recommendations. Both the fixed and random effects specifications for the whole period are significant.

Estimates for the Subperiods

All save the GENDER and S coefficients were significant under both models for the 1973-1979 period. The GENDER was significant under both models for 1980-1988. The increases in estimated demand elasticities suggest that the market for educated labour became more competitive in the post restructuring period. The number of foreign and expatriate workers on work permits or employment passes may have introduced a greater degree of substitution between local and foreign manpower particularly at the skilled levels. Starting salaries rose by 0.26% for every 1% increase in GDP under the fixed effects model and by 0.28% under the error components model in the earlier period. The estimated elasticities increased to 0.35% and 0.33% respectively in the 1980-1988 period.

The coefficients of GENDER were not significant in the 1973-1979 period in both models while they were in 1980-1988. The effect of the NWC recommendations appeared to have remained constant: both models estimated that starting salaries rose by 0.03% for every 1% increase in the rate of NWC recommendations in both periods. Demobilized graduates continued to earn significantly more than their non-NS counterparts. The effect of the previous year's salary $COST_{-1}$ is significant for all periods in both models.

8.7. Structural Change in the Skilled Labour Market?

The hypothesis of structural change in the labour market over the two periods was tested formally using the Chow test. This yielded an F-value of 4.78 under the fixed effects specification and 3.80 under the random effects model, both of which are greater than the critical values at both 5% and 1% levels [$F_{0.95}$ (7, 413) = 2.01, $F_{0.99}$ (7,413) = 2.64]. We may thus surmise that there were significant changes in the structure of the skilled labour market from 1973-1979 to 1980-1988.

A further indication of significant changes over the two periods may also be gleaned by testing the hypothesis of whether error components existed in the two periods. The Lagrange Multiplier Statistic for the Error Components Model was used to test the null hypothesis that individual error components did not exist in all three periods (Breusch and Pagan 1980).

The Lagrange Multiplier is a chi-squared statistic and the results are as follows:

1973-1979: LM = 0.015 (p-value = 0.9024)

1980-1988: LM = 0.6725 (p-value = 0.4122)

For 1973-1979, the hypothesis that individual error components did not exist cannot be rejected at the 10%

significance level while it cannot be accepted for 1980-1988. This result indicates that the extent of individual error components was more sizable in the later period, which in turn implies that the labour market structure for each of the groups was more differentiated in 1980-1988 than in 1973-1979.

8.8. A Qualification to the Results

The NWC recommendations were all given in nominal terms. NWCH is a nominal variable and the nature of the recommendations preclude their recalculation in real terms. The anomaly of regressing nominal variables against real variables is recognized and for this reason, the equations are re-estimated using nominal values and the results reported in Table 8.4.

The coefficients for NWCH are almost unchanged for all specifications and all periods. This helps to support the validity of the first set of results.

Table 8.4
Estimates using Nominal Variables

A. The Dummy Variable/Fixed Effects Model

1973-1988

COST = 0.17GDP - 0.02S_{-1} - 0.00GENDER + 0.04DEMOB +
(6.91) (-2.45) (-0.18) (5.31)

0.00NWCH + 0.62COST-1
(4.14) (19.51)

F(6, 418) = 238
P-Value = 0.00

1973-1979

COST = 0.23GDP - 0.04S_{-1} + 0.00GENDER + 0.04DEMOB +
(3.09) (-2.43) (0.08) (3.19)

0.00NWCH + 0.63COST-1
(2.27) (11.33)

F(6, 127) = 48
P-Value = 0.00

1980-1988

COST = 0.43GDP - 0.01S_{-1} - 0.00GENDER + 0.04DEMOB +
(4.13) (-0.83) (-0.19) (5.30)

0.01NWCH + 0.54COST-1
(4.15) (13.05)

F(6, 282) = 78
P-Value = 0.00

B. The Error Components Model

1973-1988

COST = 0.39 + 0.16GDP - 0.02S_{-1} + 0.00GENDER + 0.04DEMOB +
(4.42) (6.67) (-2.35) (0.03) (5.22)

0.00NWCH + 0.63COST-1
(4.09) (20.21)

F(7, 420) = 1624
P-Value = 0.00

1973-1979

COST = 0.03 + 0.23GDP - 0.04S_{-1} + 0.01GENDER + 0.04DEMOB +
(0.10) (3.04) (-2.51) (0.34) (3.01)

0.00NWCH + 0.67COST-1
(2.31) (12.81)

F(7, 129) = 1255
P-Value = 0.00

1980-1988

$$\begin{aligned} COST = {} & -0.57 + 0.41GDP - 0.00S + 0.00GENDER\ 0.04DEMOB + \\ & (-1.24)\ (3.92)\quad (-0.68)^{-1}\quad (0.05)\qquad (5.14) \\ & 0.01NWCH + 0.56COST\text{-}1 \\ & (4.00)\qquad (13.74) \end{aligned}$$

F(7, 284) = 1301
P-Value = 0.00

8.9. Conclusion

These findings uphold the postulate that women earn significantly less than men in similar occupations. In the previous chapter, it was hypothesized that the earnings differences over the course of working life could be due to the fact that many women withdraw from the labour force to have children which in turn reduces the incidence of women's training and retraining.

It is more difficult to explain significant differences in entry level salaries as the "demobilization" effect has already been taken into account. This suggests some form of discrimination in the skilled labour market.

Discrimination in the form of lower pay will discourage women to enter and remain in the labour force. In the context of manpower shortages, this is clearly counterproductive. On the other hand it may encourage women to switch to take up the childbearing role more seriously (and more often!), which would help to allay the manpower situation in the long run.

While the extent of the impact is difficult to ascertain, it is inefficient that significant discrepancies in remuneration should exist in a labour short economy. Further research into the determinants of salaries for men and women is required and there is a strong case for a review of male-female remuneration scales.

CHAPTER NINE:
TRAINING, TENURE AND MOBILITY

High levels of labour turnover have rendered the level of training provided voluntarily by firms suboptimal. The state grant-levy training system attempts to provide an incentive for firms to increase their training commitments. An evaluation is made based on a small survey of a cross-section of firms.

9.1. On-the-Job Training: Becker's model[1]

The classical theory of the demand for labour postulates that profit-maximizing firms will employ workers up to the point where the value of the marginal product (VMP) equals the marginal cost of that labour. Becker (1964) showed that the acquisition of firm-specific capital financed in part by the firm, will drive a wedge between a worker's pay and his contribution to marginal product at any given time in his tenure. He argued that wages will exceed VMP over the worker's early period of investment in firm-specific capital and the reverse will happen in the later stages when by keeping wages below VMP, the firm recoups the cost it incurred earlier.

Assume that a firm is hiring labour for a specified time period and that both labour and product markets are competitive. If there is no on-the-job training, a profit maximizing firm will be in equilibrium when the value of marginal product equals wages or when marginal receipts equals expenditures, i.e.

$$MP = W \qquad (1)$$

where W equals wages or expenditures and MP equals marginal product or receipts. More generally, equilibrium is defined by the set

$$MP_t = W_t \qquad (2)$$

---

1. This section is drawn from from Becker (1964)

where t refers to the *t*th period and the equilibrium position in each period depends only on the flow during that period.

On-the-job training alters these conditions by creating a relationship between present and future receipts and expenditures. Training could lower current receipts and raise current expenditures but firms could still profitably finance this training if future receipts were sufficiently raised or future expenditures sufficiently lowered. In this case, wages need not equal marginal product in each period and expenditures and receipts in all periods would be interrelated. Equation (2) would be replaced by an equality between the present value of receipts and expenditures where E*t* and R*t* denote expenditures and receipts respectively in period *t*. The equilibrium condition can be written as

$$\sum_{t=0}^{n-1} \frac{Rt}{(1+i)^{t+1}} = \sum_{t=0}^{n-1} \frac{Et}{(1+i)^{t+1}} \qquad (3)$$

where *i* is the market discount rate and *n* represents the number of periods. Equation (3) is a generalization of (2) for if marginal product equals wages in each period, the present value of the marginal product stream will have to equal the present value of the wage stream, but the converse need not hold.

If training were given only in the initial period, expenditures in the initial period would equal wages plus the outlay on training while expenditures in other periods would equal wages alone, and receipts would equal marginal products. Equation (3) becomes

$$MP_0 + \sum_{t=1}^{n-1} \frac{MP_t}{(1+i)^t} = W_0 + \sum_{t=1}^{k+n-1} \frac{W_t}{(1+i)^t} \qquad (4)$$

where *k* measures the outlay on training. If a new term is defined,

$$G = \sum_{t=1}^{n-1} \frac{MP_t - W_t}{(1+i)^t} \qquad (5)$$

equation (4) can be written as

$$MP_0 + G = W_0 + k \qquad (6)$$

k does not measure the entire training cost as it excludes the opportunity cost of the time that a person spends on this training. The difference between what could have been produced, MP'_0 and what is produced, MP_0 is the opportunity cost of the time spent on this training. If C is defined as the sum of the opportunity costs and outlays on training, (6) becomes

$$MP'_0 + G = W_0 + C \qquad (7)$$

The term G denotes the excess of future receipts over future outlays and measures the return to the firm from providing training. The difference between G and C measures the difference between the return and the cost of training. Equations (3) and (7) represent the general results which have to be modified depending whether the case relates to general or specific training.

9.2. General vs. Specific Training

As discussed in Chapter Three, general training raises the productivity of the worker in firms other than those providing it while firm-specific training increases the future marginal productivity of workers only in the firm providing it. Since wage rates paid by any firm in a perfect market are determined by marginal productivities in other firms, future wage rates and marginal products would increase in firms providing general training. These firms could capture some of the return

from this training only if their marginal product rose by more than their wages. Since general training is equally useful in many firms, marginal products would rise by the same extent in all of them and wage rates would rise by the same amount as marginal product. Firms providing such training would not be able to capture any of the returns.

Rational firms would therefore provide general training only if they did not have to pay any of the costs. On the other hand, since training raises their future wages, workers receiving general training would be willing to pay these costs. Trainees thus bear the cost of general training and profit from the return. More formally, since wages and marginal products are raised by the same amount, MP_t must equal W_t for all t=1,....n-1 and therefore

$$G = \sum_{t=1}^{n-1} \frac{MP_t - W_t}{(1+i)^t} = 0 \qquad (8)$$

Equation (7) becomes

$$MP'_0 = W_0 + C \qquad (9)$$

or

$$W_0 = MP'_0 + C \qquad (10)$$

and in terms of actual marginal product

$$MP_0 = W_0 + k \qquad (9')$$

or

$$W_0 = MP_0 - k \qquad (10')$$

Wages of trainees would not equal opportunity marginal product but would be less by the total cost of training. Employees pay for general training by receiving wages below their current productivity and what they could receive elsewhere.

Much of on-the-job training is neither completely general nor completely specific but raises productivity more in the firms providing it and falls

within the definition of specific training. If all training were totally specific, the wage that an employee could command elsewhere would be independent of the amount of training received. Firms would have to pay these training costs as no rational employee would pay for training which did not benefit him. Firms would provide training whenever the discounted returns were at least as large as the cost and collect the returns in the form of larger profits resulting from higher productivity.

This can be stated more formally. According to equations (5) and (7), equilibrium in the training market is

$$MP'_0 + G\left[\sum_{t=1}^{n-1} \frac{MP_t - W_t}{(1+i)t}\right] = W_0 + C \qquad (11)$$

where C is the cost of training given only in the initial period. Under specific training, W would always equal the wage that could be received elsewhere, $MP_t - W_t$ would be the full return in t from training given in 0, and G would be the present value of these returns. Since MP'_0 is the alternative marginal product and W_0 the alternative wage, MP'_0 equals W_0, and G, the present value of returns equals C, the return from training costs.

In practice, what constitutes a firm-specific skill depends largely on the structure of the labour market. If management practices and personnel policies discourage turnover, labour becomes a quasi-fixed factor (Oi 1962). In an economy where there are substantial barriers to mobility, otherwise general skills learnt in one firm may become specific.

Rapid technological change means that optimal training levels which depend on, *inter alia*, the levels of aggregate demand, the type of physical investment and the degree of substitution between skilled and unskilled labour, are rapidly being redefined. This signals a role for the government provision and financing of training together with employers and workers but there is no agreement about the precise form

of the partnership and how responsibility for providing and financing should be shared (Woodhall 1984). Institutional arrangements and financing mechanisms differ between countries and no single pattern of provision seems to be appropriate for countries with different historical and institutional patterns (Bowman 1987).

9.3. Determination of Cost-Sharing for Specific Training

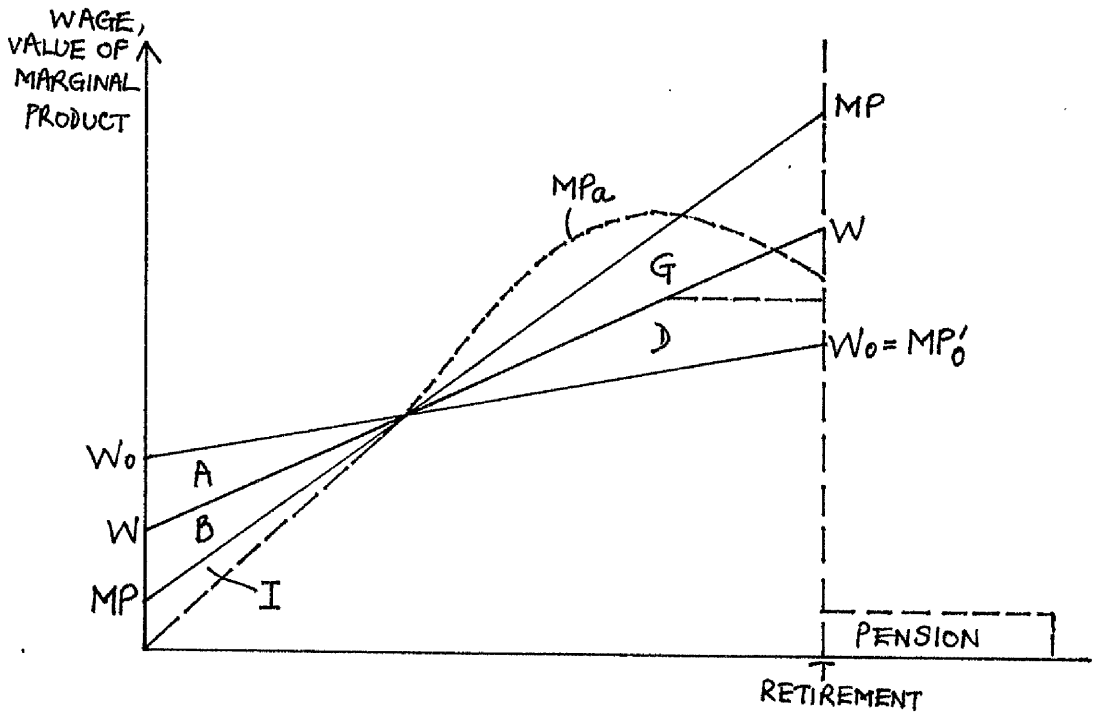
Theoretically, both the employer and employee share the costs of specific human capital investment. The actual sharing formula will have to be negotiated, and some continuity of employment is necessary. *Ceteris paribus*, the longer a worker expects his tenure with a firm to be, the more he will be willing to invest in specific training in that firm (Bartel and Borjas 1978). This means that even older workers will invest if they have recently changed jobs, so worker investments and the rate of pay will not decline monotonically with age (Siebert 1985).

The following analysis of the financing of training assumes that investment decisions are based only on earnings prospects and there are perfect capital markets. The adjusted marginal rate of return for all investments would then be equal. However the rate of return on human capital investment is supposed to be higher than on non-human capital because of financing difficulties and imperfect knowledge of opportunities. It is difficult to borrow to finance consumption during the apprentice period because human capital cannot be offered as collateral. This is a problem also faced by the employer who wishes to finance firm-specific training. This factor, together with a high rate of time preference usually produces a suboptimal level of investment in education, training, health, migration and other forms of human capital particularly in LDCs.

The main theoretical issues governing the financing of specific training are illustrated in Figure 9.1. The employee's alternative marginal product is MP'_0 and the alternative wage without specific investment is W_0. Training programmes within the firms will not affect this alternative wage, only the course of marginal product

within the firm. During training, a worker's marginal product will generally be low but once the training is completed, marginal product will be higher than it would have been. This is denoted by the line MP. The wage path for the employee in the firm is drawn as W. The dotted I segment represents direct training costs incurred by the firm.

Figure 9.1
Wages, Alternative Wages and Marginal Product in the Specific Training Case



Source: Figure 2.6, Siebert (1985)

If the wage path within the firm coincides with the worker's alternative wage, this means that employers bear all the costs and collect all the returns. The employer would pay out the area (A+B+I) and collect the triangle (G+D). The latter area must be larger than the former so that the present value of future returns R_t equals investment costs E_t, as set out in equation (3).

Both employer and employee thus have to come to an agreement about the sharing of the costs and returns. A suitable agreement would make for a steeper

MP curve, which would result from the productivity-enhancing effects of training and from greater workforce stability if workers have shared in the costs of specific training (Lazear 1979). The sharing of specific capital costs would also encourage workers to self select.

9.3.2. Effects of Tenure and Turnover

Because of the substantial investments in training and hiring costs that a firm typically makes in a worker (Oi 1962, Becker 1964), regulating turnover is an important policy of the firm, as some continuity of employment is necessary to facilitate profitable investment in firm-specific training. As stated above, the longer a worker expects his length of tenure with a firm to be, the more he will be prepared to invest in specific training in that firm. This is an issue that is particularly pertinent in an economy with high labour turnover like Singapore. The wage rate is a method for reducing turnover costs.

