Impact of Industrial Structural Changes on Income Inequality Trends in Sri Lanka

H. D. Karunaratne[1]

Introduction

The shape of the income distribution in a country is subject to change with structural changes in output and employment. Since the mid 1950s, pioneering work done by Arthur Lewis, Ranis, Fei and others, has theoretically demonstrated this phenomenon by emphasizing the dualistic features in developing countries. According to their models, a rising share of the modern sector (mainly the manufacturing industry) in terms of output and employment makes income distribution more unequal in the early stages of economic development. That is because before the Lewisian turning point occurs, labour income remains unchanged while profit income rises in the modern sector. Therefore, income distribution in developing countries can theoretically have a long term equitable shape only after the absorption of surplus labour working in the backward agriculture.

On the other hand, following Kuznets (1955), Oshima (1962), Mizoguchi (1985), many studies have empirically shown that the rising income inequality in the early stage of economic development is due to changes in employment and output structure, and is influenced by factors such as population growth rate, savings and investment rates, education expansion, technological progress, migration, urbanization, etc. Therefore, some studies have suggested government intervention as a way to generate equitable growth in developing countries. For example, Fei et al. (1978) have empirically shown that the

1. Senior Lecturer, Faculty of Management & Finance, University of Colombo

rural agricultural-oriented growth in Taiwan led to the neutralization of the Kuznets effect in the early stage of rapid economic growth. As a result, Taiwan could achieve both equity and growth objectives simultaneously. Furthermore, Ikemoto (1991, p. 14-19), argues that the rural development policies and the minimum wage laws were favorable for the falling income inequality in Thailand in the early 1970s.

In addition, following Sen (1981), many studies have shown Sri Lanka as a country that achieved low income inequality and high social welfare indices in the early 1970s. The strategy used by Sri Lanka differed from other Asian countries in putting more emphasis on welfare improvements rather than balancing growth and equity objectives. According to others, the equity and welfare oriented development policies of Sri Lanka after the independence were greatly influenced by the great depression, the malaria epidemic, World War II, the Korean War, Therawada Buddhism, British welfarism, the satisfaction of the requirements of Indian government regarding living standards of Indian immigrant workers in estate plantation agriculture etc. (see Bruton (1992), and Oshima (1987), for analytical presentations on these causes). However, due to the slow economic growth, growing labor force participation, high unemployment, and balance of payment constraints, in the mid 1970s the country could not continue with these policies. Therefore, it introduced growth-oriented liberalized economic policies in 1977. Although Sri Lanka could double its output growth by implementing these policies in the short term, inequality in the distribution of income increased during the 1973-1987 period. However, according to the latest (1996/97, issued in 1999) Report on Consumer Finances

and Socio-Economic Survey, both equity and growth performance are in a better position in the 1990s. One of the important factors behind the declining income inequality trend is the change in industrial structure in terms of output and employment. However, to the best of the authorôs knowledge, there is no single empirical work regarding these issues in Sri Lanka. Therefore, this paper, attempts to empirically relate industrial structural changes to the income inequality trends in Sri Lanka during the last four decades.

This paper is organized into seven sections. After the introduction, the methods of analysis are explained in section I. Section II describes data, definitions and the limitations of the paper. Section III highlights overall trends in structural changes of output and employment. Section IV outlines the overall trends of income inequality in Sri Lanka. Section V decomposes and disaggregates total income inequality by industries. The main findings are summarized in section VI, the last section.

I. The Method of Analysis

This paper utilizes two Theilôs entropy measures (T and L) as the group decomposable income inequality measures. They are defined as follows:[2]

$$T = \sum_i \sum_j \left(\frac{y_{ij}}{Y}\right) \log \left(\frac{y_{ij}/Y}{n_{ij}/N}\right) = \sum_i \left(\frac{Y_i}{Y}\right) T_i + \sum_i \left(\frac{Y_i}{Y}\right) \log \left(\frac{Y_i/Y}{N_i/N}\right) = T_w + T_B \quad (1)$$

$$L = \sum_i \sum_j \left(\frac{n_{ij}}{N}\right) \log \left(\frac{n_{ij}/N}{y_{ij}/Y}\right) = \sum_i \left(\frac{N_i}{N}\right) L_i + \sum_i \left(\frac{N_i}{N}\right) \log \left(\frac{N_i/N}{Y_i/Y}\right) = L_w + L_B \quad (2)$$

where, $Y_i = \sum_j y_{ij}$, $N_i = \sum_j n_{ij}$, $Y = \sum_i \sum_j y_{ij}$, $N = \sum_i \sum_j n_{ij}$, i = income class, j = industry,

y_{ij} = income of the j-th industry in i-th income class, Y= Total Income,

n_{ij} = number of the income receivers of j-th industry and i-th income class,

N = total number of income receivers,

T_i and L_i refer to the respective inequality measures for j-th industry

T_w and L_w = within-group income inequality component

T_B and L_B = between-group income inequality component

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2. For details see Anand, 1983, p. 302-354.

