

Inequality in World GDP Distribution

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1. Introduction

Economic inequality is the analysis of differences across the population in relation to the control over economic resources, and it has always been one of the central issues of any political system. The vast majority of the world community, living in the developing countries, has only a little share in the world's wealth. The developed countries (DCs), constituting 24 percent of the world population, control 86 percent of world income, while less developed countries (LDCs), constituting 76 percent of world population have access to only 14 percent of world income in 1990 (Table 1).

Table 1
Shares of GDP and population by regions, in percentage

Year	DCs GDP	LDCs GDP	Africa GDP	Asia GDP	Europe GDP	the Americas GDP
1960	89.70	10.30	2.27	13.75	39.22	44.76
1965	89.40	10.60	2.12	16.03	38.45	43.40
1970	89.00	11.00	2.07	19.95	37.76	40.22
1975	86.44	13.56	2.17	22.44	36.58	38.81
1980	85.93	14.07	2.30	23.15	35.75	38.80
1985	85.81	14.19	2.37	24.77	34.24	38.62
1990	85.73	14.27	2.25	26.30	34.10	37.35
Year	Pop	Pop	Pop	pop	pop	pop
1960	34.58	65.42	11.38	47.60	19.15	21.87
1965	32.75	67.25	11.78	48.13	18.03	22.06
1970	30.98	69.02	12.18	48.86	16.98	21.98
1975	28.88	71.12	12.40	50.34	15.72	21.53
1980	27.00	73.00	13.34	50.82	14.57	21.27
1985	25.17	74.83	14.44	51.12	13.51	20.93
1990	23.60	76.40	15.26	51.53	12.66	20.55

Shares of GDP and population are calculated from total of 108 countries

Higher rates of economic growth are critical to bridge the gap between the living standard of rich and poor countries. Some rich countries and the international community generally have felt to relieve the poverty pressure by generating development in LDCs through different ways. Exports, investment, population are considered as three of the crucial elements in economic growth of the LDCs. While investment increases employment opportunities, transformation from demographic conditions of high fertility and mortality to low fertility and mortality helps to achieve progress in socio-economic conditions (Oshima, 1983). Higher earning from exports helps to pay for the imports that are required to develop a sound economic base in developing countries.

Research in income inequality has mostly been country specific due to lack of comparable data, and also because the policies adopted to address the poverty problems are mostly national in scope. The technology of computerized data banks has provided the opportunity to have data in comparable form, and advances in communication and transportation has made the whole world very small and integrated through increased international trade. Economic policies of both big and rich countries, and world institutions have strong effects on the economic growth and its distribution among countries. With these developments research emphasis in income inequality has shifted to international level.

Several studies have attempted to explain the behavior of income inequality over time. Ram (1989), Theil (1989), Levy and Chowdhury (LC), 1994, and James et al. (1995) conducted studies applying Theil's index measure of income inequality. Theil found substantial increase in international inequality. The inequality in the North declined sharply from 1960-1985 whereas it increased substantially in Tropical Africa and Asia.

Ram also found the increasing trend in world income inequality between 1960-1980 due to increase in intercountry inequality. LC using Theil's index of income inequality for 115 countries between 1960 and 1985 found that global level of intercountry inequality declined by 16.75 percent. They also found inequality among regions, a major constituent of intercountry inequality.

Seale et al. (1995) divided the non-communist world into four regions. Their results show that whereas GDP increased 180 and 240 percent in the North and South East Asia respectively, inequality decreased 80 percent in the former and increased 183 percent in the latter. Inequality is very low in South Central Asia with no clear trend but on the other hand it is higher in Sub-Saharan Africa and increased over time until late 1970s.

Geographical and historical aspects other than economic aspects have their own effects on the distribution of income. None of the above studies divided the world on the continent level and did not include Newly Industrialized Countries (NICs) and Organization of Petroleum Exporting Countries (OPEC) as separate groups in their analysis. These two groups of countries have emerged as very important economic powers during the 1970s and 1980s. Their higher GDP with smaller population seem to have affected the distribution of income in a substantial way. Among the LDCs again OPEC are comparatively the richer which may have affected the levels of inter-country inequality over time. For the purpose of present work the world was divided into different regions and groups of countries on the basis of these different aspects to estimate population weighted income inequality. The objective of this study is to extend the work already done by the above-mentioned authors and to examine the relationship between

international income inequality on the one hand and the effects of world investment, population and exports on the other.