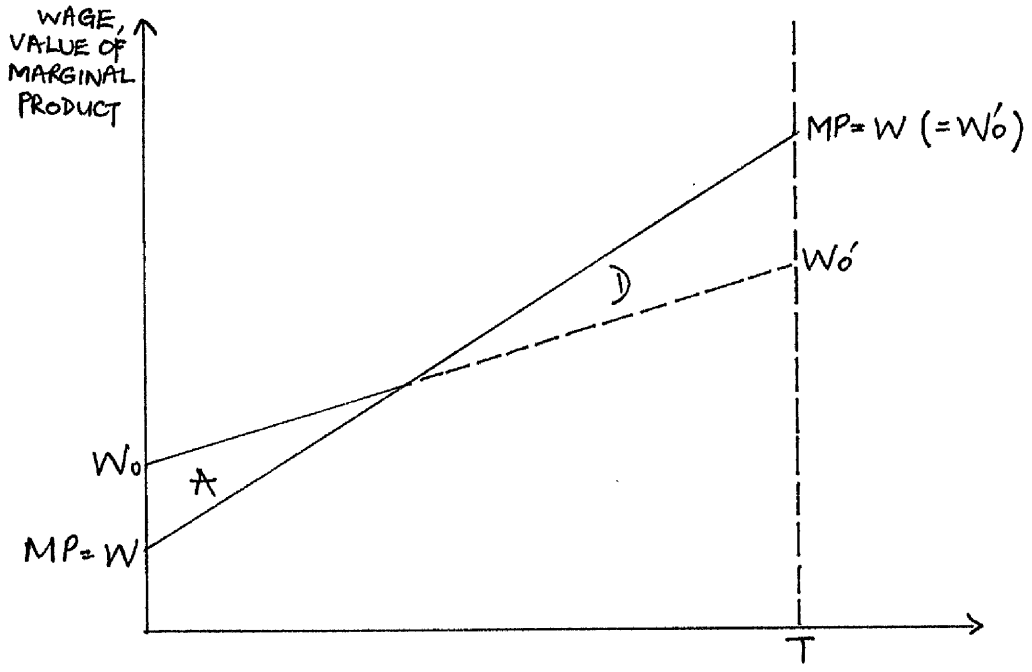
According to Salop (1973), relative wages should rise in firms which, because of either higher productivity or higher product prices, suddenly find their workers more valuable and attempt to reduce attrition due to quits. On the other side of the coin, since training costs borne by the firm must be recouped through worker productivity higher than worker wages (value of marginal product > wages), the higher the levels of specific human capital, the less likely minor and temporary fluctuations in product demand will drive productivity below wages. Thus layoffs will be less prevalent when training and hiring costs are high. (Oi 1962, Becker 1964, Rosen 1968 and Parsons 1972).

The determination of the employer's share, a, will depend on factors other than the specificity of training (Becker 1975). In coming to agreement about the amount of this investment and the shares in this investment, the two parties have to agree about the likely paths of W_0 and MP. a will be set depending on the likelihood of quits and dismissals in the firm with the aim of achieving maximum stability, since employment continuity is necessary to realize the maximum potential returns to

specific capital investment. *Ceteris paribus*, a high *a* will reduce the likelihood of dismissals but increase the probability of quits. This suggests that there should be a negative correlation between a firm's quit rate and measures of a worker's share of specific human capital. According to Parsons (1972) this seems to be the case. Workers who make successful agreements with firms will acquire more specific human capital and have longer tenure with the firm and steeper wage profiles (Mincer and Jovanovic 1978). This implies that earnings are also determined by the length of a worker's tenure with a firm.

The specific human capital concept also sheds light on the issue of mandatory retirement. The linearity of Figure 9.1 is a simplification. MP_a is a more realistic curve with productivity tailing off in old age. If wages continue to increase because of say, a seniority-based pay scheme, the date of retirement becomes important from the employer's point of view.

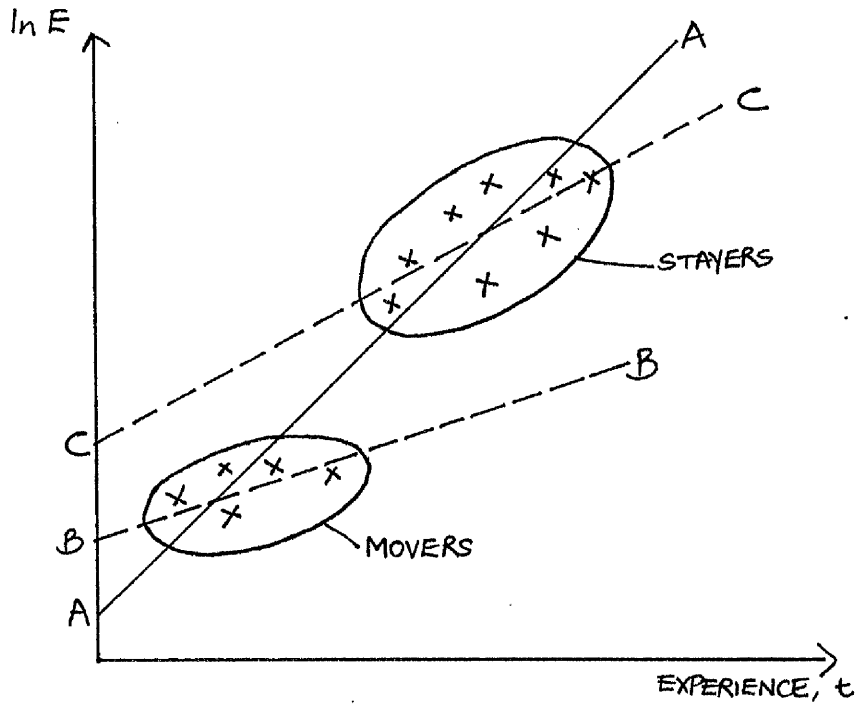
Figure 9.2
Wages, Alternative Wages and Marginal Product
with General Training



Source: Figure 2.7, Siebert (1985)

The concept of the alternative wage differs in the context of general capital because general training changes the alternative but the pre-training wage is still the relevant wage for determining whether or not to invest. The pre-training alternative wage path is W_0 in Figure 9.2, and the course of the trainee's marginal product is MP. The present value criterion ensures that areas A and D are equal in equilibrium at time t = 0. After the cross-over point, the worker's alternative wage becomes W'_0 which increases with his marginal product, but W_0 is still relevant for calculating the returns to his investment.

Figure 9.3
Tenure effects on estimates of returns to training



Source: Figure 2.8, Siebert (1985)

Failure to consider specific capital investment can bias estimates of the returns to general training, and the extent of the bias will differ between young and old workers (Mincer and Jovanovic 1978). The group with the long tenure (the stayers) have been separated from the ones with shorter tenure (the movers). Pooling these two groups in estimating the returns to training will overestimate the returns to

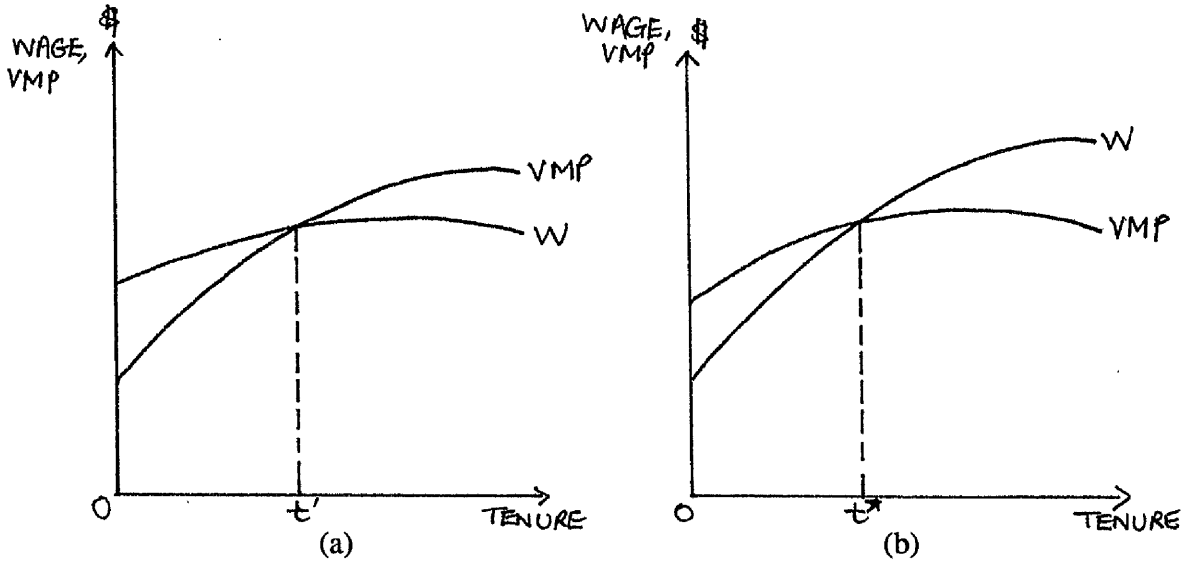
experience for both groups, as illustrated in Figure 9.3. However the bias for younger workers could be reversed. The ability effect of more able young workers job hopping could offset the effects of frequent job changing on specific capital accumulation.

Lazear (1979) proposed an alternative model in which, in order to maximize a worker's lifetime earnings and productivity by reducing turnover costs, firms and employees would agree on a schedule of compensation such that workers are paid less than their marginal product when they are younger, and compensated by higher than marginal product wages when they are older.

Figure 9.4a depicts the Becker (human capital) model and Figure 9.4b is consistent with the Lazear implicit contract model. The points in time when the W and VMP schedules intersect are t' and t^* respectively. Oliveria et.al. (1989) attempted to test which profile conforms to reality by estimating tenure-earnings and tenure-productivity profiles employing United States data from the 1983 wave of Panel Study of Income Dynamics.

The results showed that both the tenure-earnings [E(W)] and tenure-productivity [E(V)] profiles were concave. It was found that the maximum height of the E(V) schedule was reached at 21 years of tenure and diminishes thereafter. In contrast, the maximum point of wages was reached at 27 years of tenure with only modest reductions thereafter.

Figure 9.4
Hypothetical tenure-earnings and tenure-VMP profiles



Source: Figure 1, Oliveria (1989)

At the early stages of tenure in a firm (about 6 years) workers tend to receive wages higher than their productivity, as employers subsidize them during specific training. The second stage, spanning about 12 years, corresponds to the period when the employer recoups his earlier investment, during which productivity exceeds earnings. Beyond that point, wages remain relatively constant, with institutional factors mitigating against wage reduction. Oliveria et.al found that very few workers remained with a firm for more than 20 years so that the gap between wages and productivity after 18 years was not generally substantial. They concluded that this gap supports Lazear's contention of the desirability of mandatorily-imposed retirement.

9.4. The Singapore Context

The current emphasis on firm-based training in Singapore is a response to the pace of technological change and in turn, government targets set in anticipation

of comparative advantage[2]. The absence of a local training tradition has dictated a broad role for the government in both the provision and financing of training, especially in view of the high level of turnover.

A survey of 17 firms over a 10 month period in 1988 found that for every 8 workers hired, 7 left.[3] Conventional wisdom contends that too high a level of job mobility is detrimental to increasing productivity and the fostering of closer employer-worker ties. While the government has attempted to reverse this anomaly,[4] it should be noted that turnover may be both necessary and desirable in dynamic industries, and costly responsibilities of a fixed and ageing labour force would reduce employers' flexibility in managing their workforce.

Any discussion on the optimum level of mobility of trained personnel needs to distinguish between poaching between firms which is a free rider problem in a static economy, and the mobility that results from the expansion of an industry as new firms enter the market. Labour stability in a tight labour market would make it difficult for newly established companies to hire workers (Lim and Pang 1984). However, a high labour mobility will have a negative impact on the amount of training that firms find profitable to carry out.

It is plausible to assume that workers require a basic level of general training to achieve a minimum productivity for the firm. If workers only remain with a firm for a brief period, it is also likely that they will acquire very little firm-specific training. In a situation with high mobility, contrary to the predictions of theory, employers may find it difficult to shift even the cost of general training to the trainees through lower wages as these workers will be bid away by higher wage offers. The following excerpt is taken from the Business Times, 14 August 1989:

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2. The reasons for the restructuring policy were discussed in Chapter Two.
3. Straits Times, 25 January 1989
4. Some of these include the "company welfarism schemes" and the promotion of Japanese-style industrial relations.

> " The starting pay of production operators is rising in the heat of the battle for more workers...manufacturers scrambling for more workers are raising pay by up to 10 per cent. At the same time, they are offering retention bonuses to keep the new workers...Philips has a "special bonus" for the first month, $150 for the third month and another $150 for the sixth month (of service)...it realizes that it is only a matter of time before the others catch up and things are back to square one."

In this situation, firms will undertake the "minimum" amount of training.. Incentives have to be devised to encourage firms to train beyond this "minimum".

9.5. Should there be constraints on mobility?

One question that arises is whether there should be greater use of legal contracts to compel trained workers to remain with the company in which they receive their training. A bond is a legal contract that requires the trainee to perform X number of years of service in return for a specified length of training, failing which liquidated damages of a specified sum must be paid to the party that granted the training award. The ideal that employees should be motivated to stay with a company out of loyalty aside, the transaction and enforcement costs of a bond may be large enough to deter the viability of such a scheme. This may explain the greater prevalence of bonding in the public sector where enforcement costs are smaller as any unpaid bond can theoretically be recouped through the tax system.

The presence of contracts may lead to more efficient resource allocation. If it is in the interests of another firm to buy out the bond of a potential employee, the anticipated productivity of that worker within that company should be greater than the value of the bond and the related transaction costs. A similar analysis applies from the individual's point of view: if the cost of repaying the bond is fixed while his marginal product and wages are rising, it would be efficient for him to buy out the bond himself if the present discounted value of his alternative wage is greater than the cost of repaying the bond.

9.6. Overview of Training Effort

A 1987 survey highlighted the deficiencies in Singapore's training effort.[5] The workforce is less educated that those of the United States, Japan and Taiwan. At the rank and file level, 53% of our workforce in 1984 had at most primary level education compared with 15% in US, 35% in Japan and 45% in Taiwan. 47.5% of the working population in 1986 had some form of vocational training compared with the 70-80% in US and West Germany with up to high school or skilled worker equivalent qualifications in 1981.

Since 1981, the Skills Development Fund (SDF) the national authority overseeing training has disbursed some S$30 million a year in training grants. Even assuming that employers spend three times what they get in grants from the SDF, the annual training bill is only S$100 per employee. The Americans spend S$750 to S$800 a year on each employee while the Japanese spend S$2,000 to S$3,200. In terms of GDP dollar spent on training, 1.5% of the GDP dollar in the US is spent on on-the-job training while Singapore spends 0.5% of our GDP on training. In 1985 firms spent S$2,000 per worker on new fixed assets investment and only S$100 million on training the people who are going to run them while output per worker was S$16,000. In terms of time spent, workers on average spend ten hours each year on off-the-job training, compared with the 40 hours spent each year by each German worker.

9.7. The Training Infrastructure

The national authority for training is the state-run and administered Skills Development Fund (SDF) which oversees training for older and existing workers in the workforce. The state has also collaborated with some multinational corporations (MNCs), specialized manufacturers and foreign governments to set up training centres under the Joint Government-Industry Training Scheme (JGITS). This

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5. Singapore, National Productivity Board, Initiatives for Reskilling the Workforce, 1987

scheme was established in 1972 to train skilled craftsmen by providing training up to international standards by collaborating with firms which could provide experienced practical instructors, and a well tested training programme.[6]

The SDF and the Vocational and Industrial Training Board have teamed up with the private sector to set up Industry Training Centres.[7] But the bulk of employer-based training is done under the SDF levy-grant system. The system has two main aims: to overcome employers' reluctance to train and to help workers upgrade. A 2% tax is levied on the wages of all employees earning less than S$750 a month.[8] The money goes into the SDF from which grants are disbursed to help defray employers' costs of providing or sponsoring training programmes.[9].

The levy-grant system has no quid pro quo. Because there is no relation between how much a company is awarded in grant and how much levy it has to pay, it is hoped that this will encourage those employers who have a large levy bill to recoup this by increasing their training effort.

The government has always maintained in principle that the burden of financing training should rest with the end users and it put this into practice. All the money eventually disbursed as grants comes from employers but there is inevitably a degree of cross-subsidization between firms. Moreover grants seldom cover the full cost of any training programme.[10]

The grant system now favours those training courses and programmes that target workers earning less than S$750 a month or those with "A" level

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6. Some of these training centres include the Japan-Singapore Training Institute, The German-Singapore Institute of Production Technology, The French-Singapore Institute of Electro-Technology, The Precision Training Institute set up in conjunction with Tata-Telco of India and Brown Boveri of West Germany.
7. Some of the industries which have their Industry Training Centres include the hotel, textile and garment, die-casting and construction industries.
8. This began as a 2% levy that was increased to 4% in 1981. It was lowered to current levels after the recession.
9. The SDF levy originated in the 1979 NWC recommendations as a way to mop up potential excess liquidity in the economy resulting from the "high wage" recommendations.
10. Grants usually cover either 30%, 50% or 70% of the cost of a training programme

qualifications or below. Prior to 1987, training for all levels of workers including high level executives was supported with the result that those earning less than S$750, the targetted group, accounted for less than 30% of the employers' training budgets and 20% of the total training places supported by the SDF in 1982-1986.[11] After the revamp in 1987, 82% of approved training places went to those with "A" level qualifications and below and 55% went to those earning less than S$750.[12] Greater support is given to training programmes that take place within the company. Much of the training supported by grants are for general skills. The fact that firm-specific training is not widely supported has implications for turnover and retirement arrangements which have already been discussed.

9.7.2. Training Patterns

It is a stylized fact that the level of training done by small local firms is low compared with the training done in large multinational companies. SDF statistics[13] show that in 1987, firms with less than 50 employees accounted for 34% of total applications received while those with more than 200 workers submitted 42%. The categories that submitted the most number of applications were those with 10-49 and more than 500 employees.

Figures showing the percentage of companies reached by employment size are more revealing.[14] The reach of financial incentives was complete for companies employing 100 persons or more. The figure was 6% for those with less than 10 employees, rising to 44% for those with 10-49 workers and 91% for the 50-99 category. There are no figures showing the breakdown between local and foreign firms.

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11. Skills Development Fund Annual Report 1987/1988, S 32 of 1989, presented to Parliament pursuant to Statute, 9th January 1989
12. Ibid.
13. Ibid.
14. The number of firms "reached" is defined as the number of companies that have applied at least once to the SDF.

