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EARNINGS INEQUALITY IN SINGAPORE[1]

V. V. Bhanoji Rao, D. S. Banerjee and Pundarik Mukhopadhaya

Abstract Based on the data on earnings distributions from the national labour force surveys of 1974–98, trends in income inequality are studied. Of particular note are the findings from the Paglin Gini and Theil decompositions. The former show that behind an invariant overall Gini ratio lies a declining inter-age disparity and growing P-Gini. From the latter, it is found that inter-age and inter-educational disparities have respectively contributed some 12 per cent and 34 per cent to overall inequality. It is found that inter-occupational inequality, as measured by the Theil index, almost doubled in the period. This is in sharp contrast to trends in inter-educational activity, thus illustrating that the education–occupation linkage is not clear-cut.

Keywords Earnings distribution, Gini ratio, Paglin Gini, age-adjusted Gini, Theil decomposition.

JEL classifications D31, D63.

1. INTRODUCTION

Singapore, the city-state of a little over 3 million people, had GNP per capita in 1999 of US$29,610, next only to eight other economies in the list of 174 covered in the *World Development Report, 2000/01*. The country is also high up in social development, with a life expectancy of 76 years, an adult literacy rate of over 90 per cent and enviable progress in housing, health and sanitation. In housing, for example, over 80 per cent of the population are owner-occupiers of apartments built on a vast scale as part of the public housing programme.

Given the spectacular achievements of Singapore in economic and social development, a question of considerable scholarly and policy interest is the trend in income inequality. Earlier research has addressed the issue in some detail.[2] This essay attempts to add value to the previous research by providing, for the first time, trends in age-adjusted Gini coefficients and Theil decompositions of overall inequality with regard to age, education and occupation. The study refers to earnings inequality during 1974–98, covering the first to the latest year for which data are available from the government's labour force surveys.

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Traditionally, it is the household income inequality that is charted and analysed in studies of income distribution. It is, however, equally important and interesting to review trends in earnings inequality. Income accrues mostly to individuals; some income may accrue directly to families. It is, therefore, useful to look at income disparities among individuals as well as families. Income differences among individuals are closely linked to capabilities, investments in human resources, labour market conditions and allied factors.[3] The additional factors that determine family income are the number of economically active persons within the family, family assets and the returns on them. It is, however, important to note that in the case of an economy like Singapore, with little agricultural land ownership and an extremely high proportion of employees in the total labour force (over 80 per cent in recent years), most of the family income is derived from earnings (that is, income earned from employment and business).

This essay begins with a capsule account of the economic growth experience of the country since independence in 1965 (section 2). A note on the data on the distribution of earnings is provided in section 3. Trends in inequality (based on the Gini ratios) are discussed in section 4. Theil decomposition analysis with respect to age, educational attainment and occupation is presented in section 5. The final section of this essay has a few concluding remarks.

2. ECONOMIC GROWTH

(a) Growth strategy

Immediately after Singapore gained internal autonomy from Britain in 1959, the government initiated plans for economic growth. An Industrial Survey Mission of the United Nations visited Singapore and recommended that the government should undertake a programme of industrialization in order to take care of the employment needs of the growing labour force. The 1961–64 Development Plan of Singapore took account of the recommendations. Meanwhile in 1963, Singapore joined the newly established Federation of Malaysia and hoped to benefit from the common market. Thus, Singapore initially opted for an import-substituting industrialization strategy.

After separation from the Federation in 1965, because of limitations of the domestic market, the young Republic of Singapore had to abandon the import-substitution strategy and adopt, instead, an export-oriented development path. The outward-oriented strategy had been in place since the mid-1960s. The government invited foreign direct investment, technology and talent. To facilitate both domestic and foreign private investment, it developed world-class physical infrastructure (expressways, ports, airports, power and telecommunications) and social infrastructure (schools, hospitals and public housing).

Throughout 1965–98, rates of economic growth (Table 1) have been consistently high with only a few exceptions. In 1975, the relatively low 4.8 per cent growth was due to the after-effects of the first oil shock, while in 1985 and 1986 the economy plunged into a recession as a result of loss of competitiveness because of relatively high wage costs. There was also the most recent downturn of 1998/99, due to the 1997 regional economic crisis when the Singapore economy too had lacklustre performance.

The first phase (1966–73) is characterized by eight consecutive years of double-digit growth rates. For the period as a whole the average annual growth rate was a high 12.7 per cent. In many ways, 1973 marks the end of an epoch, with manufacturing sector share in GDP reaching a high 30 per cent (up from 22 per cent in 1965) and unemployment down to 2.2 per cent from close to 10 per cent in 1966. High rates of economic growth during the phase were essentially driven by the continuous and rapid increases in the investment rate (gross investment rose from 21 per cent of GDP in 1966 to 40 in 1973). The phase is characterized by a relatively large gap between saving and investment (Table 2).

The years 1974 and 1975 were characterized by rather low growth rates in comparison to the rates achieved in the preceding eight years in a row. The post-oil shock recovery began in 1976 and robust growth continued thereafter (though not at double digits) until the slowdown in 1985. Thus the second growth phase runs from 1976 to 1984. The phase witnessed a rise in the investment rate to levels close to 50 per cent and the saving–investment gap was reduced.