The T index is sensitive to upper income categories while the L index is sensitive to lower income categories. In addition, the Gini coefficient is utilized as a source decomposable income inequality measure. It is defined as follows:

$$G = \sum_{i=1}^{n-1} (N_i / N)(Y_{i+1} / Y) - \sum_{i=1}^{n-1} (N_{i+1} / N)(Y_i / Y)$$

(3)

where G = Gini coefficient, n = number of income classes, Y_i = cumulative income,

Y= total income, N_i = cumulative number of income receivers,

N= total number of income receivers,

so that, N_i /N= cumulative proportion of the number of income receivers,

Y_i / Y= cumulative proportion of income.

The Lorenz curve can be obtained by taking N_i /N data as the horizontal axis and Y_i /Y data as the vertical axis. As demonstrated in Annex I, to calculate the Gini coefficient from various income sources, equation (3) can be extended to the following equation.

$$G = \sum_{k=1}^{m} W_k C_k \qquad (4)$$

where, G = total income based Gini coefficient, m = number of income sources ,

W_k = share of the each income source in total income,

C_k = concentration coefficient of each income source.

In order to calculate the Gini coefficient, the income data must be in ascending order. However, when concentration coefficients for source incomes are calculated, income data must be arranged in the ascending order of total income and use the same formula for the Gini coefficient as given in equation (4). In addition, it is possible to derive the inter-temporal change of the Gini coefficient by applying time subscripts ‘0’ (denotes initial stage values) and ‘t’ (denotes later stage values) for equation (4) as follows:

$$\Delta G = G_t - G_o = \sum_{k=1}^{m} W_{k_0}(C_{k_t} - C_{k_0}) + \sum_{k=1}^{m} C_{k_0}(W_{k_t} - W_{k_0}) + \sum_{k=1}^{m}(W_{k_t} - W_{k_0})(C_{k_t} - C_{k_0}) \quad (5)$$

The three terms of the right hand side in equation (5) can be interpreted as follows. The first term is the contribution of the change in intra-industry inequality to the change in the overall degree of inequality. The second term is the contribution of industrial share (structural) change to the change in the degree of income inequality. The third term is the interaction between structural change and change in intra-industrial inequalities.

Furthermore, following Podder (1993), it is possible to calculate as follows, the elasticity of the Gini coefficient with respect to each industry assuming intra-industry inequalities are constant. See Annex II for the derivation of equation (6) from equation (5).

$$\eta_k = \frac{1}{G}\left[W_k(C_k - G)\right] \quad (6)$$

The advantage of formula (6) is that the sign of η_κ indicates either the positive or negative effect of the k-th industry on the total income inequality.

II. Data, Definitions and Limitations

The data used in this paper have been obtained from the following sources:

(1) *Report on Consumer Finances and Socio-Economic Survey (RCFSES)* published by the Central Bank of Sri Lanka. Surveys were conducted in the years 1953, 1963, 1973, 1978/79, 1981/82, 1986/87, and 1996/97.

(2) *Quarterly Report of the Sri Lanka Labor Force Survey, (SLES)* published by the Department of Census and Statistics, Ministry of Policy Planning and Implementation, Sri Lanka since the first quarter of the year 1990.

(3) *Annual Reports* of the Central Bank of Sri Lanka, 1963-1998.

The sample size was 8,880 households in the 1996/97 *RCFSES* and 20,000 households in the *SLES.* Sri Lanka has 9 provinces, which include 24 administrative districts. Surveys were conducted in all districts and provinces in 1953, 1963, 1973, 1978/79 and 1981/82. However, since 1983 they have not been conducted in the Northern and Eastern provinces due to the civil war. In 1988, these two provinces represented 14.8 percent of the total population and 28 percent of the land area of Sri Lanka.

Sri Lanka has three economic sectors, namely, urban, rural and estates. The urban sector consists of the people in the municipal, urban and town council areas. Manufacturing and services are the main economic activities in the urban sector. The estate sector consists of the people in tea, rubber and coconut estates with 20 or more acres and with 10 or more resident workers.

Plantation agriculture is the main economic activity in the estate sector. The rural sector consists of the people not included in the urban or the estate sectors. Traditional agriculture (which produces rice, grain, vegetables and fruit, etc.,) is the main economic activity in the rural sector. In 1997 urban, rural and estate sectors represented 22, 72 and 6 percent of the total population respectively.

This paper uses income receivers as the income unit to analyze income distribution. This is because family or individual based data were not available in the above mentioned surveys to decompose total income by industry. In the 1996/97 *RCFSES*, an income receiver is defined as ñAn individual who is in receipt of an income of any sort, preceding the date of interviewò. The total income of the economy is considered as the sum of the incomes of income receivers in six main industries, namely income from agriculture, mining, construction, manufacturing, services and others. This other category includes industries not defined under the above five categories and income receivers without employment (including transfer incomes).