2. METHODOLOGY

For inequality measure Theil's information theoretic measure is the most useful one, especially when we use grouped data and want to decompose the over all inequality into its constituent parts. Following Theil (1989) when the measure is applied to the GDP of sample countries it can be defined as:

$$J = \sum_{i=1}^n p_i \log \frac{p_i}{y_i} \quad (1)$$

where p_i is the population share and y_i is income share (GDP) of country i in world population and world income (GDP) respectively and n is the number of countries. If we combine countries into regions R_1, \dots, R_G so that each country is in one region and P_g and Y_g be the population and income shares of region g then

$$P_g = \sum_i p_i \quad \text{and} \quad Y_g = \sum_i y_i$$

where the summations are over $i \in R_g$. The extension of (1) to regions is

$$\bar{J}_R = \sum_{g=1}^G P_g \log \frac{P_g}{Y_g} \quad (2)$$

that measures the inequality among regions and

$$J_g = \sum_{i \in R_g} p_i / P_g \log \frac{p_i / P_g}{y_i / Y_g} \quad (3)$$

measures the inequality among the counties of the regions R_g . The additive form of the decomposition is

$$J = J_R + \bar{J} \quad \text{where} \quad \bar{J} = \sum_{g=1}^G P_g J_g \quad (4)$$

Total inequality among the sample countries equals regional inequality plus the average within regions inequality, the average being a weighted average with the population shares p_1, \dots, p_g as weights.

As mentioned earlier exports, investment and population are important contributors to economic growth and affect the distribution of income within as well as among nations.

To examine the relationship between inter-country inequality and the three factors namely, exports, investment, and population, the proportions of these three factors calculated are as follows:

$$\text{Index of World Exports} = \frac{\text{Total World Exports}}{\text{Total World GDP}}$$

$$\text{Index of L'DCs Investment} = \frac{\text{Total L'DCs Investment}}{\text{Total World Investment}}$$

$$\text{Index of L'DCs Exports} = \frac{\text{Total L'DCs Exports}}{\text{Total World Exports}}$$

$$\text{Index of World Investment} = \frac{\text{Total World Investment}}{\text{Total World GDP}}$$

$$\text{Population Share of LDCs} = \frac{\text{Total LDCs population}}{\text{Total World Population}}$$

The most appropriate model to define the relationship among these variables on the basis of the econometric criteria turned out to be:

$$WTPI = \alpha_0 + \alpha_1 \ln WEXP + \alpha_2 \ln WIN + \alpha_3 \ln L'DCs EXP + \alpha_4 \ln L'DCs POP + \alpha_5 \ln LDCs INV \quad (5)$$

where α_0 = Constant; WPTI = International Income Inequality (Population Weighted); $\ln WEXP$ = Log of Index of World Exports;

$\ln \text{WIN}$ = Log of Index of World Investment; $\ln \text{LDCs' EXP}$ = Log of Index of LDC 's Exports; $\ln \text{LDCs' POP}$ = Log of population share of LDCs; $\ln \text{LDCs' INV}$ = Log of index of LDC 's Investment

Using this regression, the effects of World Export, World Investment, LDCs' Exports, LDCs' Investment, and LDCs' Population on International Income Inequality during 1960-92 will be examined. The data used for this study are from the World Bank (1994).

3. International Income Inequality During 1960-1992

Decomposition based on the Theil's population weighted measure helps to identify the various components that affect world inequality. There are two pairs of opposite forces that affect world inequality. The slow growing economies with high population, in particular the countries of the Indian subcontinent and China increase inequality. On the other hand the richest countries like United States and Japan do the opposite. In addition, NICs and OPEC with usually small population and higher GDP affect world inequality substantially.

In a long span of time many economic incidents help some countries at the cost of others. During 1960-1992 trade agreements, oil price shocks of 1973 and 1979, international debt crises of the 1980s altered the distribution of income among as well as within different regions of the world.

3.1. International Inequality in Terms of Continents

Table 2 presents the international income inequality and its constituents Africa, Asia, Europe, and the Americas computed by the Theil's population weighted index measure for the period 1960-1992. Income inequality increased substantially during this period. There is almost continuous increase in inequality during the 1960s and 1980s with lots of

fluctuations during the 1970s. In 1973 and 1979 income inequality increased abruptly and then decreased. This pattern may have emerged due to the oil price shocks. These results are in contrast to L and C, who found that inequality decreased by 16.75 percent during 1960-85; but are in line with Ram and Theil. These studies show 20.30 %and 19.65 % increase in inequality for the period of 1960-80 and 1960-85 respectively, and our study shows an increase of 13.92 percent during 1960-92.

Over time regional income inequality seem to have decreased noticeably in contrast to inequality within regions that shows a substantial increase. The share of regional inequality in international inequality decreased consistently from 42.19 percent in 1960 to 28.96 percent, but since 1976 it had mixed pattern. Within region inequality is dominant in total inequality in contrast to results of LC, and Theil, who found regional inequality as dominant. During 1980s, countries and continents experienced great differences in their economic performance. DCs experienced continuous growth for several years after the 1982 recession. Economic growth has been faster in parts of Asia in the 1980s. But Africa and Latin America have seen economic decline rather than growth and development. Export growth contributes directly to economic growth and a rapid modernization of production. High export growth among Asia' newly industrializing countries and low export growth in Latin America and Africa have significantly changed the regional distribution of developing country exports during the 1980s (World Bank, 1989). Which may also have affected the distribution of income among them.