The economy went into a recession in 1985/86. Growth resumed in 1987 and continued through to 1994. In the third growth phase of 1987–94, services became prominent and there is a very large surplus of saving over investment, mostly due to the surpluses in the government sector, thus prompting a policy of

Table 1 Rates of economic growth, 1966–98

Year	*Growth rate of GNP*	*Year*	*Growth rate of GNP*	*Year*	*Growth rate of GNP*
1966	10.5	1977	7.5	1988	10.3
1967	14.8	1978	8.6	1989	8.7
1968	15.0	1979	10.3	1990	9.9
1969	13.4	1980	10.6	1991	7.8
1970	13.4	1981	10.4	1992	5.6
1971	13.2	1982	7.3	1993	9.9
1972	13.3	1983	8.7	1994	10.4
1973	11.7	1984	9.2	1995	8.4
1974	8.0	1985	**–0.2**	1996	5.1
1975	**4.8**	1986	**0.8**	1997	6.6
1976	7.3	1987	9.6	1998	–3.1

Source: Rao and Lee (1995) and updates.

Table 2 Average indicators for the growth phases

Indicator	*Phase I 1966–73*	*Phase II 1976–84*	*Phase III 1987–94*	*Phase IV 1994–98*
Growth rate of GDP (%)	12.7	8.5	8.6	8.9
Shares in GDP (%)				
Agriculture and quarrying	2.6	1.4	0.4	0.2
Manufacturing	26.0	28.6	28.5	23.8
Utilities[a]				1.8
Construction	9.1	8.7	5.9	8.7
Services[b]	62.3	61.3	65.1	71.6
Domestic saving	19.3	39.4	45.3	50.4
Domestic investment	32.0	44.6	35.1	35.3
S–I gap	–12.7	–5.2	+10.2	+15.1
Unemployment rate[c] (%)	1966: 8.9 1973: 4.5	1976: 3.9 1984: 2.7	1987: 4.7 1994: 2.6	1994: 2.6 1998: 2.8

Notes:
a For Phases I, II and III utilities have been added to manufacturing.
b Services include commerce, transport and communication, financial, business and other services.
c Seasonally adjusted.

encouraging outward investment and regionalization of the economy. Rao and Lee (1995) found that in contrast to the previous two phases when growth in 'total factor productivity (TFP)' contributed only 10 per cent or less to GDP growth, the third phase was characterized by a hefty 30 per cent contribution from TFP growth to GDP growth.

In the period 1994 to mid-1997, the Singapore economy registered the highest growth rate in 1994 and 1995. The economy expanded by 10.5 per cent and 8.7 per cent, respectively, before moderating to 6.9 per cent in 1996. The moderate growth rate in 1996 was due to the decline in global demand for electronic products and slower regional growth. These affected the output of the manufacturing sector as well as the performance of hub-related services, namely entrepôt trade and shipping services. In 1997, Singapore registered a GDP growth of 7.8 per cent. This was an increase of 0.9 per cent over 1996. The main source of growth in 1997 was external demand which accounted for 5.1 per cent of the economy's growth, or two-thirds of the growth in total demand. The diversified structure of the Singapore economy helped to support growth. In the fourth quarter of 1997, overall growth momentum decelerated as the impact of the regional slowdown filtered through to segments with a high reliance on regional demand. However, as industries servicing markets in the developed countries were less affected, this had lent support to overall growth.

The Singapore economy continued to post respectable growth rates at 5.9 per cent and an estimated 1.9 per cent in the first two quarters of 1998, respectively,

even as other major Asian economies suffered from contractions in GDP. Electronics sector growth momentum carried over from the second half of 1997 helped support Singapore's relatively strong growth in the first quarter.[4] Higher output of chemicals resulting from previous years' investments in capacity helped offset declining electronics production and the effects of the regional economic crisis to keep economic growth positive in the second quarter. The diversified nature of the Singapore economy, both in terms of activities and export markets, as well as its strong economic fundamentals and financial institutions, cushioned it from the worst impact of the 1997 Asian economic crisis.

3. INCOME DISTRIBUTION DATA

(a) Data from Labour Force Surveys

This essay is based on data on the distribution of income from *The Report on the Labour Force Survey* (1974 to 1998), excluding 1990 when data were collected as part of the population census, and *Profile of Labour Force of Singapore 1983–1994*. The *Profile* contains revised data to take account of the results available from the population census. Also, the inclusion of income tables by age, not available in the reports of the *Labour Force Survey*, renders the *Profile* invaluable.

In the labour force surveys, gross monthly income is defined as the total amount of income earned from employment in the preceding full calendar month. For employees, this includes wages and salaries, allowances, overtime, commission, tips, bonuses and the employees' contribution to the Central Provident Fund. For employers and own-account workers, it refers to the total receipt from sales and services performed less operating expenses. The surveys thus cover earnings or income from work and not property income. Since property income is directly related to wealth and since such income is likely to be more unevenly distributed, earnings distributions may understate the degree of overall income inequality.

For the years 1974 to 1981, data from the labour force surveys included unpaid family workers. As these workers were invariably in the lowest income class, their inclusion would inflate the computed level of income inequality. The number of unpaid family workers is excluded from the reported number of income recipients in the lowest income class.

Published data are given in income groups and by actual levels. For all, except the highest and lowest income classes, the class means were assumed to equal the arithmetic means of the upper and lower bounds of the classes. The highest and lowest income classes are open ended, and for the years covered in this essay, no average income data or gross income estimates are given. Thus there is the problem of estimating the class means for the lowest and the highest income classes.