Annual employment statistics are not available for the 1963-1990 period in Sri Lanka. However, *RCFSES* provides employment and unemployment data for the year 1963, 1973, 1978/79, 1981/82, 1986/87, 1996/97. In addition, starting from 1990, *SLES* provides a comprehensive annual data set on employment and unemployment in Sri Lanka.

III. Structural Changes in Employment and Output in Sri Lanka,1963-1997

In this section, we investigate the structural changes in employment and output in Sri Lanka in several dimensions. Table 1 summarizes the industrial composition of employment and

output during the 1963-2002 period. It is possible to identify several features of the allocation of labor and income distribution trends by using the statistics given in Table 1. First, even though the agricultural production share in the GDP fell considerably, more than half of the total employment was contributed by agriculture until the 1980s. For example, in order to receive 26 percent of the GDP, agriculture utilized 50 percent of total employment in 1982. This means that the majority of people received only a small part of the GDP and that the minority engaged in other industries received a much larger share of the GDP. In particular, one third of the people engaged in services received nearly half of the total output. In other words, the labor productivity in agriculture was much lower than that in the services. The labor productivity gap between agriculture and other industries has been widening since the 1960s. Since the mining industry is mainly based on gem search, its productivity shows the highest fluctuation during the whole period. However, labor productivity in manufacturing and service industries has fluctuated less and grown steadily since the mid 1980s.

Table 1

The second feature is the high service industry share in terms of both GDP and employment. On the one hand, relatively expanded services such as wholesale, retail trade, banking, insurance, real estate, transport, storage and communication have provided a significant number of employment opportunities since the late 1970s. On the other hand, this is a reflection of the low performance of other industries. The third feature is the very slow employment expansion and output increase in the manufacturing industry. The GDP and employment share of the manufacturing industry has increased only by 6 percent and 6.5 percent respectively during the

past 34 years. This speed was not sufficient to absorb surplus labor from rural agriculture. However, the manufacturing sector growth rate greatly influenced the growth in total output in the 1990s. Even though the agricultural sector growth rate has fluctuated significantly, total output growth could remain at over 5 percent due to the high growth in the manufacturing industry since the late 1980s. Therefore, increases in labor utilization in the manufacturing industry have led to increased output and reduced income inequality in recent years. This is the phenomenon observed by many income distribution analyses in Japan and East Asian countries during the past four decades (see Mizoguchi, 1985).

In order to understand the recent trends in inequality of allocation of labor, it is also important to investigate changes in occupation and employment status structure. As far as occupation is concerned, inequality in allocation of labor increased among professionals, machinery workers and service workers in this period. In other words, employees in these industries were concentrated in the urban sector during 1990-1997 periods in Sri Lanka. Since the Gini coefficient for employees of these occupational groups increased, it is possible to accept this concentration as one of the important factors behind the rising income inequality in the urban sector during the past two decades.

The allocation of labor by employment status is also an important determinant of income inequality. Normally, the share of employees increases while that of self-employed, unpaid family workers and the unemployed decrease during rapid economic expansion. The employees share in total employment was 29 percent in 1963 and 58 percent in 1997. However, the unpaid family workers share remained at 8 percent while the self-employed share increased from 28 percent to

31 percent during the 1963-1997 periods. One of the main reasons behind the increase in the share of self-employee was the introduction of liberalization, privatization, and deregulation programs in 1977. Under these policy changes, employment opportunities in small and medium-size private, services-based industries expanded in comparison to large state-owned industries.

IV. The Overall Trends in Income Inequality in Sri Lanka, 1963-1997

Some income inequality measurements for the past five decades are presented in Table 2. By using various methods, the Gini coefficient is estimated for income receivers, spending units (family) and individuals. As shown in Figure 1, the inequality trend for income receivers is absolutely high in comparison to the other two units. However, the behavior of the relative inequality trend is almost identical in the three income units.

Table 2

Figure 1

The one month mean income of an income receiver in 1953 was Rs. 107 as compared with Rs. 617 in 1978. This 477 percent increase in the mean income in the 25-year period (before the introduction of liberalized economic policies) represents a yearly increase of 19 percent. When the annual increase of 3.3 percent in prices between 1953 and 1978 as indicated by the Colombo Consumersô Price Index is taken into consideration, the rise in real income is an annual 15.7 percent during this period. In contrast, during the last 20 years, income receivers' mean income increased annually by 42 percent (1978-1997 period), while the annual inflation rate was recorded as 12.5 percent. In other words, income receiversô real income increased by more than 30 percent

per year, after the introduction of liberalized economic policies. However, according to information given in Table 2 and figure 1, it is possible to identify three phases of income inequality in Sri Lanka during the 1963-1997 period.