The incidence of employer-based training also differs by sector. In 1987, 29 training places per establishment were created in the service sector as opposed to the 39 per establishment in manufacturing.

There has been a sharp rise in the number of firm based training schemes. The percentage of employees trained by internal instructors in 1987 accounted for 76% of all workers supported and 37% of total grants committed that year. In terms of the type of training undertaken, the bulk of incentives were taken up by training in general but job-related skills. 62% of the grants committed and 41% of the training places supported went to technical production & engineering, technical service and trade & craft courses. This suggests that employers are investing more in training a greater number of employees for technical and craft skills. The most heavily subsidized form of training was the long trade/craft skills upgrading programme.

Figures like these tell only part of the story. A survey was conducted by the author to find out, first-hand, firms' attitudes to training, the types and levels of training provided by local and foreign firms, their experiences with the training system and their views on the labour market,

Requests for interviews were sent out to 116 firms and positive replies were received from 20. The sample is too small for any rigorous analysis but comments from the employers provide some insight into the training and the state of the labour market in general.

9.8. Firms' Training Profile

a. Foreign Firms

All the foreign companies in the survey sample save one, conduct manpower forecasts, most on a year-by-year basis, one on a 2-year and another a 3-year rolling basis.

In addition, all the foreign firms save one have their own in-house training programmes conducted by full-time or part-time trainers or by the heads of departments. All conduct courses for product familiarization and maintenance, and several also undertake supervisory courses. The courses are structured between the classroom and on-the-job. One manufacturing firm practises cross-training which equips each worker with skills to perform several tasks to increase flexibility. All the foreign companies also either periodically send workers, usually middle management, overseas for training/seminars or have visiting experts or their vendors from time to time. 3 firms participate in apprenticeship programmes in conjunction with either the VITB or the EDB. The food manufacturer stopped the scheme because there were no takers.

Training needs assessment is not done formally in any of the foreign firms; workers who require training are identified by departmental managers, and workers are sent for training as and when courses are available and deemed "relevant".

These companies received grants from the SDF to offset fees incurred when sending workers to Approved-in-Principle courses at local institutions. These ranged from apprenticeship arrangements with the VITB to predominantly supervisory and lower-level management courses at the Singapore Institute of Management (SIM) and the National Productivity Board (NPB). Grants were also received for the conduct of basic academic BEST and WISE and "personal effectiveness" courses[15]. These usually amounted to around 30% of their annual total training bill. The cost of training done internally is regarded as an overhead and the amount of training carried dictated by the internal needs of the company and

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15. BEST (Basic Education for Skills Training) aims to enable workers to obtain primary levels of literacy and numeracy. WISE (Worker Improvement through Secondary Education) is the next step up to enable workers at BEST or equivalent level to obtain secondary level qualifications. The most common personal effectiveness course is COSEC (Core Skills for Effectiveness and Change) which focuses on cultivating good communication and interpersonal skills. All these are run by the National Productivity Board.

production schedules. Training costs as a percentage of total payroll ranged from 1% for the food manufacturer to 10% for the instrumentation firm.[16]. The divergence can be explained by the fact that these two are at opposite end of the technology spectrum with food technology being fairly stable.

4 of the companies that have their own in-house training programmes also conduct some sort of monitoring. Performance appraisals are conducted in two of the firms while the other two measure productivity after training in terms of indicators such as quality control, output, number of call backs from customers, number of hours spent on each job. Of the other three, one relies on casual observation while the other two are in the process of working out the details of a performance evaluation.

Worker remuneration however does not depend on whether they have undergone training. They are paid in accordance with predetermined yearly increments. Despite the tendency for high turnover, only one firm practises bonding outright while another tries to induce labour stability through a comprehensive career development programme.

b. Local Firms

6 of the 13 local firms do not practise manpower forecasting. 5 of these have less than 100 employees; the only establishment with less than 100 employees that conducts quarterly and yearly reviews is the public sector computer support department.

Because of the great variability in establishment size, there are also wide differences in the amount of training undertaken. Of the 6 firms that were less than 100 strong, 2 had no in-house training at all while another 2 had just submitted their proposed Worker Training Plans to the SDF.

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16. The total training costs refer only to direct costs such as fees for local and overseas courses. Opportunity costs are not taken into account.

In the firms with more than 400 or more employees, training conducted in-house is structured into modules with a training hierarchy and designated hours for all skill levels. Training at supervisory and technician level is usually granted SDF support. Middle and higher executives in 3 firms are periodically posted overseas for training. The two that sponsor senior executives abroad only send those who have been identified for further career development within the company while the finance and accounting firm sends supervisors abroad for training but bonds them one year for each year they spend abroad. The statutory board which runs one of the tourist attractions also bonds employees sent abroad for specialist training; employees are bonded for 1 year for a month spent on overseas training, and for 9 months for a two-week stint abroad.

3 of the local firms have apprenticeship schemes. The die-casting firm trains in conjunction with the Singapore Die-Casting Training Centre but they are not able to obtain all the apprentices they require although they obtain SDF support on the order of 50%-70% for those they do sponsor. The finance and accounting firm hires accounting graduates from the tertiary institutes every year and trains them within the firm to be eventually released into the industry. This is however not supported by the SDF; support is restricted to courses undertaken in information technology. The hotel conducts formal in-house training on a classroom basis but aside from the generic BEST, WISE and COSEC for which it gets 100% reimbursement, support is not claimed.

It is difficult to measure the extent of SDF support for training done by local companies because for some of these, particularly the smaller ones, training is an ad hoc affair, with no predetermined annual training budget. Employees are sent for courses when the need arises and schedules permit. From the sample the level of support varies greatly from company to company, from over 50% of total training expenditure in 1989-1990 for the travel agency to 7% for the trading/service company in 1988.

4 of the 6 firms with less than 100 employees do not monitor performance in any way after training. One company asks for evaluation of the courses undertaken, while the other conducts works out performance indicators on a departmental basis. Of the larger companies, 3 out of the 7 do not monitor performance after training. The finance and accounting firm explained that in their case, the result of the training was applied on-the-job almost immediately and any deficiencies would show up automatically.

9.9. Evaluation of Survey Findings

1. The training structure

In general the firms agreed with the revised grant system which favours training for lower and middle-level workers. On the other hand several employers felt that this ought not be pursued to the total exclusion of higher-level management and executive workers. The creation of the facilities and environment for a "total business centre" requires a considerable pool of management expertise. It seems paradoxical that this should not be acknowledged in the training grant allowances. Moreover granting some senior level training support may give incentive for firms to provide even more training for the lower levels. It was recognized however that the cost of training management level workers is far higher than that for other workers and employers recommended flexibility in granting support to training at this level. One employer suggested that middle level training could be supported if SDF surpluses were accumulated. A system of grants for supporting middle level training could perhaps be worked out based on the firm's overall training effort and the amount of training provided to its lower-level workers.

The grant scheme is a bonus for those companies that have a training tradition. According to these firms, the SDF has not affected the amount of training their company carries out. However for the smaller firms, those with less than 100

employees, the grant scheme has enabled them to train more than they otherwise would have done.

The survey shows that firms receive greatest SDF support for apprenticeships and technical courses undertaken in conjunction with the Vocational and Industrial Training Board or the Economic Development Board or with any of the approved industry training centres, basic educational programmes, generic skills programmes, productivity-related training and supervisory development, and company-based training programmes. However many workers are reluctant to undertake generic educational courses. In some cases, employers had been willing to set up these classes at the workplace but workers had been less than enthusiastic partly because of the stigma of returning to a school setting for "basic" qualifications and partly because the skills involved were not directly related to their industry nor their job.

Much of the grants subsidize training for general skills. Even though conventional theory dictates that the cost of this should be borne by the worker, the high level of worker mobility has created a situation where the social benefits of greater provision exceed the private benefits to both the firm and the worker. This constitutes a case for public subsidy scheme which is the rationale of the present system.

4 of the employers surveyed were dissatisfied with the current levy-grant system as it permitted an enormous amount of cross-subsidy between industries. Levies collected from one industry go to subsidize training in another industry. One employer suggested that the system be modified so that funds collected from one industry be earmarked for disbursement in that industry. However under this system, mature industries like the food and beverage that have an older workforce and thus were not liable for much levy, would be run the risk of a shortage of funds.

Another surveyed employer suggested that support be given at a fixed percentage of the training budget across-the-board to all firms. If a firm spends say,

8% of total payroll on training, the SDF could reimburse 5%. When this was put to the SDF, they explained that this option had been considered unfeasible. An across-the-board grant would not motivate nor give firms the opportunity to exceed the amount of the levy paid, as the present system does.

Nevertheless to recoup the levy in the present system, employers could send the same workers for training each time. A system of checks should be instituted to ensure that workers at all skill level within a firm have access to training. This problem was highlighted by the local firm running a number of car parks where language barriers precluded access to training for 90% of the workforce. The SDF have taken stock of this problem and are putting together a series of programmes for educationally-disadvantaged workers termed "TV-led training" with tutorial backup at selected study centres.

One area that seems to have taken a back seat is monitoring and evaluation. Measuring the benefits of training is a complicated affair especially in industries where output is not easily quantifiable. In manufacturing, where this is somewhat easier, the SDF should help devise a method to monitor performance before and after training for various industries.

2. The Role of the Skills Development Fund

There seems to be a difference in the role of the SDF as perceived by the SDF and employers. The SDF sees itself primarily as an administrator, secondly as a promoter of training, and lastly as a training consultant. On the other hand, employers see its primary role as assistance in the training function, with the consultancy role dominant. Several employers felt that the SDF should help to evaluate the many other training programmes on the market. As employers expect the SDF to function as a training consultancy, several employers thought that the officials lacked the necessary business acumen needed to be effective. It was suggested that professional trainers from the private sector be brought into the SDF to inculcate expertise in training consultancy.

The most serious concern of employers is that there is insufficient private sector input into policy formulation. Many employers felt that the organization was too bureaucratic with insufficient flexibility in setting up and implementing guidelines. While the private sector is represented at the top-level management committees, their influence was not thought to be close enough to the centres of decision-making.

3. The Labour Market and Restructuring Policy

Despite the high labour turnover, bonding of employees among private firms does not seem prevalent. Only two out of the 18 firms in the private sector used contractual bonding. Government departments and statutory boards have a bonding policy and apprentices trained at industry training centres are naturally bound to serve their sponsors for a specified time. When asked why they do not bond, employers believed that if employees really wanted to leave, they would find a way to buy out their bond. They felt that employees who stayed because they were contractually bound would be inefficient and detrimental for morale. Mobility is regarded as an inevitable overhead by some of the larger firms but one small insurance company believed that it would be difficult to achieve a higher skill content without greater labour stability.

Two of the surveyed employers felt that the pace of restructuring was proceeding too quickly, and that some profitable but technologically stable industries were being pushed out. This was viewed with some trepidation as the critical mass of sophisticated manpower vital to the eventual success of a high technology phase of development was not yet present. Moreover shorter product life-cycles and increased demand for customized production imposed feasibility limits to automation. There was also some doubt expressed about whether the economy would really be able to establish itself as a hub for research, innovation and design. Those who did felt that

the prevailing environment and education system did not encourage creativity and independent thinking which form the basis for successful innovation and design.

9.10. Conclusion

The SDF has helped to mitigate underinvestment in training arising from market failure caused by high labour mobility. But it still has some way to go in raising training awareness, particularly in small firms.

While there is some dissatisfaction with the operation of grant-levy system, it still seems to be the best method yet mooted to spur firms to undertake training. While most firms agreed with the emphasis on training at the worker level, some employers suggested that it may be worthwhile to examine the possibilities of extending the net of SDF support to training middle level manpower, perhaps on a lower priority level.

The examination of the system and the problems faced by employers highlights the importance of achieving a greater degree of stability in the labour force while at the same time balancing this objective with the need to maintain efficiency in the allocation of labour.

CHAPTER TEN:
SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

Examination of various aspects of manpower policy in Singapore in the 1980s in this thesis has brought to light several policy areas requiring further consideration. The analysis has revealed two factors that will govern the scope and success of policy options: the mobility of the skilled local workers and the skilled labour wage structure.

A. Population and Fertility: Constraints and Implications

Chapter Five spelled out the extent and the implications of the demographic constraint facing Singapore. The most recent population projections show that even if replacement level fertility is attained in the year 2000, dependence on foreign workers and the ageing of the domestic labour force is likely to continue.

Replacement fertility and constant participation rates will generate a labour force rate of growth of only be around 0.1% early in the 21st century, after which it will stay flat at the zero growth level to reach its maximum size of 1.44 million in the year 2015. (Saw 1987). In this case, the proportion of workers over 40 years will stabilize at just under 50% in the year 2010. Both problems will be accentuated if fertility continues to remain below replacement level and reduces Singapore's chances of attaining a "critical mass" of nationals to sustain growth in the long run.

Some elements of the population control policy are clearly no longer appropriate. The easy availability of abortions to any woman who wishes to terminate her unwanted pregnancy is a practice that should be reviewed. Since the legalization of abortion in 1975, the annual number of abortions has exceeded the births shortfall by a wide margin. In 1985 there were 23,452 legal abortions which meant that there was one abortion for every three conceptions. The present liberal attitude towards voluntary sterilization should also be reassessed. Saw (1987) has urged that sterilization be restricted to spouses with at least two children instead of the current practice of offering this permanent method of birth control to those without children.

B. The Future Employment Status of Women

1. Childbearing, Participation and the Demand for Foreign Workers

Overall population pressures together with the observed trend that well educated women were marrying later and having fewer children than women who were less educated formed the basis of the New Population Policy. Parents who can afford to have more children are encouraged to do so by incentives such as tax rebates for a third child and enhanced child relief for working mothers with above a certain educational qualification (Lim 1988). At the other end of the scale, a cash grant incentive of S$10,000 is offered to lower educated women to undergo sterilization after reaching the two child family norm.

As pointed out in Chapter Five, raising the status of full time motherhood will reduce the demand for and the pecuniary cost of alternative childcare arrangements. This will lower the demand for foreign maids who now constitute a large proportion of the low-skilled foreign worker population. On the other hand the withdrawal of women from the labour force will mean that foreign workers will have to be imported to take up jobs in other sectors that women would have otherwise filled. While it can be argued that importing skilled labour is favourable to importing unskilled workers on the premise that the former are able to enhance the quality of the population, the costs of doing so may be greater. Premiums would have to paid to attract foreign professional workers and their increased supply, *ceteris paribus*, could lower the wages and the economic rent presently commanded by well-educated locals. Premiums for the latter would then have to be enhanced to stem the budding trend of trained citizen workers emigrating to foreign shores.

Temporary absences of well-educated women from the workforce would increase the social opportunity cost of that education and reduce the economic benefits which are already adversely affected by the overall lower participation, as shown in Table 5.12. Since reducing women's access to higher education is not a viable option in a meritocratic society like Singapore, the cost of educating women who may not realize

education's full economic benefits because of non-participation in the labour market is one that will have to borne by society as a whole.

There is already some evidence that the occupational wage structure for women is inferior to that for men (Figures 5.5a-f). Not only do men earn significantly more than women in all occupations, the differentials have widened since the early 1980s. The reasons for this can only be conjectured. It may be pure discrimination. It may be that a more elastic female labour supply reduces the wage increase in response to a given rise in labour demand relative to males. Another possibility is that having children has an adverse effect on the amount and rate of human capital accumulation. If the latter is significant, there may well be greater returns at the margin to investment in childcare than education for women to maintain the level of female participation.

An analysis of the determinants of earnings based on starting salaries for fresh graduates finds that even at entry level, women earn significantly less than men with similar qualifications (Chapter Eight). As human capital variables such as years of labour force experience are not applicable at this stage, one can only conclude that wage discrimination against women is significant. The reasons for this can only be resolved by further research on the determinants of wage differentials between men and women, particularly the importance of human capital variables. However at present, the data required for this type of exercise are not available. This point will be taken up again in the discussion of labour market data.

2. State Action in the Provision of Childcare

If the female labour force participation is to be increased further, labour shortages in other sectors of the economy will be partly assuaged by domestic sources and *ceteris paribus,* this will reduce the numbers of foreign workers required. One way of increasing female participation would be to make more jobs available on a part-time basis to cater for the large numbers of women who wish to balance work and family responsibilities. Employers have been urged to adopt more flexible work patters but there

is some evidence that they are not keen to make these changes. Other solutions have to be found.

One way of resolving the conflict in the foreign maid and working mothers policies[1] would be an enhanced state role in the provision of childcare, either on its own or in conjunction with the private sector or the trade unions. It has been suggested that the money collected from the foreign maid levy, amounting to some S$25 million annually, be earmarked for a concerted capital investment programme in childcare facilities[2] or to subsidize the cost of childcare for children of working women. Investment in childcare should be seen "as an investment in education like primary schooling. Some observers have commented that the present attitude is that it is not worth encouraging the mother to work if she cannot earn enough to pay the cost."[3]

C. Raising the Retirement Age

The ageing of the population and the labour force has made it imperative that efficient use be made of all older workers. This requires that more effort be expended in their retraining and that they be encouraged to remain in the labour force for as long as they are able. Employers have been urged to voluntarily raise the retirement age from 55 at least up to age 60 years and if possible, to 65 but on the whole, firms have been slow to respond. In 1988, less than 20% of unionized companies in the private sector raised their retirement age when their collective agreements were renewed.[4] Legislation on this issue is in the pipeline.[5]

The problem could be that it is not profitable for employers to retain workers for a longer period. The seniority-based wage system discussed in Chapter Six creates a larger and larger wedge between wages and productivity towards the end of working life. Research by Lazear outlined in Chapter Nine shows that institutional arrangements which limit firms' ability to reduce wages in line with declining

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1. Straits Times, 21 January 1989
2. Straits Times, 17 January 1989
3. Sunday Times, 7 August 1988, Straits Times, 20 January 1989
4. Straits Times, 15 January 1989
5. Ibid

productivity, provide a strong rationale for seeking the termination of tenure. These institutional arrangements should be the first area of scrutiny in the attempt to encourage voluntary extension of the retirement age.