For the years 1974–88, the mean for the lowest income group of 'below $200' was assumed to be $125. From 1989 onwards, the mean for the lowest income

class of 'below $400' was set at $260. The highest income class in the labour force survey reports for 1974 to 1976 was '$1,500 and above'. For 1977 to 1992, it was '$3,000 and above', while for 1993 and thereafter it was '$6,000 and above'. Two approaches were used for the estimation of the mean for the highest income class. One based on fitting a Pareto curve for the last two income classes. The other based on interpolation at the appropriate income groups of the data on assessed income distributions from the annual reports of the Inland Revenue Department. The estimates from the two methods were scrutinized to arrive at the means for the highest open-ended class.[5]

If it is assumed that interest, rental and dividend incomes are derived from physical and financial assets, then, to a large extent, the distribution of property income is derived from the distribution of wealth. In contrast, income from employment and business activity is derived from work. These earnings inequalities reveal the impact of the functioning of the labour market, related institutions and government policies.

(b) Other data

Data from the Central Provident Fund (CPF) Board and the Inland Revenue Authority are also used to supplement the findings based on the data from the labour force surveys. They refer respectively to the distribution of incomes of workers contributing CPF and taxpayers.

4. TRENDS IN GINI RATIOS

(a) Labour force Ginis

Income distribution in the labour force had mostly a Gini of 0.46 to 0.47 except for relatively low ratios (0.42 to 0.43) obtained during 1978–81 (Table 3). The CPF Gini has a tendency to stay around 0.43 to 0.44 with the exception of 1982, 1983 and 1987 when it was 0.46. The Gini ratios for taxpayers follow a generally rising trend showing an increase from about 0.43 in the 1970s to 0.48 in the 1990s.

Rising domestic labour cost – primarily reflecting real wage growth – and keen competition from other low-wage economies have eroded the comparative advantage that Singapore initially enjoyed in low-cost, labour-intensive exports. Given such developments, the government formally launched a programme in 1979 to restructure the economy away from labour-intensive and low value-added economic activities towards skill and technology-intensive, and higher value-added economic sectors.[6]

The restructuring also meant an effort to attract and adequately reward the talented employees at all levels, and more so, at the top end of the talent/income scale. Thus, the Gini ratios among the CPF contributors rose in 1982 and 1983 to

Table 3 Labour force Gini ratios, 1974–98

Year	*Income distribution within the*			
	Labour force	*CPF contributors*	*Resident taxpayers*	*All taxpayers*
1974	0.44	0.43	0.43	0.44
1975	0.45	0.43	0.42	0.43
1976	0.45	0.44	0.43	0.43
1977	0.46 (0.44)[a]	0.44	0.42	0.43
1978	0.42	0.43	0.41	0.42
1979	0.43	0.43	0.41	0.42
1980	0.43	0.43	0.44	0.44
1981	0.43	0.44	0.43	0.43
1982	0.46	0.46	0.44	0.45
1983	0.47	0.46	0.45	0.46
1984	0.47	0.44	0.45	0.46
1985	0.46	0.44	0.45	0.45
1986	0.46	0.44	0.45	0.45
1987	0.46	0.46	0.45	0.46
1988	0.46	0.43	0.46	0.47
1989	0.47	0.43	0.47	0.48
1990	0.46	0.43	n.a.	n.a.
1991	0.47	0.43	0.47	0.47
1992	0.47	0.43	0.47	0.48
1993	0.48	0.43	0.47	0.48
1994	0.47	0.43	0.39	0.42
1995	n.a.	0.43	0.39	0.40
1996	0.47	0.44	0.40	0.40
1997	0.47	0.44	0.39	0.39
1998	0.47	0.44	0.41	0.42

Source: Rao (1996) and updates.
Note:
a 0.44 is more plausible since the survey has apparently over-estimated the incomes in the upper-income groups.

0.46. In 1983, the 'restructuring' resulted in a 1 per cent decline in the number of CPF contributors, after a continuous increase since 1966. What is more, there were some 70.3 thousand contributors less in 1983 in the monthly wage-level groups up to $500 (as against a 'normal' decline of some 30 to 40 thousand).

The situation changed in 1984. The decline in contributors in the low-income groups became moderate, and the total number of contributors rose by 2.7 per cent. The Gini ratio declined in 1984 to 0.44 and remained at that level during the recession years 1985 and 1986. After a temporary rise to 0.46 in 1987, the Gini stabilized at 0.43. It would appear thus that there are some very stable income differentials among the workers/employees of Singapore and it is that stability that is reflected in the stable Gini for the CPF contributors.

While the CPF contributors have an income distribution characterized by a stable Gini ratio of 0.43 to 0.44, income distributions in the total labour force and among taxpayers portray different trends: namely, increasing from the 1970s Gini of about 0.43–0.44 to the post-1981 levels of 0.46–0.48. The overall expansion of employment opportunities during the 1970s resulted in a drop in the labour force Gini to levels of 0.42–0.43 during the late 1970s and early 1980s. Since then the Gini stabilized at around 0.47.

(b) Education and income inequality

Sizeable investments have been made for the development of human resources since the late 1960s. Major changes have taken place in the educational composition of the labour force. For instance, while half the labour force in 1966 comprised people with no education (or less than primary level), that proportion dropped to 19 per cent in 1989 and 14 per cent in 1998. In about a decade there will be practically none in the Singapore labour force with less than primary education. Those with a post-secondary education made up only less than 5 per cent of the labour force in 1966. In 1989 the proportion was 20.2 per cent and in 1998 it was 34 per cent.

Table 4 has the Gini ratios among the workforce by level of education. At secondary and post-secondary levels the Gini turns out to be the highest. It is quite low at the tertiary level. It is most plausible that the future labour force will have three levels of educational qualifications: secondary, post-secondary (but not tertiary) and tertiary, with the former two in large majority; these are the categories with relatively high Ginis. Structurally too, the economy tends to absorb more and more people in the service sector where income inequality tends to be relatively higher. Educational expansion, therefore, may not guarantee an eventual reduction in income inequality, even though it greatly assists in raising living standards and in improving the quality of life.