The first phase is one of declining income inequality during the 1963-1973 period, is contrary to the Kuznets (1955) prediction. The income share of the low-income group increased while that of the high-income group decreased. The income share of the bottom 40 percent of income receivers increased from 12 to 15 percent while that of the top 20 percent declined by 10 percent. In this period, the Gini coefficient declined from 0.51 to 0.41 (or by 16 percent) at the national level, 0.54 to 0.40 in the urban sector, and 0.46 to 0.37 in the rural sector. All these indices indicate declining income inequality in the 1963-1973 period. Many studies have identified government intervention as the main reason behind the reduction of inequality in this period. High government subsidies for food, and the expansion of free education and health facilities were the main causes that generated equitable income distribution prior to 1973. Economic policy was based on the objectives of import substitution and improvement in basic needs in the early 1970s. In this period, river-based agricultural development projects were implemented by the government to improve rural agricultural production. Furthermore, export-oriented estate plantation agriculture (production of tea, rubber and coconut) was heavily taxed to recover the high cost of social expenditures in Sri Lanka. As a result, a part of the income of the high-income receivers was transferred to the low-income receivers, while the government was directly supplying basic needs (e.g., education and health) to all income groups. In addition, income inequality trends in rural and urban sectors behaved similarly due to negligible rural-urban migration in this period.

However, estate sector income inequality was increasing due to the considerable increases in profit income in plantation agriculture in this period.

The second phase is the increase in income inequality during the 1973-1987 period. The Gini coefficient increased by 21 percent at the national level, 25 percent for the urban sector and 26 percent for the rural sector income receivers. The income share of the lowest 20 percent of income receivers declined from 4.97 to 3.53 percent while the fifth quintile income receiverôs income share increased from 45.9 to 57.3 percent. It is possible to identify the Lorenz domination phenomenon in the 1973-1987 period. The Lorenz curve for 1986/87 is found clearly outside the Lorenz curve for 1973. Since there are no data between 1973 and 1978, it is not possible to determine the precise time of the reversal of this trend. However, several reasons can be given to a justify increasing inequality trend in this period. First, Lakshman (1997) has identified structural and institutional changes, the 1975 nationalization of some companies, and the introduction of liberalization policies in 1977 as the major influential causes behind the increasing inequality during this period. However, liberalization policies were introduced in the budget speech in November, 15, 1977 and implemented after 1978. The income data are collected for the 1978/79 period. Therefore, it is difficult to justify liberalization policies as the major cause for the rising income inequality in this period. Secondly, since the government was preparing to reduce various subsidies under international pressure, people may have underreported their income in official surveys to have the opportunity to enjoy those subsidies for a longer period. This argument may have support from the reducing inequality trend of expenditure data in the same surveys. Third, many factors contributed to the slow growth rate and high inequality during this period. They

include the reduction in government food subsidies, the oil crisis, and high inflation, reduction in the world prices of tea, rubber and coconut, a stagnant industrial sector due to the strong import substitution policy, inefficient government enterprises and very limited private-sector participation. Since the GDP growth rate was very low, such an equitable approach could not be continued in Sri Lanka.

The third phase of income inequality is the declining trend during the 1987-1997 period. The national level Gini coefficient declined by 8 percent, while rural and estate sector Gini coefficients declined by 10 percent and 7 percent respectively during this period. In contrast, there was a marginal increase in income inequality in the urban sector with the Gini coefficient increasing by 1 percent (from 0.53 to 0.54) during the 1987-1997 period. A sizable decline in income inequality in the rural sector was due to the emerging diversity of economic activities in that sector, which led to an expansion of income-generation activities mainly in the form of off-farm employment benefiting a wider cross-section of the rural population. Strategies like rural infrastructure development, location of industries in the rural sector and expansion of rural banking enabled the bringing about of the diversity in the rural economy. The lowest Gini coefficient was attributed to the income receivers in the estate sector. Almost all income receivers in this sector are estate laborers with fixed wages and they do not generally have any other income generating sources. The estate sector income inequality declined due to the wage increases adopted from time to time during the 1987-1997 period. In addition, the number of income receivers also declined in the estate sector reflecting the increasingly participation of younger persons in education rather than entering the labor force at an early age. An increase in the GDP

growth rate (the average annual GDP growth rate for 1990-1997 was 6.4 percent) and considerable reduction in the unemployment rate (17.4 percent and 10.3 percent for the respective years of 1990 and 1997) during this period led to a decline in income inequality at the national level. The most important phenomenon in the third phase of income inequality compared to the first phase is the lesser importance of public policy for inequality reduction. Income inequality declined in the 1987-1997 period even though the country was following deregulation programs, privatization programs and outward-oriented economic policies, while cutting down some government subsidies. In addition, the inequality pattern differs from the Kuznets prediction due to the effects of factors such as insufficient industrialization, constant population share in the urban sector, and expansion of blue collar job opportunities for Sri Lankan workers in foreign countries.

V. Decomposition of Income Inequality by Industry, 1963-1997

Tables 3 and 4 summarize the income inequality decomposition results by industry during the 1963-1997 period. Table 3 shows group decomposition results using the two Theilôs entropy measures, while Table 4 presents source decomposition results using the Gini coefficient. It is possible to identify several important features of industry level income inequality by using the data given in these Tables.