This first steps to rectify this was taken by the National Wages Council Subcommittee on Wage Reform. It proposed two alternative systems each comprising a basic wage to reflect the value of the job and a variable component dependent on company profitability or productivity. The first is a profit-sharing formula and the second, a variable productivity payment arrangement. The Subcommittee envisaged that the change may take up to 5 years to complete. It also recommended that total wage increases should lag behind productivity improvements but the labour shortage will render this a hard condition to fulfil.

D. Review of Foreign Worker Policy

Analysis of educational and occupational differentials in Chapter Five indicated that earnings of workers with less education and engaged in jobs at the lower end of the skill spectrum have risen faster than for workers at the higher end of the scales. This finding was supported by evidence obtained from a survey of employers conducted by the author.

The time frame for phasing out unskilled foreign workers, presently by 1992, will have to be reviewed. Available evidence shows that foreign worker demand has persisted despite quantitative controls and substantially raised hiring costs. This may suggest that labour-intensive and technologically stable industries have approached the limit of their substitution capabilities. Shortening product cycles also mitigate against investment in capital that require a long payback before returns can be recouped. Increasing the cost of hiring foreign workers in this situation only raise the unit costs of production.

Higher labour and operating costs have prompted many labour-intensive firms to move their production bases to West Malaysia, retaining only their service

centres in Singapore. This trend needs to be carefully monitored. While lower-skill, labour-intensive industries may not be as highly productive as those that are being actively encouraged, they are also less volatile and act as a buffer for the more volatile technologically advanced industries. One aim of restructuring the economy should be to diversify the economy's manufacturing base and promote a wide spectrum of competitive industries to insulate the economy from some of the vagaries of demand.

On the other hand, the plan to encourage the immigration of skilled foreign workers to Singapore is a step in the right direction. How successful this process will be is a moot point. What is important is that the repercussions on the rate of emigration of Singapore citizens be borne in mind. Analogous to the argument that large numbers of low-skilled foreign workers in the economy will depress the wages for citizen workers,[6] an increase in the numbers of high level foreign personnel will reduce the wages earned by citizen workers for a given level of demand. The well-educated higher income professional class are more mobile internationally and have a greater propensity to emigrate (section 5.5.6) should they find that they are less well off. This point may also prove relevant for the formulation of education and training policies.

E. Education and Training

A comparison of the social returns to investment in human capital, as exemplified by expenditure on education and training, and physical capital at the present time would probably conclude that returns to the former exceed those to the latter. Gross Fixed Capital Formation has been in the region of about 35% of GNP for a good ten years, whereas the extent and import of underinvestment in both formal and informal education and training has only recently been realized (Table 5.6). Heavy investment in human capital in both these forms is likely to continue and the projected rising demand for skilled labour will render this a socially profitable investment.

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6. Straits Times, 6 February 1989

The structure of education as set out in Appendix 6 aims to ensure that those who are not able to benefit from one type of education have priority in acquiring access to another to maximize their chances of securing productive employment. This is why vocational training has been expanded to reach every school leaver whose early performance indicates that he/she may not able to pursue an academic education successfully. This represents a sizable non-pecuniary externality and should be borne in mind in assessing the returns to vocational education and training in Singapore, despite the results in Chapter Seven which indicate that the pecuniary benefits accruing to this form of training are the lowest of all the types of formal education examined.

The payback period for tertiary-level business and accountancy courses was found to be shorter than the payback to engineering indicating a higher return to the former. At first glance this seems to support the argument that Singapore's comparative advantage now lies in finance and business services rather than production-oriented manufacturing. On the other hand the private and social payback periods for polytechnic education were found to be shorter than those for general tertiary courses such as Arts and Science, reflecting the relatively higher returns to middle level technical training.

The Skills Development Fund training grant programme has helped to raise what is still a relatively suboptimal level of training. This suboptimality, highlighted in Chapter Nine, is defined in terms of the training effort of other economies and the skill targets that have been set out by the government. The skills that are being subsidized are portable, general skills for which both social and private returns are the greatest and, which under human capital theory, should be paid for by the individual.

However, evidence from a survey conducted by the author and other sources indicate that the high level of labour force mobility is a major disincentive for firms to provide training. Short supply and high mobility imbue these skills with the characteristics of a public good whose marginal social benefits exceed the marginal private benefits. This situation warrants public subsidy to compensate for the expected inadequacy of private provision. Some employers use contractual bonds to enforce

stability. But too many constraints on mobility may encourage citizen workers to emigrate elsewhere.

F. Data Sources

1. Labour Market Data

The difficulties and ambiguities encountered in analyzing labour market data in this thesis emphasizes the need for greater collaboration between researchers and data gathering agencies from the planning stage to help to ensure that information gathered and the resultant data will be relevant and set out in a useful format. One target for greater rationalization should be earnings data from the Labour Force Survey. A copy of the 1987 earnings tables by education and occupation are enclosed in Appendix 8.

Calculation of average earnings according to education and occupation from the existing format is subject to controversy as there is no information on the distribution within each range. This means that different methods will give rise to different results and different conclusions, as was described in Chapter Five. It is strongly recommended that averages are calculated directly from the raw data and published or the distribution within each range be given.

The available data also does not permit the examination of the factors that affect wage determination for different categories of workers. The analysis in Chapter Five found some evidence of segmentation against women but the lack of appropriate data precluded further investigation.

Macroeconomic labour data sources should accord greater priority to fresh labour market entrants. The Labour Force Survey has only recently started to analyze them as a separate category and only within the text of the report. The labour market experiences of new entrants give good clues to emerging trends. In this respect, tracer studies are a strong positive element in the labour market information framework.

2. Tracer Studies

My use of tracers found that they incorporate most of the relevant indicators and generally have fairly short gestation periods. There are however several gaps.

The tracer studies for the polytechnics do not categorize their findings by gender. While this practice may have arisen because most of the female graduates are concentrated in Business-related courses, it would make analysis more complete.

None of the studies construct random samples of the population but survey all graduates of a particular batch. Because questionnaires are administered by post, there is no way of identifying the nature and extent of the non-response bias. Furthermore because no sample is drawn, the results may not withstand the conventional statistical tests for representativeness of the results.

No control groups are used in any of the studies. This deficiency means that it is not possible to say that a particular type of training generates greater returns than another form. Control groups could be drawn from those who have not undergone that particular type of training but who are similar in all other respects to the graduates who are being studied.

While it is theoretically desirable that rigorous methods are adopted, doing so will probably increase the costs and expertise required to carry out these studies. Tracer costs have not been made known but it is plausible to assume that increasing rigour and sophistication by considering methodological issues and incorporating robust sample and questionnaire design and statistical analysis will raise costs, costs which institutions may be reluctant to bear. Moreover it has been advocated that, as far as possible, schools and training institutions should do the research themselves (Moura Castro 1990).

It is this writer's opinion that it is more pertinent that institutions be convinced of the value of tracer studies. The conduct of tracers should not turn into a pure statistical exercise. A problem in this respect that the input of data obtained from

tracers into the planning process has not been clearly demonstrated. One institution failed to carry out surveys in some years; clearly tracer studies were not a priority.

G. Conclusion

In the course of examining some of the manpower issues facing the Singapore economy, one conclusion derived from this analysis is that more attention should be given to relative wages and the development of a flexible and responsive wage structure. This will involve the eventual removal of practices such as centralized wage setting. In addition, further research on the factors that determine the structure of wages, based on more comprehensive labour market data will have to be carried out as an essential prelude to achieving a more efficient allocation and utilization of labour.

APPENDIX 1

Table 1
Basic Economic Indicators

	1960[1]	1970[1]	1980	1986	1988
Area(km^2)	581.5	586.4	617.8	62107	625.6
Population ('000s)	1646.4	2074.5	2413.9	2586.2	2647.1
Annual Change (%)	2.4	1.5	1.2	1.0	1.5
Employed ('000s)	448.6	644.2	1073.4	1149.0	1238.5
Unemployment Rate	4.9	6.0	3.0	6.5	3.3
GDP at current market prices ($m)	2149.6	5804.9	25090.7	38217.0	49365.3
At 1985 market prices Annual change %	8.7	9.4	9.7	1.8	11.1
GNP at current market prices	2189.0	5861.1	24188.5	39612.8	50359.3
Annual change %	9.9	14.9	18.3	-1.8	16.6
Per capita GNP	1329.6	2825.3	9940.6	14592.5	17848.4
Indigenous GNP	na	4989.8	19039.1	32649.8	42425.8
Per capita Indigenous GNP	na	2478.1	8342.8	13060.9	16483.1
Productivity Growth (% change)	na	4.3	5.7	6.7	4.6
Gross Fixed Capital Formation at current market prices					
Total	204.9	1888.5	10203.1	14274.6	17311.6
Private	145.1	1521.2	7710.2	8251.4	13216.1

Public	59.8	367.3	2492.9	6023.2	4095.5
GFCF as % of GNP	9.4	32.2	42.2	36.0	34.4
Gross National Saving ($m)	52.3	1129.7	8282.0	15767.9	20831.7
As % of GNP	na	19.3	34.2	39.8	41.4
As % of GFCF	na	59.8	81.2	110.5	120.3
Index of Industrial Production (1986=100)	na	28.6	86.2	100.0	139.0
Annual change (%)	na	12.1	12.2	8.6	18.4
Consumer Price Index	1.2	5.6	8.5	-1.4	1.5
GDP Deflator	1.0	5.3	11.4	-3.6	4.3
Balance of Payments					
Current Account Balance ($m)	-244.7	-1750.8	-3345.6	1180.5	2627.6
Overall Balance ($)	140.1	564.8	1433.8	1208.6	3343.6
Official Foreign Reserves					
Total at end of year ($m)	na	3097.9	13757.7	28157.5	33276.6
Ratio to Merchandise Imports ($m) (months)	na	4.9	3.2	6.1	4.5
Public Debt					
% Domestic	na	91.4	93.6	98.7	99.4
% External	na	8.6	6.4	1.3	0.6
Debt Servicing Ratio (%)	na	0.6	1.0	2.4	0.7

Notes: Annual changes for 1960 and 1970 refer to averages for the decade. Employment figures for 1960 are from the 1957 Census of Population.
Sources: Economic Survey of Singapore, various years

Table 2
Openess of the Economy

	1960	1970	1980	1986	1988
GDP at current market prices ($m)	2149.6	5804.9	25090.7	38217.0	49365.3
Total Trade	7554.8	12289.6	92797.1	104530.9	167278.0
Imports	4077.7	7533.8	51344.8	55545.4	88226.7
Exports	3477.1	4755.8	41452.3	48985.5	79051.3
Domestic Exports	217.1	1832.2	25805.2	32062.4	49555.2
Re-exports	3260.0	2923.6	15647.1	16923.1	29496.1
Domestic Exports as % Total Exports	6.2	38.5	62.3	65.5	62.7
Total Trade as % of GDP	3.5	2.1	3.7	2.7	3.4
Total Exports as % of GDP	1.6	0.8	1.7	1.3	1.6
Domestic Exports as % of GDP	0.1	0.3	1.0	0.8	1.0
Imports as % of GDP	1.9	1.3	2.0	1.5	1.8

Sources: Economic Survey of Singapore, various years.L.

Table 3
Percentage Distribution of GDP by Industry

	1960	1970	1980	1986	1988
TOTAL	100	100	100	100	100
Agriculture & Fishing	3.5	2.3	1.3	0.6	0.4
Quarrying	0.3	0.3	0.3	0.2	0.1
Manufacturing	11.6	20.4	29.1	26.7	30.2
Utilities	2.3	2.6	2.2	2.8	2.3
Construction	3.4	6.8	6.4	8.2	5.7
Trade	33.5	28.2	21.7	17.1	17.9
Transport Communications	11.5	10.8	14.0	13.9	13.4
Financial & Business Services	17.6	14.1	19.6	27.7	27.5
Other Services	4.3	13.2	9.3	27.7	10.6
Less Imputed Bank Charges	0.7	1.9	5.6	12.0	9.3
Add Import Duties	1.8	3.0	1.7	10.1	1.2

Other Services: Public Administration, Community, Social and Personal Services
Sources: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988; Economic Survey of Singapore 1989.L.

Table 4
Manufacturing Output and Value Added by Industry (S$ milion)

	OUTPUT		VALUE ADDED	
	1979	1988	1979	1988
Food & Beverages	1838.4	2734.3	369.9	868.7
Textiles	425.8	364.2	137.0	108.9
Wearing Apparel & Footwear	788.6	1778.7	247.0	533.0
Leather & Rubber Products	164.1	168.6	54.0	64.3
Wood Products	957.0	817.8	280.2	235.7
Paper Products & Printing	640.3	1966.2	290.3	958.4
Industrial Chemicals	255.2	3103.6	85.8	1194.5
Plastic Products	380.7	1126.9	134.2	399.8
Other Chemical Products	429.9	1526.3	224.6	875.6
Petroleum	9308.1	7765.3	916.0	743.5
Clay & Cement Products	402.9	513.4	118.6	160.0
Non-Metallic Mineral Products	102.8	150.6	46.0	62.0
Basic Metals	272.1	439.8	111.9	156.1
Non-ferrous Metals	135.4	205.3	19.0	62.4
Fabricated Metal Products	965.5	2832.1	325.5	1007.5
Machinery except Electrical & Electronic	1183.5	2425.8	526.7	902.1
Electrical Machinery & Appliances	758.4	2019.9	287.2	681.7
Electronic Products & Components	3963.0	21292.4	1200.0	6547.9
Transport Equipment	1548.0	2543.7	802.4	1365.4
Precision Equipment	276.6	540.4	130.0	320.0
Other Products	337.5	889.1	106.5	250.4
TOTAL	20492.3	55524.1	6523.9	17568.1

Source: Yearbook of Statistics Singapore 1988

Table 5
Selected Statistics of Manufacturing Production

	Value Added Per Worker $	Value Added to Output %	Remuneration to to Value Added %	Direct Exports to to Total Sales %
1965	7207	21.6	37.9	51.6
1966	7732	21.9	36.4	43.3
1967	8192	22.5	35.3	41.1
1968	8146	23.0	34.3	36.3
1969	8600	21.2	36.6	45.7
1970	9029	24.7	36.4	44.6
1971	9705	26.9	36.7	44.1
1972	10388	29.7	36.6	47.9
1973	12856	29.9	33.8	54.9
1974	17127	25.3	30.5	60.7
1975	17763	26.2	34.7	58.6
1976	19168	25.0	33.0	61.9
1977	20417	24.8	32.9	62.8
1978	21179	25.5	33.4	64.2
1979	23992	24.8	32.3	64.1
1980	30027	26.4	29.5	61.9
1981	34681	26.2	30.1	61.1
1982	34218	25.6	34.7	59.9
1983	36645	26.4	36.5	60.2
1984	40796	27.0	36.1	61.0
1985	42436	27.9	37.7	63.0
1986	48352	31.9	31.6	64.7
1987	52362	31.4	28.9	65.9
1988	54370	31.6	29.2	na

Notes: 1965-1973 average rate of growth of value added per worker = 7.5%
1973-1979 = 11%
1980-1988 = 7.7%.L.

Sources: Economic and Social Statistics 1960-1982; Yearbook of Statistics Singapore 1988

Table 6
Net Investment Commitments in Manufacturing by Industry excluding petrochemicals ($m)

	1972	1979	1984	1988
Food & Beverages	3.4	40.8	154.4	168.4
Textiles	2.2	14.2	0.3	10.6
Wearing Apparel	6.4	1.4	6.7	0.9
Leather & Rubber	-	1.5	8.1	5.6
Wood Products	14.2	33.2	15.8	-
Paper Products & Printing	-	8.0	111.3	72.0
Industrial Chemicals	2.1	5.4	8.1	106.2
Plastic Products	6.7	34.0	33.4	53.5
Other Chemical Products	0.9	31.0	30.7	44.2
Petroleum	-	224.5	358.8	-
Non-metallic Mineral Products	9.4	7.1	24.6	133.8
Basic Metals	1.3	-	18.1	15.3
Fabricated Metal Products	2.4	56.2	71.5	109.9
Machinery except Electrical	50.7	151.9	225.9	180.5
Electrical Machinery & Appliances	92.0	253.9	655.8	943.6
Transport Equipment	0.7	18.5	72.5	110.4
Precision Equipment	-	31.5	17.0	44.0
Other Products	2.1	30.5	1.6	0.7
Servicing/Engineering -	-	13.8	15.9	
TOTAL	194.5	943.6	1828.0	2015.5
FOREIGN	156.3	823.4	1334.7	1667.7
%	(80.4)	(87.3)	(73.0)	(82.7)
LOCAL	38.2	120.2	493.7	347.8
%	(19.6)	(12.7)	(27.0)	(17.3)

Note: Net Investment Commitments refer to gross commitments less projects withdrawn or uncertain as at 31 December 1988

Sources: Economic and Social Statistics 1960 - 1982; Yearbook of Statistics Singapore 1988

APPENDIX 2

List of Tax Incentives available to Foreign Investors

1. Pioneer Status for approved manufacturing and service activities - exemption of tax on profits, tax relief period of 5-10 years.

2. Expansion incentive for approved manufacturing and service activities - exemption of tax on profits in excess of pre-expansion level; tax relief period of up to 5 years.

3. Approved foreign loan scheme for manufacturing and service activities - exemption of withholding tax on interest.

4. Approved royalties for approved manufacturing and service activities - half or full exemption of withholding tax on royalties.

5. Export incentive for approved export activities - 90% tax concession on approved export profits.

6. Double tax deduction for expenses on export promotion and development.

7. Double tax deduction for expenses on research and development.

8. Accelerated depreciation allowance.

9. Investment allowance for approved manufacturing and service activities, approved research and development activities, approved construction operations, and approved projects for reducing consumption of potable water.

10. Post pioneer incentive for approved companies enjoying pioneer status or export incentive as a follow up to pioneer incentive - corporate tax rate of not less than 10% for up to 5 years upon of pioneer or export incentive.