(c) Age and inequality

Paglin (1975) noted in his celebrated article that it is only natural for income to change in some systematic fashion with age and this fact should be taken into account in assessing income inequality. For instance, if all inequality is *only* due to differences in age, it has much less significance since every one in the workforce will have a chance to experience a rise in earnings along with growing age. In the context of Singapore, data on earnings by age are available for 1983–94 and, based on them, the estimates in Table 5 are presented.

The estimates in Table 5 have an interesting tale to tell. Even if one assumes a nearly invariant overall Gini of around 0.47 throughout the period, it is made of two distinct components with diverse trends and not stability. The age-Gini which portrays income inequality across age groups (assuming no inequality within each

Table 4 Gini ratios by level of education

Year	*Never attended school/ lower primary*	*Primary/ post-primary*	*Secondary*	*Post-secondary*	*Tertiary*	*Diploma*
1974	0.34	0.38	0.40	0.38	0.37	
1975	0.33	0.35	0.42	0.44	0.31	
1976	0.37	0.35	0.38	0.42	0.33	
1977	0.33	0.35	0.41	0.46	0.41	
1978	0.33	0.33	0.38	0.42	0.39	
1979	0.34	0.33	0.39	0.43	0.41	
1980	0.32	0.31	0.38	0.47	0.41	
1981	0.31	0.31	0.39	0.46	0.40	
1982	0.34	0.33	0.39	0.47	0.37	
1983	0.35	0.34	0.40	0.46	0.34	
1984	0.36	0.34	0.39	0.46	0.31	
1985	0.33	0.34	0.38	0.46	0.31	
1986	0.33	0.33	0.38	0.45	0.31	
1987	0.33	0.33	0.39	0.46	0.33	
1988	0.32	0.32	0.39	0.47	0.32	
1989	0.32	0.32	0.39	0.48	0.31	
1990	0.34	0.34	0.40	0.49	0.29	0.40
1992	0.35	0.35	0.40	0.49	0.27	0.41
1993	0.35	0.32	0.38	0.49	0.41	0.39
1994	0.34	0.33	0.38	0.49	0.41	0.38
1996	0.38	0.35	0.38	0.45	0.38	0.41
1997	0.37	0.35	0.36	0.45	0.37	0.40
1998	0.37	0.35	0.35	0.45	0.36	0.40

age group) decreasing over time and the P-Gini which is simply the difference between the overall Gini and the age-Gini, increasing over time.

The age premium, for the age group 45–54 over the age group 25–29, for instance, declined from around 60 per cent during 1983–89 to 50 per cent during 1991–94. Such were the changes behind the narrowing of the age-Gini. Despite this trend, the P-Gini steadily rose from less than 0.23 in 1983 to 0.27 in 1998 (Table 5). The movement away from seniority-based earnings helped to moderate the otherwise exploding income inequality. Indeed, in most jobs, since age and abilities may not be highly correlated, a flexi-wage system based on linking performance and rewards may in fact help bring about stability in the overall income distribution. In addition, as long as the system of rewards based on performance is transparent, frustrations too may be minimized especially since all are aware of how anyone can obtain the higher rewards.

A methodological problem with respect to the calculation of the Paglin Gini is the determination of the optimal size of the age group. There are other problems also with the P-Gini but a discussion of these is beyond the scope of this paper.

Table 5 Paglin Gini ratios

Year	*Gini*	*A-Gini*	*P-Gini*
1983	0.471	0.245	0.226
1984	0.467	0.245	0.222
1985	0.460	0.237	0.223
1986	0.455	0.216	0.239
1987	0.461	0.238	0.223
1988	0.460	0.239	0.221
1989	0.469	0.239	0.230
1991	0.468	0.224	0.244
1992	0.470	0.221	0.249
1993	0.478	0.270	0.208
1994	0.472	0.225	0.247
1996	0.477	0.209	0.268
1997	0.472	0.205	0.267
1998	0.475	0.208	0.267

5. THEIL DECOMPOSITIONS

Almost all of the previous research on income inequality in Singapore has been based on the Gini coefficients. The Gini is not easily decomposable. In contrast, the Theil index is readily decomposable.[7] Islam and Kirkpatrick (1986) analysed the distribution of income in Singapore for the period 1973–83 using the Theil-2 index.[8]

(a) Trends in overall income inequality

The labour force Theil indices for 1974–98 (Table 6), generally fall between 0.39 and 0.44. The value for 1977 (0.47), however, was completely out of line with the overall trend and replaced by 0.39 just as the Gini of 0.46 was replaced by 0.44. From Figure 1, it can be observed that the Theil index and the Gini ratio follow more or less the same pattern and appear to be devoid of a clear trend, upward or downward.

Ignoring minor changes in the Theil index, the following summary may be considered (Table 7). The Theil index brings out well the increase in the degree of income inequality in the period of economic restructuring: for the 1970s, the degree of income inequality was relatively low and it edged up in the early 1980s and has remained at a slightly lower level since.