Table 3

Table 4

The most important phenomenon is the low between-industry share during the whole period in the total income inequality measured by the two Theil indices. As shown in the percentage values of the T and L indices, between-industry share in the total income inequality was around 15 percent in 1963. After reaching the minimum value in the late 1970s, it was around 6 percent in 1996/97. The between-group income inequality indicates income inequality due to differences in the mean income among industries. Thus, the mean income does not vary much among different industries in Sri Lanka. Therefore, income inequality is overwhelmingly a matter of within the various industries. This finding is similar to Terasaki (1993). Professor Terasaki used the same inequality measures, a completely different data set, a slightly different industrial classification, and for 1990/91 found the between-industry inequality share as 6 percent of the total income inequality. Therefore, further investigation of income inequality within various industries is important.

As far as the income inequality pattern is concerned, the agricultural industry behaved differently than the total income inequality trends. As indicated from two Theilôs entropy measures (T and L), the agricultural industry income inequality declined in the 1982-1997 period, while total inequality increased during the 1973-1987 period. In other words, the agricultural sector income inequality declined even though in the total income inequality was increasing during 1982-1987 period. According to Table 4, the percentage contribution by the agricultural industry to the total income inequality declined from 31 percent to 13 percent during the 1982-1997 period. Therefore, investigation of trends and structure of the agricultural industry is important in overall inequality analysis. Agricultural activities in Sri Lanka can be divided into two separate

sub-industries as traditional agriculture, which produces rice, grain, vegetables, fruits etc, and plantation agriculture which produces tea, rubber and coconuts. These two types of agricultural activities differ among sectors also. Urban agriculture is based on growing vegetables, fruits, tea on a small scale, and the rubber and coconut plantation industries. The share of urban agriculture in terms of output and employment is less than 10 percent of the total agriculture. Rural agriculture is mainly based on growing rice, grains, vegetables, fruit etc. Its share in the total agriculture represents more than 75 percent. Within the urban agricultural farmers, some of them have the opportunity to sell their products in retail markets and receive a high level of income in comparison to others. On the contrary, almost all rural farmers sell their output to intermediate traders or state owned firms. For example, state owned firms purchase rice under a guaranteed price. Therefore, income inequality among rural farmers is lower than that of urban farmers.

Estate agriculture is based on large scale plantation lands. The lowest income inequality is attributed to the farmers in plantation estates. In particular, the Gini coefficient among income receivers in the estate sector was 0.2915, while it was 0.5369 percent among urban income receivers in 1996/97. In other words, the estate sector Gini coefficient is only 54 percent of the urban sector Gini coefficient. This is to be expected as most income receivers in the estate sector are estate laborers with fixed wages and they do not generally have any other income generating sources. In addition, a large part of the plantation workers are immigrant Indian Tamils, and they have a well organized labor union in comparison to other industries. As a result their bargaining power on wage determination is high. The continuous decline in income inequality in the estate

plantation agriculture was due to wage increases adopted from time to time in response to powerful labor union activities.

In addition the to above mentioned factors, the recent decline in income inequality among all agricultural income receivers was due to a decline in the agricultural labor surplus as a result of expanding employment opportunities in other industries, increasing food prices due to high domestic inflation, growing female labor force participation due to a remarkable decline in birth rate and child care etc. However, even though relative income inequality declined among agricultural workers, their mean income in real terms also declined during past two decade. For example agricultural income receiversô real monthly mean income was 807 and 693 rupees in 1987 and 1997 respectively. Therefore, due to real income decline, declining relative income inequality does not imply welfare improvements among the agricultural workers.

The three income inequality measurements given in Tables 3 and 4 do not indicate a consistent pattern for the mining industry. This is due to the low contribution of that industry to the total income inequality. As measured by the Gini coefficient, the mining industry share in the total income inequality was less than 2 percent during the entire period.

According to Terasaki (1993), the highest intra-industry inequality was attributed to manufacturing and construction industry workers. He considered manufacturing and construction industry income receivers as one industry. However, income inequality among the manufacturing industry income receivers was quite high in comparison to the construction industry in our findings. The sum of these two industries represents just less than 15 percent of the total income inequality measured by the Gini coefficient. Therefore, in determining the total income inequality

trends in Sri Lanka, service and agricultural industries are more powerful than the manufacturing, construction and other industries. The service industry represented more than 50 percent of the total Gini coefficient in 1996/97. This was due to the large share of the service industry in the total output, employment and income in Sri Lanka. However, inequality measures for service industry income receivers were not much different from other industries. Income inequality in other industries (not classified) was also quite high in Sri Lanka. This paper included income receivers without employment (they receive income from transfers) in the other industry-group. Therefore, we are not in a position to identify special reasons for high income inequality in other industries.