11. 10% concessionary tax on income of Asian Currency Units, offshore income of insurance companies and income from offshore gold transactions.

12. Tax exemption on income from approved syndicated loans and syndicated credit facilities.

13. Tax exemption on income of Singapore registered ships.

14. 50% tax concession on export income of approved warehousing, technical and engineering services.

15. 50% tax concession on export income for approved consultancy services.

16. 50% tax concession on export income of approved international trading companies.

17. Concessionary 10% tax on income from approved headquarter operations.

18. Venture capital incentive for investment by eligible companies and individuals in approved new technology projects - losses incurred from the sale of shares, up to 100% of equity invested, can be set off against the investors' other taxable income.

Source: Table 9.7 , Lim (1988)

APPENDIX 3

CONFIDENTIAL
1988 GRADUATE EMPLOYMENT SURVEY
NATIONAL UNIVERSITY OF SINGAPORE AND NANYANG TECHNOLOGICAL INSTITUTE

NAME:
ADDRESS:
TELEPHONE:

WHERE APPLICABLE, PLEASE CIRCLE THE NUMBER NEXT TO YOUR ANSWER. DO NOT CIRCLE MORE THAN ONE NUMBER UNLESS OTHERWISE STATED.

SECTION I : PERSONAL PARTICULARS

1. SEX:

1	MALE	2	FEMALE

2 RACE:

1	CHINESE	3	INDIAN
2	MALAY	4	OTHERS

3 CITIZENSHIP

1	SINGAPORE CITIZEN OR PERMANENT RESIDENT
2	NON-SINGAPOREAN

4 MAIN LANGUAGE OF INSTRUCTION IN PRE-UNIVERSITY OR JUNIOR COLLEGE

1	ENGLISH	3	MALAY
2	CHINESE	4	OTHERS (PLEASE SPECIFY)

5 DEGREE COURSE COMPLETED AT

1	NUS	2	NTI

6 (A) DEGREE CONFERRED

01	B.A.	11	B.D.S.
02	B.A.(HONS.)	12	LL.B.
03	B.SOC.SCI. (HONS)	13	B.B.A.
04	B.SC.	14	B.B.A. (HONS.)
05	B.SC. (HONS.)	15	B.ACC.
06	B.SC. (COMPUTER & INFO.SC.)	16	B.A. (ARCH. STUDIES)
		17	B. ARCH.
07	B.SC. (COMPUTER & INFO SC. HONS)	18	B.SC. (BUILDING)
		19	B.SC. (ESTATE MANAGEMENT)
		20	B.ENG. (CIVIL)
08	B.SC. (PHARMACY)	21	B.ENG (ELECTRICAL)
09	B.SC. (PHARM) (HONS)	22	B.ENG. (MECHANICAL)
10	M.B.B.S.	23	B.ENG. (CHEMICAL)

(B) IF YOU ARE AN HONOURS DEGREE GRADUTE IN ARTS, SOCIAL SCIENCE OR SCIENCE, INDICATE YOUR AREA OF SPECIALIZATION:

01	CHINESE STUDIES	13	BIOCHEMISTRY
02	ECONOMICS	14	BOTANY
03	ENGLISH LANGUAGE	15	CHEMISTRY
04	ENGLISH LITERATURE	16	CHEMISTRY & PHYSICS
05	GEOGRAPHY	17	COMPUTER SCIENCE &
06	HISTORY		INFORMATION SCIENCES
07	JAPANESE STUDIES	18	MATHEMATICS
08	PHILOSOPHY	19	MICROBIOLOGY
09	POLITICAL SCIENCE	20	PHARMACY
10	SOCIAL WORK	21	PHYSICS
11	SOCIOLOGY	22	PHYSIOLOGY
12	STATISTICS	23	ZOOLOGY
		24	OTHERS (PLEASE SPECIFY)

(C) IF YOU ARE A GENERAL DEGREE GRADUATE IN ARTS OR SCIENCE, INDICATE YOUR TWO MAJOR THIRD YEAR SUBJECTS;

01	CHINESE STUDIES	14	STATSITICS
02	ECONOMICS	15	BIOLOGY A
03	ENGLISH LANGUAGE	16	BIOLOGY B
04	ENGLISH LITERATURE	17	CHEMISTRY A
05	GEOGRAPHY	18	CHEMISTRY B
06	HISTORY	19	BIOCHEMISTRY
07	JAPANESE STUDIES	20	COMPUTER SCIENCE
08	MALAY STUDIES	21	INFORMATION SCIENCE
09	MATHEMATICS A	22	MATHEMATICS B
10	PHILOSHOPHY	23	MICROBIOLOGY
11	POLITICAL SCIENCE	24	PHYSICS
12	SOCIAL WORK	25	APPLIED PHYSICS
13	SOCIOLOGY	26	OTHERS (PLESE SPECIFY)

7 MAIN SOURCE OF FINANCIAL SUPPORT FOR STUDIES AT NUS OR NTI:

01	OWN OR FAMILY RESOURCES
02	TUITION FEE LOAN (FROM BANK)
03	PUBLIC SERVICE COMMISSION AWARD
04	NUS OR NTI ADMINISTERED FINANCIAL AWARDS
05	MINISTRY OF EDUCATION SPONSORHIP
06	MINISTRY OF DEFENCE SPONSORSHIP
07	OTHER GOVERNMENT OR STATUTORY BOARD SPONSORSHIP
08	OTHERS (PLEASE SPECIFY)

8 WHAT WERE YOU DOING BEFORE ENTERING NUS OR NTI?

01	STUDYING FULL TIME (PRE-UNIVERSITY, JUNIOR COLLEGE, PRE-UNIVERSITY CENTRE OR POLYTECHNIC)
02	WORKING FULL TIME
03	SERVING NATIONAL SERVICE
04	OTHERS (PLEASE SPECIFY)

9 PRESENT ACTIVITY STATUS:

01	READING HONOURS DEGREE IN NUS OR NTI	GO TO SECTION IV
02	READING HIGHER DEGREE IN NUS OR NTI	GO TO SECTION IV
03	READING DIPLOMA IN EDUCATION IN THE INSTITUTE OF EDUCATION	GO TO SECTION IV
04	READING DIPLOMA IN PHYSICAL EDUCATION IN THE COLLEGE OF PHYSICAL EDUCATION	GO TO SECTION IV
05	PURSUING OTHER FULL TIME STUDIES (PLEASE SPECIFY)	GO TO SECTION IV
06	SERVING FULL TIME NATIONAL SERVICE	GO TO SECTION IV
07	LAW GRADUATE DOING PRACTICAL LAW COURSE OR READING IN CHAMBERS	GO TO SECTION IV
08	PHARMACY GRADUATE SERVING PUPILLAGE	GO TO SECTION IV
09	B.A.(ARCH. STUDIES) GRADUATE UNDERGOING YEAR OUT PRACTICAL TRAINING	GO TO SECTION IV
10	MEDICAL GRADUATE SERVING HOUSEMANSHIP	GO TO SECTION IV
11	DENTAL GRADUATE EMPLOYED BY GOVERNMENT AS DENTAL OFFICER	GO TO SECTION II
12	WORKING	GO TO SECTION II
13	ACCEPTED JOB AND WILL COMMENCE WORK SOON	GO TO SECTION II
14	WORKING ON CASUAL, PART TIME OR TEMPORARY BASIS WHILE LOOKING FOR PERMANENT JOB	GO TO SECTION III
15	NOT WORKING BUT LOOKING FOR A JOB	GO TO SECTION III
16	NOT WORKING AND NOT LOOKING FOR A JOB	GO TO SECTION IV
17	OTHERS (PLEASE SPECIFY)	

SECTION II : EMPLOYMENT PARTICULARS

10 FIRST DAY OF WORK DATE_____/_____/_____

11 TYPE OF PRESENT EMPLOYER

1	GOVERNMENT	5	OWN FAMILY BUSINESS
2	STATUTORY BOARD	6	SELF-EMPLOYED
3	PRIVATE SECTOR	7	OTHERS (PLEASE SPECIFY)
4	VOLUNTARY ORGANIZATION		

12 WHICH COUNTRY ARE YOU WORKING IN?

1	SINGAPORE	3	OTHERS (PLEASE SPECIFY)
2	MALAYSIA		

13 INDUSTRIAL SECTOR OF EMPLOYER:

01	DEFENCE AND SECURITY (MINDEF OR POLICE ETC.)
02	EDUCATION
03	HEALTH
04	COMMUNITY DEVELOPMENT AND SOCIAL SERVICES
05	FINANCE, INSURANCE AND ECONOMIC SERVICES
06	TRADE AND COMMERCE (WHOLESALE, RETAIL, RESTAURANTS)
07	MANUFACTURING
08	CONSTRUCTION, REAL ESTATE, INFRASTRUCTURE, HOUSING AND ENVIRONMENT
09	TRANSPORT AND STORAGE (LAND, WATER AND AIR TRANSPORT)
10	COMMUNICATIONS AND INFORMATION SERVICES
11	RESEARCH AND MANAGEMENT CONSULTANCY
12	LEGAL SERVICES
13	OTHERS (PLEASE SPECIFY)

14 GROSS MONTHLY SALARY:

01	LESS THAN $600	08	$1,800 - $1,999
02	$600 - $799	09	$2,000 - $2,199
03	$800 - $999	10	$2,200 - $2,399
04	$1,000 - $1,199	11	$2,400 - $2,599
05	$1,200 - $1,399	12	$2,600 - $2,799
06	$1,400 - $1,599	13	$2,800 - $2,999
07	$1,600 - $1,799	14	$3,000 AND ABOVE

15 IS YOUR PRESENT SALARY HIGHER OR LOWER THAN YOUR EXPECTATIONS:

1	HIGHER THAN EXPECTED	3	LOWER THAN EXPECTED
2	ABOUT THE SAME AS EXPECTED		

16 THROUGH WHICH MAIN CHANNEL DID YOU OBTAIN YOUR FIRST JOB?

01 SCHOLARSHIP OR BURSARY HOLDER HOLDING BOND
02 HELD A FULL TIME JOB BEFORE JOINING THE UNIVERSITY AND RETURNED TO WORK FOR PREVIOUS EMPLOYER
03 NEWSPAPER ADVERTISEMENTS
04 WROTE OR WENT TO FIRM ON OWN INITIATIVE
05 RECOMMENDATIONS OF FAMILY MEMBERS, RELATIVES OR FRIENDS
06 EMPLOYMENT AGENCIES AND SERVICES
07 UNIVERSITY (EG. SLO'S VACANCY LISTS, LECTURERS OR CAREER TALKS)
08 OTHER GOVERNMENT BODIES (EG. PUBLIC SERVICE COMMISSION)
09 OTHERS (PLEASE SPECIFY)

17 (A) NAME OF GOVERNMENT DEPARTMENT, STATUTORY BOARD OR COMPANY YOU ARE WORKING IN:

(B) WHAT IS YOUR PRESENT JOB TITLE?

(C) DESCRIPTION OF DUTIES AND RESPONSIBILITIES:

18 HOW LONG DID IT TAKE YOU TO FIND YOUR FIRST JOB FROM THE TIME YOU COMPLETED YOUR EXAMINATION?

1 LESS THAN I MONTH
2 1 TO LESS THAN 3 MONTHS
3 3 TO LESS THAN 6 MONTHS
4 6 TO MORE MONTHS

19 HOW MANY JOB OFFERS HAVE YOU RECEIVED TO-DATE (INCLUDING YOUR PRESENT JOB?)

1 ONE
2 TWO
3 THREE
4 FOUR
5 FIVE
6 SIX

20 (A) IS YOUR PRESENT JOB YOUR FIRST, SECOND, THIRD, ETC. SINCE YOU STARTED LOOKING FOR WORK?

1 FIRST
2 SECOND
3 THIRD
4 FOURTH OR MORE

(B) IF YOUR PRESENT JOB IS NOT YOUR FIRST, WHAT WAS THE MAIN REASON FOR LEAVING YOUR LAST JOB?

01 SALARY BELOW EXPECTATION
02 POOR PROMOTION PROSPECTS
03 LACK OF OPPORTUNITIES FOR PERSONAL DEVELOPMENT
04 ROUTINE AND DULL JOB
05 POOR INTERPERSONAL RELATIONSHIP
06 POOR WORKING ENVIRONMENT
07 NO GENUINE INTEREST IN THE JOB
08 COMPANY'S FINANCIAL STATUS UNSOUND
09 TRANSPORTATION PROBLEM
10 DISLIKE FOR SHIFT WORK
11 OTHERS (PLEASE SPECIFY)

21 (A) ARE YOU ACTIVELY LOOKING FOR ANOTHER JOB?

1 YES 2 NO

(B) IF YES, WHAT IS THE MAIN REASON FOR WANTING TO LEAVE YOUR PRESENT JOB?

01 SALARY BELOW EXPECTATION
02 POOR PROMOTION PROSPECTS
03 LACK OF OPPORTUNITIES FOR PERSONAL DEVELOPMENT
04 ROUTINE AND DULL JOB
05 POOR INTERPERSONAL RELATIONSHIP
06 POOR WORKING ENVIRONMENT
07 NO GENUINE INTEREST IN THE JOB
08 COMPANY'S FINANCIAL STATUS UNSOUND
09 TRANSPORTATION PROBLEM
10 DISLIKE FOR SHIFT WORK
11 OTHERS (PLEASE SPECIFY)

22 TO WHAT EXTENT DO YOU MAKE USE OF THE KNOWLEDGE AND SKILLS YOU ACQUIRED IN NUS OR NTI IN YOUR PRESENT JOB?

1 TO A LARGE EXTENT
2 TO A SATISFACTORY EXTENT
3 TO A LITTLE EXTENT
4 NOT AT ALL

NOTE: EMPLOYED GRADUATES, PLEASE PROCEED TO SECTION IV : GRADUATES' COMMENTS

SECTION III : UNEMPLOYMENT PARTICULARS

23 WHAT WAS YOUR MAIN METHOD FOR FINDING A JOB?

1 PLACED OR ANSWERED NEWSPAPER ADVERTISEMENT
2 WROTE OR WENT TO FIRM ON OWN INITIATIVE
3 ASKED FAMILY MEMBERS, RELATIVES OR FRIENDS FOR ASSISTANCE
4 REGISTERED WITH EMPLOYMENT SERVICES OR AGENCIES
5 ANSWERED ADVERTISEMENTS IN SLO'S VACNACY LIST OR ATTENDED CAREER TALKS
6 ASKED UNIVERSITY LECTURERS FOR ASSISTANCE
7 OTHERS (PLEASE SPECIFY)

24 HOW MANY JOB OFFERS HAVE YOU RECEIVED TO-DATE?

0 NONE (GO TO Q27)
1 ONE
2 TWO
3 THREE
4 FOUR
5 FIVE
6 SIX OR MORE

25 HOW LONG DID IT TAKE YOU TO OBTAIN YOUR FIRST JOB OFFER FROM THE TIME YOU COMPLETED YOUR EXAMINATION?

1 LESS THAN 1 MONTH
2 1 TO LESS THAN 3 MONTHS
3 3 TO LESS THAN 6 MONTHS
4 6 OR MORE MONTHS

26 WHAT WAS YOUR MAIN REASON FOR DECLINING YOUR MOST RECENT JOB OFFER?

01 SALARY BELOW EXPECTATION
02 POOR PROMOTION PROSPECTS
03 LACK OF OPPORTUNITIES FOR PERSONAL DEVELOPMENT
04 ROUTINE AND DULL JOB
05 POOR INTERPERSONAL RELATIONSHIP
06 POOR WORKING ENVIRONMENT
07 NO GENUINE INTEREST IN THE JOB
08 COMPANY'S FINANCIAL STATUS UNSOUND
09 TRANSPORTATION PROBLEM
10 DISLIKE FOR SHIFT WORK
11 OTHERS (PLEASE SPECIFY)

27 WHAT IS THE MINIMUM GROSS SALARY YOU WOULD EXPECT FOR A JOB REQUIRING YOUR QUALIFICATIONS?

S$_____

SECTION IV : GRADUATES' COMMENTS

28 (A) DO YOU INTEND TO PURSUE POST-GRADUATE STUDIES?

1 YES 2 NO

(B) DO YOU INTEND TO PURSUE OTHER FORMS OF TRAINING?