Table 6 Theil index for Singapore, 1974–98

Year	*Theil index*	*Gini ratio*
1974	0.39 (0.38)	0.44
1975	0.42 (0.41)	0.45
1976	0.40 (0.38)	0.45
1978	0.38 (0.36)	0.42
1979	0.41 (0.40)	0.43
1980	0.42 (0.40)	0.43
1981	0.42 (0.40)	0.43
1982	0.45 (0.43)	0.46
1983	0.46 (0.44)	0.47
1984	0.45 (0.44)	0.47
1985	0.43 (0.43)	0.46
1986	0.42 (0.41)	0.46
1987	0.42 (0.42)	0.46
1988	0.43 (0.42)	0.46
1989	0.43 (0.43)	0.47
1991	0.42 (0.41)	0.47
1992	0.42 (0.41)	0.47
1993	0.45 (0.45)	0.48
1994	0.44 (0.44)	0.47
1996	0.43 (0.43)	0.47
1997	0.42 (0.42)	0.47
1998	0.42 (0.42)	0.47

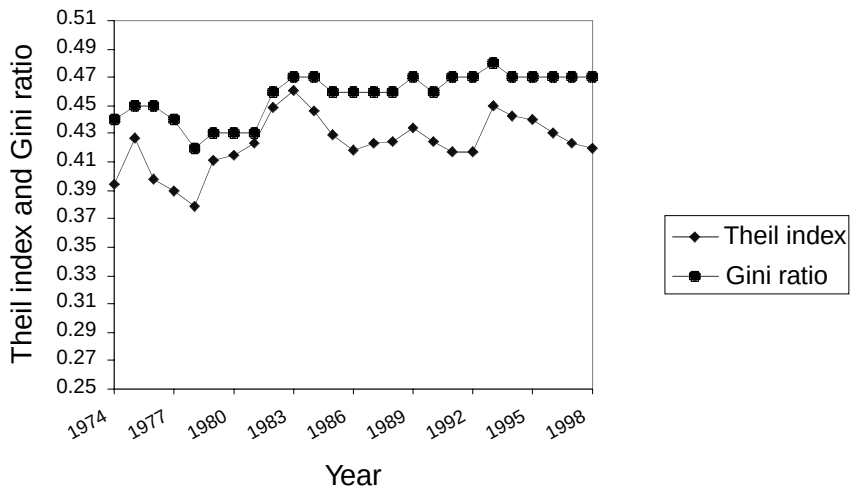

Figure 1 Overall trends of the Theil index and the Gini ratio for Singapore

Table 7 Summary of the Theil index

Time period	*Theil index*
1974–81	0.38–0.42 (0.38–0.41)
1982–84	0.45 (0.44)
1984–98	0.42–0.45 (0.42–0.45)

(b) Inequality and age

From 1983 to 1998, the proportion of the labour force in the 15–25 age group declined by about 16 per cent, while the proportion of those over 40 years of age rose almost by 9 per cent. There was a drastic drop in the labour force participation rates for the under-20 and 20–25 age groups. This was the result of relatively more individuals pursuing tertiary education. The participation rate of those beyond 60 years of age also declined. It must be that either the elderly had become more affluent and could afford to leave the workforce, or there was a bias against employing members of the aged population.

The inter-age income inequality pattern in Singapore from 1983 to 1998 can be divided into three phases (Table 8). Between 1983 and 1986, there was a decline in inter-age inequality from 0.058 to 0.061 (while, during 1984 inter-age inequality increased to 0.069). From 1986 to 1989, inter-age inequality was constant at 0.058. It dropped to 0.051 in 1990 to 1992, jumped to 0.082 during 1993 and stayed mostly around 0.040 thereafter. On the other hand, intra-age inequality fluctuated within a narrow range of 0.357 and 0.378, while the only exception is 1983, when the intra-age inequality is 0.623. Since inter-age inequality was relatively stable, the shifts in intra-age inequality resulted in fluctuations in the overall Theil index.

It is not difficult to speculate on the reasons for the reduction in the inter-age inequality in three blocks. The Theil index in this case is based on the disparities in the mean incomes among the different age groups. A narrowing of that disparity means erosion of the age premium in earnings. This may be the result of an explicit/implicit flexi-wage system. In such a system, earnings are based on results and results may not be correlated to 'experience'. That is, a partial demise of the 'pay-according-to-seniority' system has occurred. The decline in inter-age inequality was also due to relatively more of the better-qualified workers being found in the younger age groups. Since remuneration rises with the educational attainment of the worker, this boosts the mean wages of the younger age groups relative to the older age groups.

Table 8 Decomposition of Theil index by age

Year	*Theil index*	*Inter-group inequality*	*Intra-group inequality*	*Inter-group contribution (%)*	*Intra-group contribution (%)*
1983	0.447	0.061	0.386	13.67	86.33
	(0.440)	(0.073)	(0.374)	(15.00)	(85.00)
1984	0.446	0.069	0.375	15.58	84.42
	(0.440)	(0.085)	(0.361)	(17.95)	(82.05)
1985	0.429	0.061	0.367	14.23	85.77
	(0.426)	(0.075)	(0.351)	(17.61)	(82.39)
1986	0.418	0.058	0.357	13.92	86.08
	(0.415)	(0.071)	(0.344)	(17.11)	(82.89)
1987	0.423	0.058	0.363	13.69	86.31
	(0.420)	(0.071)	(0.349)	(16.90)	(83.10)
1988	0.425	0.058	0.365	13.71	86.29
	(0.420)	(0.076)	(0.349)	(16.90)	(83.10)
1989	0.434	0.058	0.376	13.27	86.73
	(0.428)	(0.062)	(0.366)	(14.49)	(85.51)
1991	0.417	0.051	0.366	12.27	87.73
	(0.415)	(0.055)	(0.360)	(13.25)	(86.75)
1992	0.417	0.051	0.367	12.14	87.86
	(0.414)	(0.054)	(0.360)	(13.04)	(86.96)
1993	0.450	0.052	0.398	11.64	88.44
	(0.442)	(0.062)	(0.385)	(12.90)	(87.10)
1994	0.443	0.048	0.395	10.88	89.12
	(0.440)	(0.045)	(0.384)	(12.73)	(87.27)
1996	0.430	0.039	0.391	9.08	90.92
	(0.426)	(0.041)	(0.385)	(9.63)	(90.37)
1997	0.423	0.039	0.384	9.26	90.74
	(0.419)	(0.044)	(0.378)	(9.79)	(90.21)
1998	0.420	0.042	0.378	10.07	89.93
	(0.415)	(0.050)	(0.371)	(10.61)	(89.39)