In order to relate structural changes in output with income inequality trends, this paper decomposes inter-temporal changes of the total Gini coefficient by using equation (7). National level results for the respective periods 1963-1973, 1973-1978, 1978-1982, 1982-1987, 1987-1997 are provided in Table 5. In addition, we have undertaken inter-temporal analysis for sectoral level inequality change, but the results are not presented in this paper.

Table 5

The Gini coefficient decreased from 0.5062 to 0.4105 (by -0.0957) in the 1963-1973 period. The total reduction was contributed by changes in intra-industry inequality (-0.0978), the structural change effects (0.0104) and the interaction effect (-0.0083). Therefore, inequality reduction in this period is mainly a result of declining intra-industry inequality in Sri Lanka. In particular, inequality associated with manufacturing, agriculture and service industry income receivers declined. However, mining industry inequality remained at a constant level during this

period. Although the structural change effect showed a positive contribution to the total income inequality, its share is not considerable. This is because relative income share changes among industries were not notable during the 1963-1973 period. The interaction effect was also very low in this period. As far as sectors are concerned, during the 1963-1973 period, the Gini coefficient decreased in the urban sector (by 26 percent) and the rural sector (by 20 percent), while it increased in the estate sector (by 25 percent). Declining intra-industry income inequality contributed to this situation, both in the urban and rural sectors. However, the rural sector structural change effect showed a significant positive contribution to the total inequality change. This was due to a sizable increase in the agricultural, manufacturing, and service industry shares of the total rural income, while there was a decline in the income share of other industries. In contrast to the urban and rural sectors, both the intra-industry effect and the structural change effect were positive in the estate sector. Out of the 25 percent increase in the Gini coefficient, 80 percent was from intra-industry income inequality. In other words, only 19 percent of inequality growth was associated with the industrial structural changes in the estate sector. There was no sizable change in the income shares of each industry in the estate sector during the 1963-1973 period.

The total Gini coefficient increased by 0.1002 (28 percent) in the urban sector, 0.1167 (31 percent) in the rural sector and 0.088 (21 percent) at the national level, while declining in the estate sector by 0.0534 (14 percent) during the 1973-1978 period. Out of these changes, intra-industry inequality contributed more than 100 percent of the inequality growth at the urban, rural and national levels. Within the intra-industry inequality effect, services and manufacturing

industries in the urban sector represented a significant portion. When it comes to the rural sector, agriculture and services were important contributing industries. Since more than 46 percent of the rural employed population is attributed to agriculture, the inequality increase in this group is the most important reason behind increasing income inequality during the 1973-1978 period. Opposite to the intra-industry inequality effect, the structural change effect showed negative values both in the urban and rural sectors. In other words, industrial structure changed at a very slow speed during the 1973-78 period. As the highest contributing industries to the structural changes effect, the urban sector services share declined by 14 percent and the manufacturing industry share increased by 7 percent. However, the declining share of the service industry led to a decrease in total income inequality in the estate sector. The interaction effect was negligible during this period.

Gini coefficients for all six industries were in the range of 0.33-0.39 in the year 1973. The absolute level of the Gini coefficients increased, and, as a result, in 1978 the range of the Gini coefficients varied from 0.43 to 0.52. The intra-industry income inequality contributed a larger part of total inequality than the other two effects. In particular, the structural change effect was negative in this period. Of the total income, the agricultural industry share decreased from 42 percent to 38 percent, while the manufacturing share increased from 9 percent to 13 percent. The declining service industry share (from 43 to 37) in the total income neutralized inequality growth in this period. If the service sector share had been constant in the total income, the Gini coefficient would have increased by 3 percent during this period. In contrast to the 1963-73 period,

inequality increased in the urban and rural sectors contributing to the increase in the total income inequality during the 1973-1978 period.

There are two main reasons for selecting the 1978-1982 period as a separate period (although 1973-1987 is seen as one inequality phase in figure 1). First, the introduction of liberalized economic policies in 1977. Second, 1978-1982 is the period of highest output growth recorded in Sri Lanka (the average annual GDP growth rate was 6.3 percent). Keeping in mind the two reasons for the importance of this period, it is possible to identify several features of inequality behavior.

First, total income inequality measured by the Gini coefficient increased by 7, 1, and 4 percent at the urban, rural and national levels while respectively decreasing by 1 percent in the estate sector. Although these changes are low in terms of absolute levels, it is important to investigate contradictory behavior of income inequality among industries. For example, the intra-industry inequality effect was positive at the urban, rural and national level but less in amount in comparison to the former period. Income inequality in the manufacturing industry declined to a considerable extent during the 1978-82 period. Specifically, the Gini coefficient of the income receivers in urban manufacturing industries declined from 0.5733 to 0.5147 (by 10 percent) from 1978/79 to 1981/82. On the one hand, this was mainly due to nominal wage increases in most of the manufacturing industries. On the other hand, the manufacturing sector provided a great number of employment opportunities in this period (wage inequality among new employees is normally lower than that of experienced workers).