1 YES 2 NO

29 PLEASE GIVE YOUR COMMENTS ON:

(A) THE CURRENT JOB MARKET PERTAINING TO YOUR QUALIFICATIONS:

_____
_____
_____
_____

(B) THE RELEVANCE OF THE COURSE CURRICULUM YOU READ AT NUS OR NTI:

_____
_____
_____

(C) HOW TO MAKE THE COURSE CURRICULUM MORE RELEVANT TO THE JOB MARKET:

_____
_____
_____

THANK YOU FOR YOUR CO-OPERATION

APPENDIX 4
Labour Force Statistics

Table 1
Distribution of the Labour Force by Age and Sex

Age Group	1957 All	1957 Male	1957 Female	1970 All	1970 Male	1970 Female
Total	471653	388494	83057	717242	533872	183459
15-19	57103	41649	15364	121958	70331	51627
20-24	69839	56531	13308	149791	95851	53939
25-29	67113	58565	8548	85630	65290	20340
30-34	56317	49440	6870	82703	67277	15426
35-39	53329	45814	7510	68019	57491	10528
40-44	50908	42198	8710	61329	52975	8354
45-49	45327	36608	8719	49055	42466	6589
50-54	33848	27351	6497	39151	33287	5864
55-59	21677	17496	4181	30225	25152	5073
60-64	10141	8043	2098	17113	13987	3216
> 65	6051	4799	1252	12268	9765	2503

Age Group	1980 All	1980 Male	1980 Female	1988 All	1988 Male	1988 Female
Total	1112074	728621	383458	1281388	787073	494318
15-19	141012	70397	70615	64535	31744	32790
20-24	255060	142670	112390	225000	112339	112661
25-29	198631	125818	72818	240845	135397	105448
30-34	150981	105157	45824	214061	131697	82364
35-39	92359	67523	24836	175077	114028	61049
40-44	86457	64913	21544	124189	83678	40512
45-49	66306	52414	13892	96011	69307	26704
50-54	52437	43281	9156	66814	50057	16757
55-59	31135	26148	4987	37053	28849	8204
60-64	19033	15652	3381	21771	17374	4397
> 65	18663	14648	4015	16032	12603	3432

Sources: Economic and Social Statistics 1960-1982; Yearbook of Statistics, Singapore 1988

Table 2
Age-Specific Labour Force Participation Rates

Age Group	1957 All	1957 Male	1957 Female	1970 All	1970 Male	1970 Female
15-	42	59.4	23.4	49.5	55.7	43
20-	58.9	92.3	23	73.5	92.9	53.6
25-	60.1	98	16.5	64.5	98	30.8
30-	62.6	98.6	17.3	60.6	98.3	22.7
35-	64.5	98.5	20.8	60.2	98.4	19.3
40-	66.8	98	26.3	60.8	98.1	17.8
45-	67.9	97	30.1	60	96.2	17.5
50-	65.4	94	28.8	55	88.1	17.5
55-	57.9	85.1	24.7	46.2	73.9	16.2
60-	42	67	17.1	35	55.6	13.4
65-	19.5	38.9	6.3	17.7	31.9	6.5
Total	49.8	76.6	19.2	46.6	67.6	24.6

Age Group	1980 All	1980 Male	1980 Female	1988 All	1988 Male	1988 Female
15-	49.1	47.5	50.7	26.2	25.2	27.2
20-	86.1	93.4	78.4	82.7	84.6	80.9
25-	78.3	97.2	58.7	85.1	96.7	73.8
30-	71.5	97.9	44.2	77.8	98.1	58.4
35-	68	98	37.1	74.1	98.7	50.6
40-	65.8	97.6	33.2	72.2	98.3	46.6
45-	61.8	95.7	26.5	68.5	96.3	9.3
50-	56.3	89.6	20.4	58.3	88.9	28.8
55-	43.6	70.7	14.5	40.5	65.1	17.4
60-	31.9	52.5	11.3	29.5	47.3	11.9
65-	16.4	28.6	6.4	12.1	21.2	4.7
Total	55.9	72	39.3	62.9	78.5	47.8

Sources: Same as Table 1.

APPENDIX 5
Education Statistics

Table 1
Government Expenditure on Education 1970-1988 (S$ Millions) (Real S$)

Year	Total	Recurrent	Devt	Total % GDP	Recurrent % of Total
1970	390.1	367.0	23.0	3.5	94
1971	415.1	387.4	27.5	3.2	93
1972	426.6	408.7	17.8	2.8	95
1973	454.4	437.6	16.8	2.8	96
1974	464.6	427.8	36.8	2.8	92
1975	529.5	459.9	69.6	3.1	86
1976	559.9	498.2	61.7	3.0	88
1977	555.9	425.7	46.1	2.8	76
1978	592.3	540.8	51.4	2.8	91
1979	684.0	617.3	66.7	2.9	90
1980	778.6	666.7	111.9	3.0	85
1981	984.8	744.7	240.1	3.5	75
1982	1366.6	989.7	377.0	4.5	72
1983	1602.0	1100.	501.5	4.8	68
1984	1714.8	1233.1	481.8	4.8	71
1985	1712.2	1338.8	373.5	5.0	78
1986	1602.0	1248.6	353.4	4.6	77
1987	1606.5	1313.3	293.2	4.2	81
1988	1641.7	1454.1	187.5	3.8	88

Rates of Growth of Education Expenditure %

1970-1980	7.2
1980-1985	17.1
1980-1988	9.8

Note: GDP defined as Gross Domestic Product at Current Factor Cost.

Sources: Economic and Social Statistics,Singapore 1960-1982; Yearbook of Statistics 1988.

Table 2
National University of Singapore and Polytechnics Fee and Grant Structure (Nominal S$) Figures are for one academic year

NUS	Arts and Social Sciences				NUS	Science			
	Fees	Grant	Total	% Subsidy		Fees	Grant	Total	% Subsidy
1981	800	6000	6800	88.2		900	4000	4900	81.6
1982	800	6000	6800	88.2		900	4000	4900	81.6
1983	900	6000	6900	87.0		900	4000	4900	81.6
1984	900	6000	6900	87.0		900	4000	4900	81.6
1985	1000	12200	13200	92.4		1000	10500	11500	91.3
1986	1100	12250	13350	91.8		1100	10550	11650	90.6
1987	1200	12300	13500	91.1		1200	10600	11800	89.8
1988	2000	13700	15700	87.3		2400	10500	12900	81.4

NUS	Business Administration				NUS	Accountancy			
	Fees	Grant	Total	% Subsidy		Fees	Grant	Total	% Subsidy
1981	900	1400	2300	60.9		900	1400	2300	60.9
1982	900	1400	2300	60.9		900	1400	2300	60.9
1983	900	1400	2300	60.9		900	1400	2300	60.9
1984	900	1400	2300	60.9		900	1400	2300	60.9
1985	1000	5500	6500	84.6		1000	5500	6500	84.6
1986	1100	5550	6650	83.5		1100	5550	6650	83.5
1987	1200	5600	6800	82.4		1200	5600	6800	82.4
1988	2000	8900	10900	81.7		2000	8900	10900	81.7

NUS and NTI	Engineering				Polytechnics				
	Fees	Grant	Total	% Subsidy		Fees	Grant	Total	% Subsidy
1981	800	6000	6800	88.2		420	2580	3000	86
1982	800	6000	6800	88.2		420	2580	3000	86
1983	900	6000	6900	87.0		420	2580	3000	86
1984	900	6000	6900	87.0		500	5300	5800	91.4
1985	1000	12200	13200	92.4		600	5350	5950	89.9
1986	1100	12250	13350	91.8		720	5410	6130	88.3
1987	1200	12300	13500	91.1		760	5430	6190	87.7
1988	2400	13300	15700	84.7		800	5450	6250	87.2

Sources: National University of Singapore Prospectus, various years
The Singapore Polytechnic.

Table 3
Fee, Grant and Subsidy Structure (Real S$)

NUS Arts and Social Sciences

	Fees	Grant	Total	% Subsidy
1981	836	6270	7106	88
1982	805	6036	6841	88
1983	895	5964	6859	87
1984	872	5814	6686	87
1985	964	11765	12729	92
1986	1075	11975	13050	92
1987	1167	11965	13132	91
1988	1916	13123	15038	87

NUS Science

	Fees	Grant	Total	% Subsidy
	940	4180	5120	82
	905	4024	4930	82
	895	3976	4871	82
	872	3876	4748	82
	964	10125	11090	91
	1075	10313	11388	91
	1167	10311	11479	90
	2299.	10057	12356	82

NUS Business Administration

	Fees	Grant	Total	% Subsidy
1981	940	1463	2403	61
1982	905	1408	2314	61
1983	895	1392	2286	61
1984	872	1357	2229	61
1985	964	5304	6268	85
1986	1075	5425	6500	83
1987	1167	5447	6615	82
1988	1916	8525	10441	82

NUS Accountancy

	Fees	Grant	Total	% Subsidy
	940	1463	2403	61
	905	1408	2314	61
	895	1392	2286	61
	872	1357	2229	61
	964	5304	6268	85
	1075	5425	6500	83
	1167	5447	6615	82
	1916	8525	10441	82

NUS and NTI Engineering

	Fees	Grant	Total	% Subsidy
1981	836	6270	7106	88
1982	805	6036	6841	88
1983	895	5964	6859	87
1984	872	5814	6686	87
1985	964	11765	12729	92
1986	1075	11975	13050	92
1987	1167	11965	13132	91
1988	2299	12739	15038	85

Polytechnics

	Fees	Grant	Total	% Subsidy
	439	2696	3135	86
	423	2596	3018	86
	417	2595	2982	87
	484	5136	5620	91
	579	5159	5738	90
	704	5288	5992	88
	739	5282	6021	88
	766	5220	5987	87

Table 4
Payback Periods

ENGINEERING

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1603	19236	6943.2	800	6800
1982	1784	21408	8247.6	800	6800
1983	1862	22344	6660.0	900	6900
1984	1960	23520	11496.0	900	6900
1985	1962	23544	12704.4	1000	13200
1986	1873	22476	13189.2	1100	13350
1987	1830	21960	13297.2	1200	13500
1988	1947	23364	13474.8	2400	15700

ARTS GENERAL DEGREE

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	888	10656	6943.2	800	4900
1982	1007	12084	8247.6	800	4900
1983	1126	13512	6660.0	900	4900
1984	1174	14088	11496.0	900	4900
1985	1113	13356	12704.4	1000	11500
1986	966	11592	13189.2	1100	11650
1987	1088	13056	13297.2	1200	11800
1988	1114	13368	13474.8	2000	12900

ARTS HONOURS DEGREE

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1250	15000	6943.2	800	4900
1982	1408	16896	8247.6	800	4900
1983	1429	17148	6660.0	900	4900
1984	1394	16728	11496.0	900	4900
1985	1600	19200	12704.4	1000	11500
1986	1367	16404	13189.2	1100	11650
1987	1611	19332	13297.2	1200	11800
1988	1625	19500	13474.8	2000	12900

B.SOC.SCI. HONOURS

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1375	16500	6943.2	800	4900
1982	1549	18588	8247.6	800	4900
1983	1500	18000	6660.0	900	4900
1984	1636	19632	11496.0	900	4900
1985	1580	18960	12704.4	1000	11500
1986	1511	18132	13189.2	1100	11650
1987	1494	17928	13297.2	1200	11800
1988	1600	19200	13474.8	2000	12900

B.SC. GENERAL DEGREE

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1033	12396	6943.2	900	4900
1982	1242	14904	8247.6	900	4900
1983	1088	13056	6660.0	900	4900
1984	1376	16512	11496.0	900	4900
1985	1290	15480	12704.4	1000	11500
1986	1232	14784	13189.2	1100	11650
1987	1160	13920	13297.2	1200	11800
1988	1122	13464	13474.8	2400	12900

B.SC. HONOURS DEGREE

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1254	15048	6943.2	900	4900
1982	1438	17256	8247.6	900	4900
1983	1403	16836	6660.0	900	4900
1984	1398	16776	11496.0	900	4900
1985	1398	16776	12704.4	1000	11500
1986	1222	14664	13189.2	1100	11650
1987	1550	18600	13297.2	1200	11800
1988	1700	20400	13474.8	2400	12900

B.B.A. GENERAL DEGREE

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1138	13656	6943.2	900	2300
1982	1188	14256	8247.6	900	2300
1983	1236	14832	6660.0	900	2300
1984	1284	15408	11496.0	900	2300
1985	1221	14652	12704.4	1000	6500
1986	1093	13116	13189.2	1100	6650
1987	1123	13476	13297.2	1200	6800
1988	1253	15036	13474.8	2000	10900

B.B.A. HONOURS DEGREE

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1440	17280	6943.2	900	2300
1982	1688	20256	8247.6	900	2300
1983	1575	18900	6660.0	900	2300
1984	1880	22560	11496.0	900	2300
1985	1900	22800	12704.4	1000	6500
1986	1575	18900	13189.2	1100	6650
1987	1557	18684	13297.2	1200	6800
1988	1670	20040	13474.8	2000	10900

ACCOUNTANCY

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1981	1033	12396	6943.2	900	2300
1982	1148	13776	8247.6	900	2300
1983	1166	13992	6660.0	900	2300
1984	1219	14628	11496.0	900	2300
1985	1159	13908	12704.4	1000	6500
1986	1122	13464	13189.2	1100	6650
1987	1200	14400	13297.2	1200	6800
1988	1288	15456	13474.8	2000	10900

TECHNICAL MANPOWER

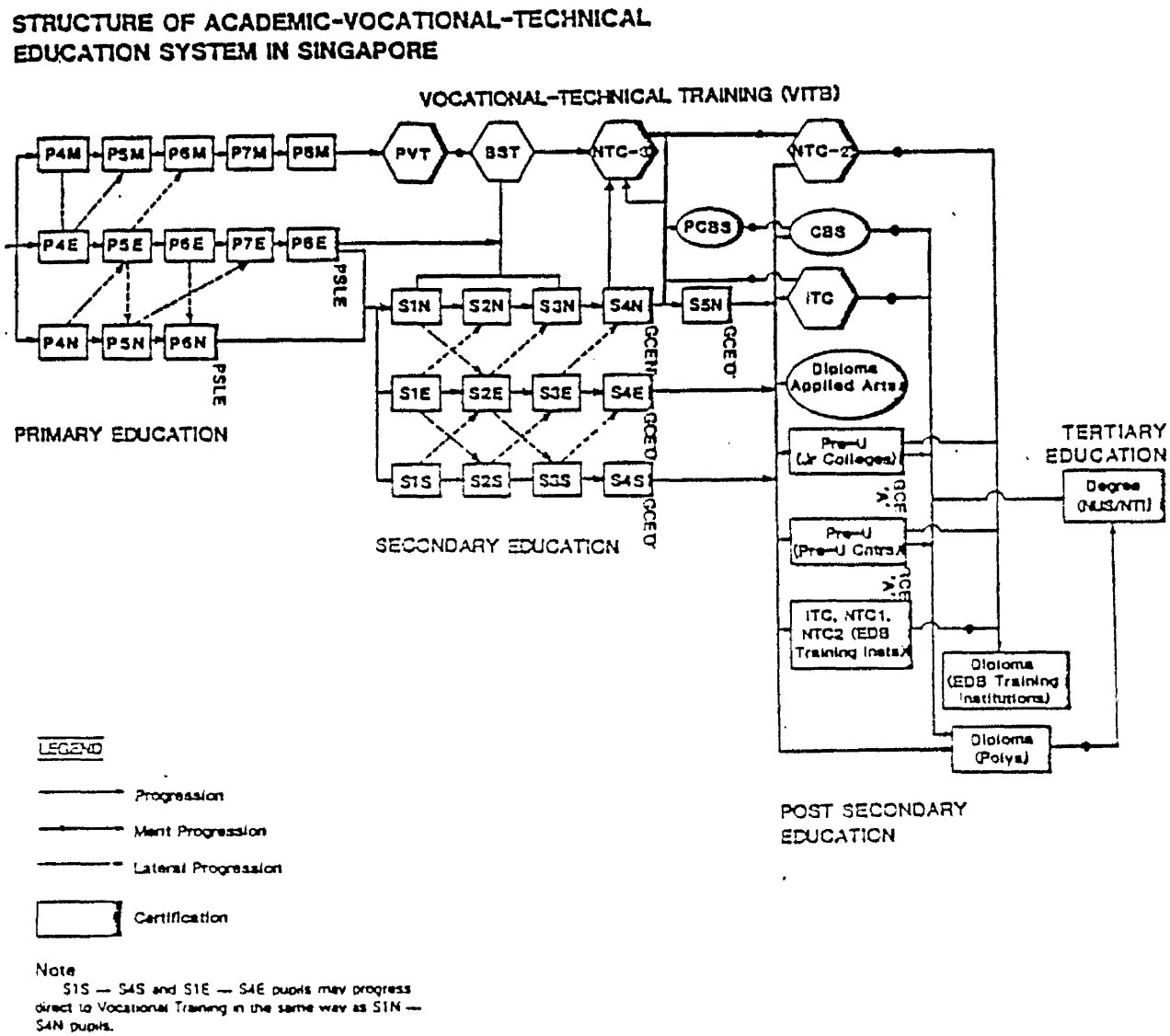
Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1982	601	7212	5757.6	420	3000
1983	874	10488	4851.6	420	3000
1984	988	11856	7465.2	420	3000
1985	844	10128	8403.6	500	5800
1986	845	10140	8997.6	600	5950
1987	862	10344	8976.0	720	6130
1988	918	11016	8285.6	760	6190

SKILLED MANPOWER

Year	Monthly Salary	Yearly Salary	Forgone Earnings	Private Fees	Social Cost
1980	358	4296	4092	144	2880
1981	440	5280	4464	144	3619
1982	512	6144	5040	144	4048
1983	570	6840	5976	144	1698
1984	532	6384	6552	156	5723
1985	489	5868	7140	168	4945
1986	484	5808	7752	180	4128
1987	507	6084	7884	192	3863
1988	578	6936	8145	204	4035

APPENDIX 6
The Singapore Education System

A. The Structure of Academic-Vocational-Technical Education.



Note
S1S — S4S and S1E — S4E pupils may progress direct to Vocational Training in the same way as S1N — S4N pupils.

Abbreviations

The New Education System

P	= Primary
PN	= Primary Normal
PE	= Primary Extended
PM	= Primary Monolingual
PSLE	= Primary School Leaving Examination
SS	= Secondary Special
SE	= Secondary Express
SN	= Secondary Normal
GCE	= General Certificate of Education
GCE "N"	= GCE "Normal" level
GCE "O"	= GCE "O" level
GCE "A"	= GCE "Advanced" level

Vocational and Technical System

Dip in AA	= Diploma in Applied Arts
ITC	= Industrial Technician CErtificate
CBS	= Certificate in Business Studies
PCBS	= Preliminary Certificate in Business Studies
NTC	= National Trade Certificate
BST	= Basic Skills Training
PVT	= Pre-Vocational Training

Post-Secondary and Tertiary Education

Pre-U	= Pre-University ("A" level)
EDB	= Economic Development Board
Polys	= Singapore Polytechnic and Ngee Ann Polytechnic
NTI	= Nanyang Technological Institute
NUS	= National University of Singapore

B. The Bilingual Policy

The vast majority of students are taught in English and learn one other language, usually the mother tongue. Ironically this is called the "Second Language". There are however exceptions. Many Straits - born Chinese families "the Babas" speak Malay rather than Chinese at home and children from these families generally opt for Malay as their second language.