(c) Inequality and education

Between 1974 and 1998, the educational level of the labour force shifted upwards due to an increasing number of better-educated entrants. The proportion of the workforce with below primary education decreased from 40.0 per cent in 1974 to 14.3 per cent in 1998. On the other hand, the proportion of the labour force with secondary and higher education doubled from 28.7 per cent to 62.5 per cent in the same period.

Decomposition of the Theil index by level of educational attainment (Table 9), shows that while intra-group inequality levels were relatively stable at around a Theil index value of 0.285, there was an overall increase in inter-group inequality levels between 1974 and 1983, with some moderation thereafter. Inter-group

Table 9 Decomposition of Theil index by educational attainment

Year	*Theil index*	*Inter-group inequality*	*Intra-group inequality*	*Inter-group contribution (%)*	*Intra-group contribution (%)*
1974	0.394	0.109	0.286	27.66	72.59
	(0.381)	(0.112)	(0.269)	(29.47)	(70.53)
1975	0.427	0.136	0.289	31.85	67.68
	(0.411)	(0.145)	(0.265)	(35.34)	(64.66)
1976	0.398	0.116	0.282	29.15	70.85
	(0.381)	(0.123)	(0.258)	(33.41)	(67.59)
1978	0.379	0.108	0.271	28.50	71.50
	(0.362)	(0.110)	(0.252)	(30.39)	(69.61)
1979	0.411	0.124	0.288	30.17	70.07
	(0.400)	(0.132)	(0.267)	(33.07)	(66.93)
1980	0.415	0.135	0.280	32.53	67.47
	(0.399)	(0.139)	(0.259)	(35.01)	(64.99)
1981	0.423	0.137	0.286	32.39	67.61
	(0.402)	(0.141)	(0.261)	(34.96)	(65.04)
1982	0.449	0.158	0.291	35.19	64.81
	(0.431)	(0.160)	(0.270)	(38.29)	(62.70)
1983	0.447	0.164	0.282	36.88	63.12
	(0.440)	(0.180)	(0.260)	(41.95)	(59.05)
1984	0.446	0.168	0.278	37.67	62.33
	(0.440)	(0.181)	(0.259)	(42.08)	(58.92)
1985	0.429	0.164	0.266	38.23	62.00
	(0.426)	(0.179)	(0.247)	(43.06)	(57.94)
1986	0.418	0.159	0.259	38.04	61.96
	(0.415)	(0.178)	(0.237)	(43.00)	(57.00)
1987	0.423	0.152	0.270	35.93	63.83
	(0.420)	(0.166)	(0.254)	(39.43)	(60.57)
1988	0.425	0.148	0.277	34.82	65.18
	(0.420)	(0.155)	(0.265)	(37.95)	(63.05)
1989	0.434	0.157	0.277	36.18	63.82
	(0.428)	(0.168)	(0.260)	(39.31)	(60.69)
1991	0.417	0.140	0.277	33.57	66.43
	(0.415)	(0.150)	(0.265)	(36.00)	(64.00)
1992	0.417	0.142	0.274	34.22	65.78
	(0.414)	(0.153)	(0.261)	(38.01)	(62.99)
1993	0.450	0.149	0.301	33.63	66.37
	(0.447)	(0.165)	(0.281)	(36.99)	(63.01)
1994	0.443	0.150	0.293	33.72	66.28
	(0.440)	(0.163)	(0.277)	(37.04)	(62.96)
1996	0.430	0.157	0.273	36.64	63.36
	(0.426)	(0.166)	(0.260)	(39.00)	(61.00)
1997	0.423	0.161	0.262	38.10	61.90
	(0.419)	(0.172)	(0.247)	(42.07)	(58.93)
1998	0.420	0.160	0.260	38.19	61.81
	(0.415)	(0.171)	(0.244)	(42.13)	(58.87)

inequality levels were relatively low in the mid to late 1970s (around 0.11 as measured by the Theil index), crept up in the early 1980s, reaching a peak value of 0.170 in 1983, and declined to 0.149 in 1994 and increased again to 0.160 during 1998.

This pattern was due to the post-1979 shift away from the low value-added activities and towards the higher value-added skill and technology-intensive sectors. This restructuring of the economy shifted educational wage differentials in favour of professional and other skilled workers, resulting in higher inequality levels between educational groups during the early 1980s. However, the upward shift in the educational composition of the workforce, together with the recession in 1985–86, brought these skill premiums down in the mid-1980s.

(d) Inequality and occupation

In 1974, 'production and related workers', together with 'sales and related workers' and clerical workers, made up the three largest groups. However, economic restructuring in the early 1980s boosted the demand for professionals, managers and technicians. This increase was also due to the expansion of the financial and business services as well as the commerce sector. By 1998, 'professionals and managers' and 'technicians and related professionals' had overtaken sales workers and clerical workers to become two of the three largest groups. Although production and related workers remained the largest group throughout the period from 1974 to 1998, their employment share declined in tandem with that of the manufacturing sector.