Secondly, the share of the not-defined industries in the total income and the absolute level of inequality increased in the urban sector. The reason is that income receivers without employment opportunities were also included in that group. In other words, transfer income receivers are in the not defined industry group. The author identified elsewhere (Karunaratne 1998), the rapid increase of migrant workers to Middle East and South East Asian countries and the positive contribution of their remittances to the total income inequality in Sri Lanka can be considered as one of the main reasons behind the inequality increase (Gini coefficient by 24 percent) in the not-defined industries in the urban sector. Thirdly, income inequality within agriculture increased at the urban, rural and national levels while it decreased in the estate sector.

Finally, the structural change effect was not an influential factor in the determination of income inequality during the 1978-1982 period. Its contribution was negative and very low (-6 percent) at the national level. Although it was positive in the rural sector, its absolute contribution to total income inequality was 9 percent. Therefore, the inequality increase in the first stage of the open door policy was overwhelmingly a factor attributable to the intra-industry effect. This situation is quite strange according to economic theory which, after the introduction of economic policies, predicts inequality increases due to changes in industrial structure. As far as the Sri Lankan situation is concerned, the government put more investment into agricultural and infrastructure development, while domestic private investors were making profits in services. Foreign investments were also limited to very small amounts due to rigidities in the economy and domestic civil disturbances. Therefore, the limited contribution of the structural change effect to the total income inequality in Sri Lanka is understandable.

Income inequality increased marginally at the rural and national levels, while it decreased in the urban and estate sectors in the 1982-1987 period also. Industry-wise, during the 1982-87 period, inequality (measured by the Gini coefficient) increased in urban agriculture (10 percent), urban manufacturing (12 percent), estate manufacturing (31 percent), estate construction (23 percent) while declining in urban mining (18 percent), urban construction (11 percent), urban not-defined (16 percent), rural mining (9 percent), and estate services (33 percent). The intra-industry inequality effect contributed highly to decrease income inequality in the urban sector and estate sector. However, the structural change effect and interaction effects were more powerful in the rural sector. Specifically, the agricultural share in total income declined by 9 percent, contributing a considerable negative share to the total structural change effect in the rural sector.

The total Gini coefficient declined from 0.5219 to 0.4790 (by 0.082) during the 1987-1997 period. Out of this decline 143 percent was due to inequality decrease in within-industries. This is because income inequality associated with all five main industries declined during this period. Only 'not-defined' industry showed increasing income inequality. On the other hand, changes in industrial structure contributed a in positive 41 percent to the total Gini change. This is due to two reasons. First, the relatively low inequity indicated that the agricultural industry income share had declined considerable amount (by 8 percent), while relatively high inequality indicated that manufacturing, mining and other industry income shares were marginally changing. Second, even though service industry share increased in total income, inequality associated within service industries declined. In terms of determining total income inequality trend, the interaction effect is negligible in the 1987-1997 period also.

In order to predict future behavior of income inequality components, the elasticity of the Gini coefficient is calculated for various industries following the Podder (1993) method. Table 4 summarizes the elasticity of the Gini coefficient with respect to each industry, assuming constant concentration coefficients. For example, if the concentration coefficient for one industry is not changed, the changes in income shares of industries will alter the total income inequality by the value of the respective elasticity figure. Therefore, it is reasonable to assume that these elasticity figures can be used to predict the future contribution of inequality components. According to the data given in Table 4, the agriculture, mining, and construction industries showed negative elasticity figures. This means that the decreasing share of these industries in the total income will lead to increased total income inequality in Sri Lanka. On the other hand, services and other industries indicate positive elasticity figures. Therefore a growing share of the service sector in terms of output and employment will generate more income inequality unless appropriate government policies are implemented to reduce within-service sector income inequality.

The elasticity of the Gini coefficient with respect to the manufacturing industry had a positive sign during 1963-1978 and a negative sign during the 1982-1997 period. This has very important implications in the context of economic policy in Sri Lanka. When import substitution policies were implemented, manufacturing industries based heavily on imported raw materials, intermediate goods and capital goods and capital intensive technology. As a result, employment generation in manufacturing industries was limited. Therefore, the growing share of the manufacturing industry in total income led to an increased income inequality. In contrast to this situation, a remarkable increase in employment opportunities in manufacturing industries after the

introduction of economic liberalization led to reduced income inequality in the 1990s. Therefore, in Sri Lanka not only for economic growth, but also to reduce total income inequality, the share of manufacturing industries in the total income must be increased.

VI. CONCLUSIONS

This paper examined the impact of industrial structural changes on income inequality trends in Sri Lanka. There were three main income inequality phases during the 1963-1997 period. Contrary to the Kuznets inverted-U hypothesis, income inequality declined during 1963-1973, increased during 1973-1987, and again declined during the 1987-1997 period. These inequality phases were confirmed by using several inequality indices (mean income, decile shares, the Gini coefficient, two Theilôs entropy measures etc). In addition, inequality trends are consistent with various income units and methods of estimation of the Gini coefficient also. Furthermore, inequality measures were decomposed into components to identify quantifiable factors behind the changing income inequality trend by industry and temporal level. Our empirical findings can be summarized as follows.