Although English was the medium of instruction for all practical purposes, the government thought it undesirable that Singaporeans lose all connection with their ancestral and cultural roots regardless of whether they were Chinese, Malay or Tamil. Hence the bilingual policy. But prior to the late 1970s there was an anomaly. The majority of Chinese families speak one of the several Chinese dialects and only a small fraction actually use Mandarin in the course of daily life. But most Chinese school children were taught in English and Mandarin both of which 85% of them did not speak at home. The difficulties were borne out by the results of the Primary School Leaving Examination (PSLE) and the GCE "O" Level examinations which were applied uniformly across schools. More than 60% of the children who sat these examinations failed in one or both languages . Only 19% of primary school cohorts passed both languages at the GCE "O" level. The problem was exacerbated by the virtually automatic promotion in all grades of school other than primary 6 when students had to sit the PSLE. The result was that some 65% of a Primary One cohort of pupils did not complete their education in the sense of getting three "O" level passes. Nearly half of this 65% could not pass the PSLE even after three tries.

This quirk was taken stock of in the late 1970s with revisions in the primary and secondary education systems ending automatic promotion and the implementations of the recommendations of Dr. Goh Keng Swee and the Education Study Team as set out in the Report on the Ministry of Education 1978

C. Recommendations of the Goh Report

The streaming policy was one of the major recommendations of the Goh Report to help to reduce the attrition rates and produce school-leavers literate in at least one language, defined as the ability to read local news in the newspapers and to write simple sentences. The Goh Report recommended that students be channelled according to their language proficiency and academic ability. Specifically students were allowed a further two years to complete primary education and a further year each to complete secondary and pre-university education. Streaming was introduced at the end of primary three, primary six/eight, secondary two, and secondary four/five. At the end of Primary 3 students are channelled into either one of three streams: the Normal bilingual stream where they do 2 languages and complete their primary education in 6 years; the Extended bilingual stream where they also do 2 languages but with another one or two years; or the Monolingual stream where students concentrate on literacy and numeracy. Students from the Monolingual stream are usually strongly encouraged to enter the vocational stream.

Likewise at the secondary level students enter one of three streams: a Special bilingual stream where students do two languages at first language level and complete their secondary education up to GCE "O" level in four years; the Express bilingual stream where students study English at first language level and another language at second language level and also complete their secondary education in four years; and the Normal stream which concentrates on English and relegates the second language to a lower level than in the Express stream. Pupils sit for the GCE "O" levels at the end of five years rather than four and do fewer subjects. Students in this stream sit for the Certificate of Secondary Education or the GCE "Normal" examinations at the end of the fourth year and if they do well enough continue through to sit the "O" level examinations at the end of the fifth year.

Those who opt to go on to pre-university sit the GCE "A" level examinations regardless of whether they are in the two-year or three-year streams. Streaming is based on academic performance and intelligence tests and the system incorporates the possibility of lateral movements to allow any wrong fit to be corrected. Those who do not go on to sit for the "O" level examinations are also encouraged to take up vocational training.

D. The Tertiary System

Prior to 1979, there were two tertiary institutions, the University of Singapore and the Nanyang University. The latter was established in 1958 by the Chinese community to optimize opportunities for those educated in the Chinese medium. The University of Singapore was established in 1961 after the split of the then University of Malaya into two camps, one in Singapore and the other became the University of Malaya.

In the 1970s, more and more Nanyang University graduates were not able to secure well paid employment in the private sector and more and more of the best students from the Chinese stream schools applied for and obtained admission to the University of Singapore to take up courses in engineering, medicine, architecture, science and mathematics where their lack of proficiency in languages would not have hampered them as much as it would have in humanities and law. Admission standards in Nanyang thus had to be lowered and this further reduced the market value of graduates. Nanyang University responded in 1978 by announcing, in the face of considerable opposition, that it would prepare its undergraduates for the same examination as the University of Singapore which meant instruction and written examinations in the English language. In 1981, the two merged to form the National University of Singapore

The Singapore Bachelor's system is different from the British system. In Singapore, the general Bachelor's course is completed in 3 years. If the undergraduate's academic performance at the end of the three years is good, the student will be offered a place on the one-year Honours programme.

The Nanyang Technological Institute (NTI) was established in 1981 upon the recommendation of the Council for Professional and Technical Education to increase the intakes of engineering undergraduates. At present all undergraduates undergo the same first year course, at the end of which they are channelled either to the academic engineering course at the NUS or to the more industry-oriented course at the NTI. All graduates will obtain degrees conferred by the NUS until 1991 when the NTI will be upgraded to a full-fledged university.

The Polytechnics offer two and three-year Diploma-level training in courses ranging from Business Studies, Mechanical Engineering, Electrical and Electronic Engineering, Building Maintenance and Management, Land and Quantity Surveying, Chemical Process Technology, and Information and Software Technology. In addition to Diploma-level courses, the Singapore Polytechnic also conducts certificate courses and courses at the post-Diploma level. As there are no data on these other levels, they are excluded from the discussion

APPENDIX 7
Estimating the Effects of the NWC recommendations

YEAR	ACTUAL	ACTUAL % CHANGE	NWCA	NWCA % CHANGE	NWCAT	NWCAT % CHANGE
1972	324					
1973	355	9.6	350	8		
1974	418	17.8	387	9		
1975	476	13.8	500	19.6		
1976	498	4.7	505	6.1		
1977	533	6.9	533	7		
1978	563	5.6	565	6		
1979	612	8.8	609	8.2		
1980	692	13	687	12.3		
1981	789	14	777	12.3		
1982	910	15.3	884	12.1	900	14.1
1983	991	9	969	6.5	988	8.6
1984	1083	9.2	1041	5	1060	7
1985	1191	10	1175	8.5	1197	10.5
1986	1210	1.6	1250	5	1274	7
1987	1231	1.7	1210	0	1210	0
1988	1295	5.2	1231	0	1231	0
AV73-79		9.6		9.1		
AV80-85		11.75		9.5		9.4

YEAR	NWCH	NWCH % CHANGE	NWCAT	NWCAT % CHANGE	NWCAT -NWCH	ACTUAL--NWCH
1973	350	8			1.6	
1974	381	9			8.8	
1975	460	20.7			-6.9	
1976	487	5.9			-1.2	
1977	521	7			-0.1	
1978	552	6			-0.4	
1979	597	8.2			0.6	
1980	671	12.4			0.6	
1981	754	12.4			1.6	
1982	847	12.3	861		14.2	3
1983	904	6.7	936		8.7	2.3
1984	950	5.1	1002		7.1	4.1
1985	1034	8.8	1109		10.7	1.2
1986	1085	4.9	1187		7	-3.3
1987	1085	0	1187		0	1.7
1988	1085	0	1187		0	5.2
AV73-79		9.2				
AV80-85		9.6			9.5	

Source: Based on Lee (1987) Table 7.3

The actual weekly wage series obtained from the Hours and Earnings Survey on average weekly earnings is converted to monthly wages by multiplying by a factor of 30/7. Lee (1987) sets out 4 ways of calculating the NWC recommended rate of wage increases.

In NWCA, the recommendations were calculated as a percentage of the previous year's actual monthly earnings on the assumption that the current year's recommendations had not yet been

implemented. The recommendations were in the form of a range from 1981-1985. The mid-point of the range was used for computing NWCA. NWCAT was calculated in exactly the same way except that the top of the range was used to calculate the actual rate of wage increases for 1982-1986.

Another method of determining the NWC impact is to compute what wages would have been if the recommendations had been strictly adhered to every year. NWCH is the series of hypothetical rates of wage increases using the actual wage only in 1972. Like NWCA, the mid-point of the range is used where applicable whereas the top of the range recommended is used for calculating NWCHT. The incentive payments of 2% in 1980 and 3% in 1981 for more productive workers are ignored. The variable used in the model is NWCH. 1986 and 1987 were years of wage restraint in the wake of the recession and in 1988, the NWC moved away from the system of outright recommendations to encouraging firms to adopt a flexi-wage policy. It recommended that the total wage be given in two parts - a moderate basic wage increase and a variable payment/bonus linked to company/individual performance and productivity.

APPENDIX 8

TABLE 1: EMPLOYED PERSONS AGED FIFTEEN YEARS AND OVER BY HIGHEST QUALIFICATION ATTAINED, GROSS MONTHLY INCOME AND SEX (TOTAL)

HIGHEST QUALIFICATION ATTAINED	TOTAL	UNDER $200	$200 - $399	$400 - $599	$600 - $799	$800 - $999	$1,000 - $1,499	$1,500 - $1,999	$2,000 - $2,499	$2,500 - $2,999	$3,000 & OVER
TOTAL*	**1166449**	**47053**	**153873**	**291606**	**208007**	**122378**	**161233**	**64666**	**44540**	**17918**	**55174**
NO QUALIFICATION (BELOW PSLE)	176411	9161	35632	59971	35226	16370	14060	3122	1447	381	1041
PRIMARY	336501	12080	48398	108623	75477	37409	37460	9213	4137	1142	2563
POST PRIMARY	11268	533	1700	3781	2411	1091	1294	228	127	25	76
SECONDARY	346120	11091	27613	76036	67102	44388	65757	25481	14593	4644	9416
POST SECONDARY	140803	7893	13959	11903	14212	15227	29313	16370	13451	6142	12334
TERTIARY	63702	254	1650	660	838	1726	7842	8248	9441	4924	28120
QUALIFICATIONS NOT ELSEWHERE CLASSIFIED	5101	25	228	355	457	457	787	711	584	431	1067
NOT APPLICABLE (NEVER ATTENDED SCHOOL)	86543	6015	24694	30277	12283	5710	4721	1294	761	228	559

*Excludes Unpaid Family Workers

SOURCE: TABLE 37, REPORT ON THE LABOUR FORCE SURVEY OF SINGAPORE 1987

APPENDIX 8

TABLE 2: EMPLOYED PERSONS AGED FIFTEEN YEARS AND OVER BY OCCUPATION, GROSS MONTHLY INCOME AND SEX (TOTAL)

	OCCUPATION	TOTAL	UNDER $200	$200 - $399	$400 - $599	$600 - $799	$800 - $999	$1,000 - $1,499	$1,500 - $1,999	$2,000 - $2,499	$2,500 - $2,999	$3,000 & OVER
	TOTAL*	**1166449**	**47053**	**153873**	**291606**	**208007**	**122378**	**161233**	**64666**	**44540**	**17918**	**55174**
0/1	PROFESSIONAL, TECHNICAL AND RELATED WORKERS	133570	1015	2589	7258	9669	13426	30379	19872	18400	8832	22131
2	ADMINISTRATIVE, MANAGERIAL AND EXECUTIVE WORKERS	71747	152	102	660	1218	2792	14111	11700	11446	5380	24186
3	CLERICAL AND RELATED WORKERS	183719	685	6725	52408	47434	29389	34389	9314	2462	482	432
4	SALES WORKERS	150016	4873	18704	37866	28069	15811	24009	8071	5863	1624	5127
5	SERVICE WORKERS	137605	6979	43170	38703	19745	9771	12258	4010	1751	508	710
6	AGRICULTURAL, ANIMAL HUSBANDRY AND FORESTRY WORKERS AND FISHERMEN	12512	660	2284	4543	2436	1041	1066	355	76	25	25
7/8/9	PRODUCTION AND RELATED WORKERS, TRANSPORT EQUIPMENT OPERATORS AND LABOURERS	421065	9263	63016	147199	97583	48423	40936	9492	3528	711	914
X/Y/Z	WORKERS NOT CLASSIFIABLE BY OCCUPATION	56215	23425	17283	2969	1853	1726	4086	1853	1015	355	1650

*Excludes Unpaid Family Workers

SOURCE: TABLE 34, REPORT ON THE LABOUR FORCE SURVEY OF SINGAPORE 1987

APPENDIX 9
The NUS Graduate Employment Surveys

Table 1
Response Rates %

Year	Output	All Respondents	3-Year General	4-Year Honours	Engin
1975	2380	59	58.4	59.8	64.7
1976	2386	73	76.6	78.4	76.5
1977	2357	69	73.9	64.9	72.2
1978	2422	71	75.1	68.0	76.2
1979	2763	72	68.2	74.3	85.7
1980	2603	68	68.4	69.6	72.5
1981	2345	64	58.5	66.8	76.2
1982	2581	76	78.0	69.8	83.1
1983	3081	80.5	81.9	80.5	87.3
1984	3725	78.6	78.7	82.0	82.1
1985	4286	74.7	74.9	72.4	79.3
1986	4883	76.4	81.4	75.8	70.8
1987	5070	74.3	76.0	71.0	76.3
1988	5220	75.6	70.8	69.4	78.9

Output figures from the Singapore Yearbook of Labour Statistics, various years. From 1985, Engineering figures include graduates from NT1
Response rates refer to Singaporean and non-Singaporean graduates. Singaporean graduates refer to citizens and permanent residents. First batch of NUS graduates: 1981 Data prior to 1981: Singapore University graduates

Sources: see Table 7.

Table 2
Total Supply of Graduates from Singapore University/ National University of Singaprore and Nanyang Technological Institute (1975-1988)

Year	3-Year	Honours	Engin	Total Supply
1975	571	164	231	1685
1976	553	190	238	1665
1977	623	191	248	1640
1978	721	147	214	1644
1979	914	171	238	1928
1980	675	207	255	1820
1981	992	235	323	1550
1982	1115	255	349	1719
1983	1391	293	441	2125
1984	1548	338	585	2471
1985	1885	376	769	3030
1986	2093	426	687	3206
1987	2126	440	597	3163
1988	2172	430	1025	3627

* Figures for Engineering from 1985 include the output of NTI. The figures for General degree have been adjusted for those continuing onto the Honours programme the following year. "Supply" refers to the numbers actually released to the labour market in the year.

Table 3
Employment Rates of Singaporean Graduates by Sex

	Total	Male	Female
1975	89.4		
1976	84.2	88.1	81.6
1977	92.8	91.8	93.7
1978	94.5	95	93.9
1979	93.1	92.9	93.3
1980	95.3	96.6	94
1981	95.6	96.2	94.9
1982	94.3	94.1	94.5
1983	96.8	97.7	96
1984	95.3	96.4	94.3
1985	84.3	91.2	79.4
1986	78.7	91.4	71.2
1987	84.8	91.3	77.7
1988	90.5	94.4	86.7

Table 4
Employment Rate of NUS Singaporean Graduates by Degree

Employment Rate = (Employed/Economically Active) * 100

	NUS 3-Year	Honours	Engin	NTI Engin
1975	81.5	92.5	86.3	
1976	75.1	97.9	85.0	
1977	90.6	97.6	86.9	
1978	90.0	95.0	98.5	
1979	91.6	96.7	88.8	
1980	93.5	97.7	93.6	
1981	94.5	98.3	94.1	
1982	91.6	92.1	98.1	
1983	95.4	98.3	99.4	
1984	93.7	97.4	95.0	
1985	79.6	92.5	86.4	92.1
1986	71.4	87.7	92.6	90.8
1987	76.3	89.6	97.1	98.0
1988	85.8	92.5	98.9	97.2
AV1975-88	86.5	94.7	92.9	94.5

Table 5
Working Singaporean Graduates: Median Monthly Salary
(Nominal S$)

	3 year		Honours		Engineering		Total	
	M	F	M	F	M	F	M	F
1975	908	771	1256	937	1240	1221	1053	846
1976	954	716	1097	884	1226	1286	1071	817
1977	923	718	1088	957	1464	1133	1174	820
1978	891	745	1176	978	1497	1317	1134	839
1979	914	775	1166	1017	1365	1236	1156	837
1980	995	803	1262	1086	1468	1426	1249	950
1981	1117	932	1443	1185	1638	1432	1352	1084
1982	1279	1131	1717	1427	1784	1628	1524	1263
1983	1352	1149	1691	1425	1855	1744	1626	1237
1984	1534	1226	1844	1535	1970	1840	1784	1331
1985	1500	1183	1908	1550	1957	1650	1770	1305
1986	1552	1067	1546	1210	1829	1938	1670	1167
1987	1425	1100	1883	1481	1827	1638	1672	1226
1988	1355	1143	1787	1524	1835	1831	1675	1234

The figures for Engineering for 1985-1988 include NTI graduates.

Table 6
Working Graduates by Class of Employer

	Govt	Stat	Private
1975	37.2	17.4	45.5
1976	43.4	14.1	42.4
1977	37.1	17.3	45.6
1978	35.6	14.1	50.3
1979	36.6	14.1	49.3
1980	33.4	14.1	52.5
1981	29.1	13.6	57.2
1982	33.5	15.6	50.9
1983	29.5	27.4	43.1
1984	32.9	23.0	44.1
1985	31.9	26.3	41.8
1986	22.9	18.6	58.5
1987	20.7	12.3	67.0
1988	18.0	11.3	70.7

Stat = Statutory Board

Table 7
Working Singaporean Graduates by Class of Employer and Type of Degree

	NUS General 3-Year			Honours		
	Govt	Stat	Private	Govt	Stat	Private
1975	26.1	12.8	60.6	51.0	22.6	26.4
1976	35.3	7.0	57.7	52.0	24.0	24.0
1977	35.2	13.6	50.0	45.9	23.0	31.1
1978	30.0	12.5	56.1	42.0	21.0	37.0
1979	40.0	7.0	52.3	36.6	24.1	39.3
1980	30.2	8.2	61.0	39.0	22.0	37.3
1981	22.3	10.7	65.4	39.6	18.1	41.6
1982	30.0	10.3	58.2	54.4	21.0	23.8
1983	26.3	27.8	43.4	20.4	57.0	20.9
1984	29.0	22.2	47.7	30.0	46.7	23.3
1985	27.1	25.7	46.6	38.2	42.6	18.2
1986	18.8	17.1	61.0	29.9	46.6	22.2
1987	23.5	5.2	71.3	31.0	28.7	38.4
1988	15.4	9.0	75.5	25.7	34.6	39.7

	NUS Engineering		
	Govt	Stat	Private
1975	25.0	42.2	27.8
1976	9.1	56.8	24.1
1977	20.5	22.3	57.1
1978	28.0	15.0	57.0
1979	7.8	23.4	68.8
1980	14.6	24.8	59.8
1981	11.8	20.0	67.7
1982	16.6	26.9	56.3
1983	22.9	18.2	58.1
1984	27.1	17.7	54.6
1985	32.2	20.6	47.0
1986	16.6	11.1	72.0
1987	17.7	10.7	71.3
1988	16.6	9.3	74.1

	NTI Engineering		
	Govt	Stat	Private
1985	29	22.3	48.7
1986	14.4	11.8	73.8
1987	17.5	11.7	70.8
1988	17.9	9.3	72.8

The totals may not add up to 100% because of the small percentage engaged in family-run businesses or who are self employed.