Inter-occupational inequality levels (Table 10) showed an upward trend between 1974 and 1998, excluding a slight dip during the 1985 recession. Between 1974 and 1998, inter-occupational inequality, as measured by the Theil index, almost doubled from 0.106 to 0.194. Intra-group inequality, however, had a downward trend. It fell by almost a third from 0.288 to 0.226. This is in sharp contrast to trends in intra-educational activity, thus illustrating that the education–occupation linkage is not clear-cut.

The rise in inter-occupational inequality can be attributed to a widening wage gap between the various occupational groups. The shortage of skilled labour has allowed the two most highly paid occupations – professional, and administrative and managerial – to improve their position relative to the other groups. On the other hand, the presence of cheap foreign workers has resulted in the relative stagnation of wages for the workers in unskilled and semi-skilled occupations.

The significant reduction in intra-occupational inequality is an across-the-board reduction as indicated in Table 11. This implies that if inter-occupational disparities had been kept in check, the overall level of income inequality would have gone down. The inter-occupational inequality increase was because of the immigration policy referred to earlier. Immigration policy is not governed by income inequality considerations alone. Preserving the international

Table 10 Decomposition of Theil index by occupation

Year	*Theil index*	*Inter-group inequality*	*Intra-group inequality*	*Inter-group contribution (%)*	*Intra-group contribution (%)*
1974	0.394	0.106	0.288	26.90	73.10
	(0.381)	(0.116)	(0.265)	(30.46)	(69.54)
1975	0.427	0.113	0.314	26.46	73.54
	(0.411)	(0.127)	(0.283)	(31.00)	(69.00)
1976	0.398	0.108	0.290	27.14	72.86
	(0.381)	(0.121)	(0.260)	(31.76)	(68.24)
1977	0.379	0.110	0.268	29.36	70.85
	(0.362)	(0.116)	(0.246)	(32.08)	(67.92)
1978	0.411	0.114	0.296	27.97	72.03
	(0.395)	(0.126)	(0.269)	(31.85)	(68.15)
1979	0.415	0.118	0.293	28.71	71.29
	(0.399)	(0.127)	(0.271)	(32.00)	(68.00)
1980	0.423	0.143	0.280	33.73	66.27
	(0.402)	(0.144)	(0.257)	(35.87)	(64.13)
1981	0.449	0.155	0.268	36.64	63.36
	(0.431)	(0.168)	(0.263)	(39.01)	(60.99)
1982	0.447	0.171	0.277	38.08	61.69
	(0.440)	(0.177)	(0.262)	(40.28)	(59.72)
1983	0.446	0.191	0.270	41.43	58.57
	(0.440)	(0.194)	(0.246)	(42.89)	(57.11)
1984	0.429	0.190	0.256	42.60	57.40
	(0.426)	(0.188)	(0.238)	(44.07)	(55.93)
1985	0.418	0.177	0.252	41.26	58.74
	(0.415)	(0.180)	(0.235)	(43.32)	(56.68)
1986	0.423	0.173	0.245	41.39	58.61
	(0.420)	(0.183)	(0.237)	(43.48)	(56.52)
1987	0.425	0.174	0.249	41.13	58.87
	(0.420)	(0.182)	(0.237)	(43.51)	(56.49)
1988	0.434	0.174	0.251	40.94	59.06
	(0.428)	(0.184)	(0.244)	(42.99)	(57.01)
1989	0.424	0.189	0.245	43.55	56.45
	(0.421)	(0.190)	(0.231)	(45.13)	(54.87)
1991	0.417	0.210	0.208	50.36	49.88
	(0.415)	(0.212)	(0.203)	(51.09)	(48.91)
1992	0.417	0.216	0.201	51.80	48.20
	(0.414)	(0.221)	(0.193)	(53.42)	(46.58)
1993	0.450	0.218	0.232	48.44	51.56
	(0.447)	(0.225)	(0.222)	(50.37)	(49.73)
1994	0.443	0.216	0.228	48.76	51.47
	(0.440)	(0.224)	(0.216)	(51.01)	(48.99)
1996	0.430	0.197	0.233	45.81	54.19
	(0.426)	(0.204)	(0.222)	(47.91)	(52.09)
1997	0.423	0.189	0.234	44.68	55.32
	(0.419)	(0.195)	(0.224)	(46.48)	(53.52)
1998	0.420	0.190	0.230	46.19	61.81
	(0.415)	(0.195)	(0.220)	(46.98)	(53.02)

competitiveness may well mean that workers from both the upper and lower ends of the income scale must be attracted to Singapore. The implication is loud and clear. International competitiveness, rapid economic growth and the growing riches of Singapore may not be always compatible with the lowering of income inequality.

6. CONCLUDING OBSERVATIONS

In this essay we attempted to provide an analytical description of the trend in earnings inequality in Singapore. In terms of absolute inequality Singapore is ahead of the United States and United Kingdom, countries with the highest degree of inequality among the high-income economies. This was a result of (a) attracting talented and skilled workers by rewarding them handsomely in order to raise productivity and (b) at the same time allowing firms and households to employ guest workers at the lower end to contain costs.

We see that educational expansion may not lower the level of earnings inequality. An important finding was that a movement from a seniority-based wage scheme has in fact helped to moderate the level of income inequality.

The decomposition analysis has brought out some interesting facts. While it is normal to expect income disparities across age groups and educational groups, they have not been major contributors to inequality. Inter-age and inter-educational income disparities respectively contributed some 12 per cent and 34 per cent to the overall inequality (Table 12). Among all the inter-group disparities, it is inter-occupational disparities that have the highest weight in the overall inequality.