First, inequality decomposition by sub-groups of population into six main industries led to the identification of the importance of intra-industry income inequality in Sri Lanka. The between-industry income inequality share (in the Theil measures) was less than 16 percent of the total income inequality during the whole period. This finding is consistent with the findings of Teraski (1993), even though he used a completely different data set and industrial classification also. Therefore, income inequality in Sri Lanka is overwhelmingly a matter of within the various industries. Second, decomposition of temporal changes of income inequality was done by using

the Gini coefficient for the periods of 1963-73, 1973-78, 1978-82, 1982-87, 1987-97. The empirical results showed a negligible contribution of structural changes to the change in total income inequality during the first three periods. In other words, changes in inequality within each industry contributed more than 80 percent of the changes in total inequality. However, changes in industrial structure contributed to a sizable portion of the changing income inequality during the last two periods. Third, in order to have an empirical basis on which to predict behavior of inequality components, the elasticity of the Gini coefficient was estimated with respect to each industry and sector. The agriculture, mining and construction industries showed negative elasticities, while services and other industries indicated positive elasticities. Industries with positive elasiticites indicate the possibility of increasing income inequality as their share in the total income increases. However, elasticity figures for the manufacturing industry were positive until 1978 and negative since 1982. This situation is a reflection of the economic policy change in 1977.

There are some important policy implications from the findings of this paper. If policy makers wish to reduce income inequality, they should try to establish labor intensive, manufacturing-oriented industries in the rural sector to absorb surplus labor from rural agriculture. This may bring growth and equity objectives simultaneously to the economy. In addition, Sri Lanka needs a more diversified industrial structure to improve its output and reduce the present level of income inequality. If the governmentôs goal is to reduce inequality, it should focus on the inequality within each industry rather than among the industries. In order to satisfy this objective, there should be an appropriate progressive income tax system for income receivers.

ANNEX I

It is possible to relate equations (3) and (4) as follows:

$$G = \sum \frac{N_i}{N} \cdot \frac{Y_{i+1}}{Y} - \sum \frac{N_{i+1}}{N} \cdot \frac{Y_i}{Y} \qquad \text{[Equation (3)]}$$

$$= \sum_{i=1}^{n-1} \frac{N_i}{N} \sum_{k=1}^{m} \frac{Y_{i+1,k}}{Y} - \sum_{i=1}^{n-1} \frac{N_{i+1}}{N} \cdot \sum_{k=1}^{m} \frac{Y_{i,k}}{Y}$$

$$= \sum_{k=1}^{m} \left(\sum_{i=1}^{n-1} \frac{N_i}{N} \cdot \frac{Y_{i+1,k}}{Y} - \sum_{i=1}^{n-1} \frac{N_{i+1}}{N} \cdot \frac{Y_{i,k}}{Y} \right)$$

$$= \sum_{k=1}^{m} \frac{Y_{.k}}{Y} \cdot \left(\sum_{i=1}^{n-1} \frac{N_i}{N} \cdot \frac{Y_{i+1,k}}{Y_{.k}} - \sum_{N}^{n-1} \frac{N_{i+1}}{N} \cdot \frac{Y_{i,k}}{Y_{.k}} \right)$$

$$= \sum_{k=1}^{m} \frac{Y_{.k}}{Y} . C_k$$

$$= \sum_{k=1}^{m} W_k C_k \qquad \text{[Equation (4)]}$$

ANNEX II

Equation (6) can be obtained by taking the total derivative of Equation (4) with respect to each industry share, assuming C_k is constant and substituting the results to the normal elasticity formula. See Podder (1993 p.53-54) for the proof, but we can derive equation (8) in the following way.

$$G = \sum_{k=1}^{m} W_k C_k \qquad \text{[Equation (4)]}$$

Since $W_k = \frac{\mu_k}{\mu}$

$$G = \sum_{k=1}^{m} \frac{\mu_k}{\mu} C_k$$

Taking up only the k - th factor,

$G = (\mu_k / \mu) C_k$ Then total differentiation with respect to μ_k gives

$$dG = (C_k / \mu).d\mu_k - (\mu_k / \mu^2) C_k .(\partial\mu / \partial\mu_k).d\mu_k$$

$$(\partial\mu / \partial\mu_k = 1)$$

$$= (C_k / \mu).d\mu_k - (G / \mu)d\mu_k$$

$$= (C_k - G) / \mu . d\mu_k$$

$$dG / d\mu_k = (C_k - G) / \mu$$

Elasticity formula is

$$\eta_k = \frac{dG}{d\mu} \times \frac{\mu_k}{G} = \frac{C_k - G}{\mu} . \frac{\mu_k}{G} = \frac{1}{G}\left[\frac{\mu_k}{\mu}(C_k - G)\right]$$

$$= \frac{1}{G}\left[W_k (C_k - G)\right] \text{ [Equation (6)]}$$

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