Sources: Economic Research Centre, Report of the Graduate Employment Survey, 1975-1982; Applied Research Corporation, Report of the Graduate Employment Survey, 1983-1988

APPENDIX 10
Ngee Ann and Singapore Polytechnics Graduate Employment Surveys

Table 1
Ngee Ann Polytechnic - Vital Statistics

Year	Output	Employment Rate (%)	Salary ($)	% Change in Supply	% Change in Salary
1974	251	90.5	498		
1975	369	83.0	481	47.0	-3.4
1976	335	75.5	467	-9.2	-2.9
1977	344	83.8	498	2.7	6.6
1978	559	89.6	504	62.5	1.2
1979	754	96.3	532	34.9	5.6
1980	584	94.8	610	-22.5	14.7
1981	661	94.1	663	13.2	8.7
1982	973	91.6	745	47.2	12.4
1983	928	89.4	736	-4.6	-1.2
1984	1293	93.8	821	39.3	11.5
1985	1535	82.5	746	18.7	-9.1
1986	1932	79.2	646	25.9	-13.4
1987	2710	83.7	735	40.3	13.8
1988	3059	89.9	787	12.9	7.1

Output includes males going into National Service
Median salary includes that for Business Studies graduates

Sources: see Table 8

Table 2
Ngee Ann Polytechnic: Distribution by Class of Employer

Batch	Public	Private
F1974	24	76
S1974	14.7	85.3
M1975	12	87
S1975	16.8	83.1
M1976	11.7	87
S1976		
M1977	12	84.8
S1977	16.4	
AP1978	75	82.5
O1978	24.3	73.8
AP1979		
O1979	10.7	87.5
AP1980	10.1	87.6
O1980	22.1	74
AP1981	9	88.9
O1981	22.2	75.3
AP1982	8.7	91.3
O1982	33.1	67
S1983	16.6	80
S1984	15.7	80.3
S1985	17.5	76
S1986	9	84.9
S1987	5	90
S1988	5.6	90.9

F - February; M - March; AP - April; S - September; O - October.
The sums may not add up to 100% because of the small fraction engaged in self employment or in family run businesses.
The figures were not available for some years.

Table 3
Ngee Ann Polytechnic: Salary by Class of Employer

	Public	Private	Public/Pte Differential	Public % change	Private %change
O1980	634	486	1.31		
AP1981	758	721	1.05		
O1981	683	771	0.89	7.7	58.7
AP1982	*	671	*		
O1982	1004	735	1.37	47.0	-4.7
S1983	887	709	1.25	-11.7	-3.5
S1984	959	810	1.18	8.1	14.2
S1985	982	710	1.38	2.4	-12.3
S1986	712	643	1.11	-27.5	-9.4
S1987	944	728	1.30	32.6	13.2
S1988	941	782	1.20	-0.3	7.4

% change is measured over the same time the previous year.

Table 4
Ngee Ann Polytechnic: Vital Statistics of Demobilized Graduates

Year	Employment Rate	Median Salary	% in Pte Sector
1975	85.1	548	40
1976	100.0	725	67
1977	92.9	716	76
1978/79	100.0	782	86
1979/80	100.0	805	88
1981	100.0	854	91
1982	98.3	891	87
1983	97.0	1050	69
1984	85.5	1107	56
1985	92.7	1040	80
1986	92.0	889	96
1987	94.5	939	94
1988	96.4	1043	97

There were no figures for the actual number of graduates, thus the response rate could not be calculated.

Table 5
Ngee Ann Polytechnic: Salary Differential between Fresh and Demobilized Graduates (Nominal S$)

Year	Fresh	Demob	Differential
1975	481	548	1.14
1976	467	725	1.55
1977	498	716	1.44
1979	532	782	1.47
1980	610	805	1.32
1981	663	854	1.29
1982	745	891	1.20
1983	736	1050	1.43
1984	821	1107	1.35
1985	746	1040	1.39
1986	646	889	1.38
1987	735	939	1.28
1988	787	1043	1.33

Table 6
Singapore Polytechnic - Vital Statistics

Year	Output	Employment Rate %	Salary	% in Output	% in Salary	% in Pte Sector
1973	464	85.2	493			79.2
1974	702	88.8	509	51.3	3.2	72.7
1975	659	77.3	610	-6.1	19.8	69.5
1976	685	70.2	581	3.9	-4.8	74.0
1977	1274	49.4	572	86.0	-1.5	77.6
1978	1241	53.7	473	-2.6	-17.3	80.3
1979	1388	80.9	573	11.8	21.1	71.5
1980	1240	84.5	603	-10.7	5.2	85.6
1981	1318	74.3	618	6.3	2.5	89.6
1982	1532	71.0	691	16.2	11.8	95.2
1983	1574	78.3	825	2.7	19.4	81.1
1984	1688	77.0	800	7.2	-3.0	84.9
1985	1808	58.3	760	7.1	-5.0	79.4
1986	1860	26.6	700	2.9	-7.9	90.6
1987	2407	95.0	750	29.4	7.1	92.2
1988	2251	78.0	790	-6.5	5.3	82.0

Output refers only to Diploma graduates.

Table 7
Singapore Polytechnic: Vital Statisitcs of Demobilized Graduates

Year	Employment Rate	Median Salary	% in Pte Sector
1973		603	75
1974		579	53
1975	87.4	555	42
1976	96.6	782	60.6
1977	94	703	63.6
1978/79	98.7	826	81.1
1979/80	100	812	83.7
1981	97.6	879	88.3
1982	96.8	991	85.9
1983	NO SURVEY WAS CARRIED OUT		
1984	97.6	1056	87.8
1985	NO SURVEY WAS CARRIED OUT		
1986	87.7	950	88.7
1987	92	950	90
1988	96.5	1000	92.3

See note in the previous table.

Table 8
Singapore Polytechnic: Salary Differential between Fresh and Demobilized Graduates

	Fresh	Demob	Differential
1973	493	603	1.22
1974	509	579	1.14
1975	610	555	0.91
1976	581	782	1.35
1977	572	703	1.23
1979	573	826	1.44
1980	603	812	1.35
1981	618	879	1.42
1982	691	991	1.43
1984	800	1056	1.32
1986	700	950	1.36
1987	750	950	1.27
1988	790	1000	1.27

Sources: ERC, The Labour Market Experiences of National Servicemen Demobilized in 1975, February 1976; ERC, Employment Experiences of Polytechnic and Ngee Ann Graduates Demobilized in 1976, September 1977; Han Teng Fong, The Job Market for Technical Manpower in Singapore in 1977/78: A Survey Report, Singapore Polytechnic December 1978; ERC, A Report on the Job Market for Technical Graduates In Singapore in 1979/80, June 1981, University of Singapore; ERC, A Report on the Job Market for Technical Graduates in Singapore in 1980-1982, National University of Singapore, January 1983; ERC, Ngee Ann Polytechnic Graduate Employment Survey, 1974-1982 ; Ngee Ann Polytechnic Graduate Employment Survey 1983-1988 Department of Business Studies, Ngee Ann Polytechnic; The Registry, Singapore Polytechnic

APPENDIX 11
The Vocational and Industrial Training Board

Courses conducted by the Vocational and Industrial Training Board

Pre-Vocational Training: One year programme for Primary 8 Monolingual pupils. Those who perform well and have the necessary aptitudes can go on to the Certificate of Competency or the NTC-3 courses

Certificate of Competency: Short Artisan level courses normally extending over three months for entrants with primary education. These are upgrading courses designed also for industrial workers to reinforce their practical skills with a theoretical background.

National Trade Certificate (NTC 3): A two-year programme of which Basic Skills Taining (BST) forms the first year for Primary 8 Extended (P8E) and Secondary 1 to 3 entrants. The programme is of a year's duration for entrants with Scondary 4 Normal qualifications. This is the basic standard of skill and knowledge obtained from a vocational institute or attained by an apprentice in his first or second year.

Preliminary Certificate in Business Studies (PCBS): A one-year programme for GCE "O" and "N" level entrants.

National Trade Certificate (NTC 2): 2-year full-time programme for good NTC-3 holders and those who leave school with GCE "O" or "N" level qualifications. These courses develop semi-skilled NTC-3 workers into fully skilled workers. This is the level of the fully trained and competent craftsman normally attained after a formal apprenticeship programme and 2 or 3 years of on-the-job experience.

Certificate of Business Studies (CBS): A two-year programme for GCE "O" and "N" level entrants.

National Trade Certificate (NTC 1): This is the standard of the expert craftsman attained after ten or more years of experience.

Industrial Technician Certificate (ITC): Two-year full-time institutional programme targetted at GCE "O" level holders. The ITC is essentially a trade or skill-based programme including technician-level theoretical and laboratory training and supervisory skills.

Diploma: Three-year full-time institutional programme for GCE "O" level entrants. Diploma level training is only conducted by the Polytechnics and the VITB undertakes this level of training only in the Applied Arts.

Data from the VITB Graduate Employment Surveys

Table 1
Intake by Levels for Full Time Regular Courses at the VITB

YEAR	DIP	ITC	NTC2	NTC3	CoC	TOTAL
1975	0	792	0	5190	376	6358
1976	0	1144	0	6429	736	8309
1977	0	986	0	5304	1046	7336
1978	0	1024	0	5288	692	7004
1979	0	1049	0	5771	296	7116
1980	43	1541	125	4153	278	6140
1981	41	934	441	4589	388	6393
1982	61	890	551	4573	1317	7392
1983	67	799	579	3236	1235	5916
1984	65	656	715	5913	55	7404
1985	95	885	1216	4637	26	6859
1986	88	905	680	5021	49	6743
1987	82	1168	1241	4982	28	7501
1988	108	1336	1346	4722	0	7512

All figures exclude business and commercial courses, The BEST and MOST schemes, pre-vocational training and ad hoc courses.
Sources: Singapore, Economic and Social Statistics 1960-1982, Department of Statistics, Singapore; Vocational and Industrial Training Board, Annual Reports, various years; Singapore, Yearbook of Statistics 1988, Department of Statistics, Singapore

Table 2
Intakes by Levels - Full Time and Part Time

YEAR	DIP	ITC	NTC2	NTC3	CoC	TOTAL
1975		1207	553	6593	444	8797
1976		1348	350	7961	1294	10953
1977		1177	506	5792	1046	8521
1978		1076	485	6176	692	8429
1979		1187	473	6749	296	8705
1980	43	1736	461	6139	386	8765
1981	41	980	1920	7698	548	11187
1982	61	1050	3959	8939	1674	15683
1983	67	879	4960	9585	1870	19311
1984	65	981	5007	8722	303	15078
1985	95	1185	4712	12094	12	18098
1986	88	1167	4143	12839	94	18331
1987	82	1493	5367	15384	56	22382
1988	108	1751	5987	16665	66	24577

Notes and sources: see Table 1.

Table 3
Full-time Output of the VITB

YEAR	DIP	ITC	NTC2	NTC3	CoC	TOTAL
1975		330		2651	514	3495
1976		682		3636	776	5094
1977		839		4147	660	5646
1978		1010		4022	579	5611
1979		883		3915	303	5101
1980		970	4	3830	413	5227
1981		985	225	3394	305	4909
1982		811	484	3629	1144	6068
1983	30	718	232	3652	1429	7229
1984	30	748	509	2818	573	6281
1985	59	532	462	3302	12	7597
1986	64	425	646	3344	30	8472
1987	65	641	1009	2820	28	8853
1988	78	700	737	3302	0	9025

Table 4
Full time and Part-time Output of the VITB

YEAR	DIP	ITC	NTC2	NTC3	CoC	TOTAL
1975		398	510	3116	525	4549
1976		739	319	4285	968	6311
1977		916	383	4805	681	6785
1978		1214	238	4415	579	6446
1979		966	276	4427	303	5972
1980		1065	549	6235	413	8162
1981		1014	1793	6866	435	10108
1982		858	3839	7895	1420	14012
1983	37	748	4631	8464	1941	16874
1984	30	774	4805	8677	747	17113
1985	59	584	4259	9542	12	18049
1986	64	476	4026	12269	66	21180
1987	65	770	5109	13250	56	23963
1988	78	827	5347	15370	56	26026

Sources: see Table 1

Table 5
VITB Fresh Female Graduates: Employment Rate

BATCH	DIP	ITC	NTC2	TRADE/ NTC3
1969/73		92		86
1974		98		90
1978		97		88
1979		99		90
1980/81		98		93
1981/82		99	100	91
1983	100	92	100	79
1984	100	89	79	77
1985	94	100	68	77
1985	-	100	100	79
1986	95	95	76	80
1986	-	-	75	86
1987	92	100	85	100
1987	-	-	-	89
1988	100	98	94	80

Table 6
VITB Fresh Female Graduates: Nominal Median Salary

BATCH	DIP	ITC	NTC2	TRADE/ NTC3	ARTISAN/ CoC	TOTAL
1969/73		461		275	240	
1974		394		233	200	
1978		339		234	-	242
1979		447		270	-	281
1980/81		525		345	-	385
1981/82		709	522	397	-	429
1983	838	650	476	386	-	458
1984	767	664	675	371	-	484
1985	663	663	563	438	-	475
1985	-	582	-	375	-	383
1986	680	613	499	450	-	458
1986	-	-	515	400	-	420
1987	751	650	499	450	-	500
1987	-	-	-	450	-	460
1988	754	700	525	579	-	550

Table 7
Fresh Female VITB Graduates: Class of Employer and Sectoral Salary

Batch	(%) Public	(%) Private	($) Public	($) Private	Public/Private Differential($)
1978	11	89			
1979	8	83			
1981	10	86			
1982	13	86			
1983	11	82			
1984	19	67	499	481	1.04
1985	24	69	480	472	1.02
1985	14	73	381	385	0.99
1986	12	83	458	470	0.97
1986	6	85	420	423	0.99
1987	9	-	455	500	0.91
1987	15	81	444	471	0.94
1988	18	82	510	550	0.93

Table 8
VITB Fresh Male Graduates: Employment Rate

BATCH	DIP	ITC	NTC2	NTC3	CoC
1984	N.C.	93	96	81	92
1985	N.C.	90	91	92	-
1985	-	96	100	65	N.C.
1986	N.C.	94	91	75	-
1986	-	-	93	75	N.C.
1987	100	100	100	95	-
1987	-	-	90	83	-
1988	100	89	94	65	-

Table 9
VITB Fresh Male Graduates: Nominal Median Salary

BATCH	DIP	ITC	NTC2	NTC3	CoC	TOTAL
1984	-	676	539	448	351	483
1985	-	869	598	534	-	595
1985	-	691	538	398	N.C.	423
1986	N.C.	830	590	605	-	601
1986	-	-	768	450	N.C.	450
1987	707	700	650	699	-	699
1987	-	-	825	480	-	500
1988	800	796	730	602	-	750

Table 10
VITB Fresh Male Graduates: Class of Employer and Sectoral Median Salary

	% Public	Private	Salary Public	Private	Public/Private Differential
1984	16	65	513	477	1.08
1985	26	69	642	583	1.10
1985	7	80	401	426	0.94
1986	15	78	618	601	1.03
1986	7	81	460	450	1.02
1987	15	85	626	698	0.90
1987	8	81	501	480	1.04
1988	8	90	600	750	0.80

Table 11
Real Starting Salaries of Fresh Male and Female VITB Graduates

BATCH	Salary
1971	630
1972	538
1973	402
1974	322
1975	305
1976	
1977	
1978	308
1979	344
1980	
1981	402
1982	431
1983	455
1984	468
1985	428
1986	440
1987	469
1988	526

Note: The salary of fresh graduates is a weighted average (by numbers employed) of fresh male and female graduates

Table 12
Employment Rates of Demobilized VITB Graduates

BATCH	ITC	NTC2	TRADE/ NTC3	ARTISAN/ CoC
1972	**		**	**
1973	**		**	**
1974	**		**	**
1976	85		79	48
1977	99		94	91
1978	97		95	90
1979/80	98		93	81
1980/81	99		96	90
1982	100	94	92	92
1983	96	94	90	84
1984	96	88	84	90
1985	97	85	78	100
1985	91	72	74	86
1986	97	92	81	-
1986	94	84	84	-
1987	100	100	94	-
1987	100	89	89	100
1988	98	95	91	-

The trade course was reorganized into the NTC3 course in 1979/80 and the Artisan into the CoC in 1981

Table 13
Nominal Median Salary of Demobilized Graduates

BATCH	ITC	NTC2	TRADE/ NTC3	ARTISAN/ CoC	TOTAL
1972	-		225	167	
1973	402		182	196	
1974	413		266	245	
1976	519		335	246	
1977	483		355	303	
1978	533		373	260	389
1979/80	596		442	380	508
1980/81	675		493	429	506
1982	-	533	558	458	572
1983	772	600	555	508	603
1984	805	609	572	526	619
1985	771	609	553	-	652
1985	767	676	514	513	547
1986	730	631	501	-	580
1986	706	700	530	-	550
1987	749	635	600	-	649
1987	748	900	550	525	550
1988	752	700	580	480	670

Table 14
Real Starting Salaries of Demobilized Graduates

BATCH	Salary ($)
1972	464
1973	481
1974	466
1975	544
1976	486
1977	478
1978	496
1979	
1980	574
1981	634
1982	575
1983	599
1984	599
1985	574
1986	553
1987	589
1988	641

Table 15
Demobilized Graduates: Class of Employer Sectoral Salary

	% Public	Private	Salary Public	Private	Public/Private Differential
1978	25				
1979	17	75			
1981	16	74			
1982	21	68	745	546	1.36
1983	17	76	728	589	1.24
1984	18	74	768	601	1.28
1985	21	68	796	604	1.32
1985	15	70	584	540	1.08
1986	12	78	601	580	1.04
1986	14	78	600	550	1.09
1987	12		595	650	0.92
1987	12	76	500	551	0.91
1988	7	86	740	660	1.12

Source: Data supplied by the VITB.

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