Table 11 Theil index by occupation, 1974, 1988 and 1998

	1974		*1988*		*1998*	
	Income share	*Theil index*	*Income share*	*Theil index*	*Income share*	*Theil index*
Professional, technical and related workers	0.200	0.347 (0.335)	0.235	0.301 (0.292)	0.389	0.245 (0.239)
Legislators, senior officials and managers	0.083	0.241 (0.238)	0.207	0.221 (0.210)	0.289	0.238 (0.222)
Clerical and related workers	0.168	0.203 (0.191)	0.119	0.119 (0.114)	0.100	0.099 (0.095)
Service workers, shop and market sales workers	0.216	0.362 (0.349)	0.187	0.360 (0.352)	0.069	0.191 (0.183)
Production workers, equipment operators and labourers	0.272	0.219 (0.201)	0.221	0.134 (0.130)	0.136	0.185 (0.180)
Others	0.060	0.367 (0.308)	0.031	0.783 (0.769)	0.016	0.880 (0.871)

Table 12 Average inter-group and intra-group contribution to total inequality (1974–98)

Labour force characteristic	*Average contribution (%)*	
	Inter-group inequality	*Intra-group inequality*
Occupation	39.26	60.74
	(41.60)	(58.40)
Educational attainment	34.13	65.87
	(37.63)	(64.36)
Age[a]	12.27	87.73
	(14.13)	(85.87)

Note:
a For age the contribution is calculated for the year 1983–98.

As explained earlier, this has been due to the impact of selective immigration policies and related factors.

This essay would remain incomplete if mention is not made of some of the measures adopted in Singapore to manage income inequality. There are, for instance, different forms of subsidies, which are not included in the earnings distributions. Most important of these subsidies are in the public housing sector and higher education. In the former, they arise in the sale of government flats at subsidized prices to the poor and housing grants of S$40,000 to S$50,000 to the citizens. In the latter too, the subsidies could be S$40,000 or more per annum per student. Since all these are block subsidies regardless of income level of the recipients, naturally they contribute relatively greatly to the overall living standard of the low-income classes. There are others: medical and health subsidies, public assistance for the needy, preferential share allotments to citizens in privatized enterprises and so on. If all these are considered the level of earnings inequality will be lower than what has been shown in this essay.

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NOTES

1 A different version of this essay was originally prepared at the request of the late Professor Harry Oshima for a book he intended to edit. The essay is dedicated to him in remembrance.
2 See, for example, Rao and Ramakrishnan (1980), Rao (1990, 1996), and Tan (1998).

3 See Sahota (1978) for a review of literature on the determinants of personal income distribution.
4 Electronics accounts for 12 per cent of Singapore's GDP, consisting mainly of exports of disk drives, semiconductors and computer parts to the US and Europe.
5 See Rao and Ramakrishnan (1980) for a full explanation of the methods and Rao (1990, 1996) for estimated means.
6 See the essays in Lim and Associates (1988) for elaboration on this point from various standpoints.
7 Cheong (2001) using a methodology of decomposition with a linear transformation of the Gini explained the rising trend of Korean income inequality. Akita *et al.* (1999) used Theil decomposition analysis to explain the Indonesian trend in inequality. Akita (2000) provides a list of various Theil decomposition analysis used in East Asian economy.
8 Also called L-index. We have used both the Theil-1 (based on income share) and Theil-2 (based on population share) to check the trend. As there is no significant difference in trend observed so far as these two Theil measures are concerned, the analysis had been done with Theil-1 (for simplicity we call it the Theil measure in this paper); however, results of Theil-2 (that is, L-index) are provided in parentheses in each table.

REFERENCES

Akita, T. (2000) 'Decomposing regional income inequality in China and Indonesia using two-stage nested Theil decomposition method', paper presented at 7th Convention of the East Asian Economic Association, Singapore, 17–18 November.

Akita, T., Lukman, R. A. and Yamada, Y. (1999) 'Inequality in the distribution of household expenditure in Indonesia: a Theil decomposition analysis', *The Developing Economies* 37(2): 197–221.

Cheong, K. S. (2001) 'Economic crisis and income inequality in Korea', *Asian Economic Journal* 15(1): 39–60.

Islam, I. and Kirkpatrick, C. (1986) 'Export-led development, labour-market conditions and the distribution of income: the case of Singapore', *Cambridge Journal of Economics* 10: 113–27.

Lim, Chong Yah and Associates (1988) *Policy Options for the Singapore Economy*, Singapore: McGraw-Hill.

Paglin, M. (1975) 'The measurement and trend of inequality: a basic revision', *American Economic Review* 65 (September): 598–609.

Rao, V. V. Bhanoji (1990) 'Income distribution in Singapore: trends and issues', *Singapore Economic Review* (April): 143–60.

Rao, V. V. Bhanoji (1996) 'Income inequality in Singapore: facts and policies', in Lim Chong Yah (ed.) *Economic Policy Management in Singapore*, Singapore: Addison-Wesley, pp. 383–96.

Rao, V. V. Bhanoji, and Lee, C. (1995) 'Sources of growth in the Singapore economy and its manufacturing and service sector', *Singapore Economic Review* (April): 83–115.

Rao, V. V. Bhanoji and Ramakrishnan, M. K. (1980) *Income Inequality in Singapore*, Singapore: Singapore University Press.

Sahota, G. (1978) 'Theories of personal income distribution: a survey', *Journal of Economic Literature* 16(1) (March): 1–55.

Tan, F. (1998) 'Income inequality trends in Singapore', unpublished Honours thesis, Department of Economics, National University of Singapore.