Table 2

Table 2: International Income Inequality, and Income Inequality in the Americas

International	Regional	Average within	3 as a %age	Inequality in	Subregional	Average within	7 as a percentage
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Year	Inequality	Inequality	Regions	of 2	The Americas	Inequality	Subregions	of 6
1	2	3	4	5	6	7	8	9
1960	1.1394	0.4807	0.6587	42.19	0.6059	0.3280	0.2779	54.13
1961	1.1486	0.4730	0.6756	41.18	0.5978	0.3205	0.2773	53.61
1962	1.1656	0.4653	0.7003	39.92	0.5643	0.3285	0.2358	58.21
1963	1.1680	0.4503	0.7177	38.55	0.6199	0.3443	0.2756	55.54
1964	1.1799	0.4428	0.7371	37.53	0.6259	0.3457	0.2802	55.23
1965	1.2092	0.4456	0.7636	36.85	0.6504	0.3611	0.2893	55.52
1966	1.2362	0.4426	0.7936	35.80	0.6621	0.3721	0.2900	56.20
1967	1.2451	0.4306	0.8145	34.58	0.6643	0.3736	0.2907	56.24
1968	1.2560	0.6692	0.5868	53.28	0.6585	0.3685	0.2900	55.96
1969	1.2593	0.9652	0.2941	76.65	0.6508	0.3600	0.2908	55.32
1970	1.2525	0.3851	0.8674	30.75	0.6281	0.3415	0.2866	54.37
1971	1.2583	0.3848	0.8735	30.58	0.6175	0.3338	0.2837	54.06
1972	1.2861	0.3818	0.9043	29.69	0.6118	0.3330	0.2788	54.43
1973	1.3017	0.3842	0.9175	29.52	0.6042	0.3277	0.2765	54.24
1974	1.2718	0.3732	0.8986	29.34	0.5815	0.3106	0.2709	53.41
1975	1.2483	0.3637	0.8846	29.14	0.5704	0.3043	0.2661	53.35
1976	1.2599	0.3649	0.895	28.96	0.5727	0.3049	0.2678	53.24
1977	1.2574	0.3670	0.8904	29.19	0.5801	0.3061	0.2740	52.77
1978	1.2612	0.3719	0.8893	29.49	0.5885	0.3181	0.2704	54.05
1979	1.2884	0.3742	0.9142	29.04	0.5803	0.3119	0.2684	53.75
1980	1.2784	0.3756	0.9028	29.38	0.5584	0.2986	0.2598	53.47
1981	1.2723	0.3720	0.9003	29.24	0.5722	0.3177	0.2545	55.52
1982	1.2646	0.3631	0.9015	28.71	0.5728	0.3177	0.2551	55.46
1983	1.2685	0.3694	0.8991	29.12	0.6076	0.3377	0.2699	55.58
1984	1.2853	0.3764	0.9089	29.28	0.6264	0.3486	0.2778	55.65
1985	1.2904	0.3779	0.9125	29.29	0.6313	0.3522	0.2791	55.79
1986	1.2934	0.3869	0.9065	29.91	0.6318	0.3408	0.2910	53.94
1987	1.2997	0.3911	0.9086	30.09	0.6371	0.3427	0.2944	53.79
1988	1.2995	0.3911	0.9084	30.10	0.6573	0.3564	0.3009	54.22
1989	1.3023	0.3907	0.9116	30.00	0.6704	0.3685	0.3019	54.97
1990	1.3014	0.3904	0.911	30.00	0.6805	0.3790	0.3015	55.69
1991	1.2981	0.3815	0.9166	29.39	0.6670	0.3661	0.3009	54.89
1992	1.2980	0.3849	0.9131	29.65	0.6733	0.3664	0.3069	54.42

3.2. Income Inequality at Continent Level

3.2.1. Africa and Regions within Africa

The levels of income inequality in Africa and its constituents, North Africa and Sub-Saharan Africa are given in Table 3. Though income inequality increased by 13.65 percent in 1992 from its 1960 level there does not seem to be any consistent trend except from 1977 to 1984. Inequality during the 1980s was higher because after reasonable growth in the 1960s and 1970s, the region 's economic performance deteriorated and varied a lot among countries (World Bank, 1994). Inequality within subregions has a major share in over all inequality in Africa. According to the World Bank (1994), most

countries in Africa that improved their policies started enjoying positive rates of GDP per capita growth. Out of 29 African countries, six with the most improved macroeconomic policies had a median increase in GDP per capita growth of almost 2 percentage points between 1981-86 and 1987-91 compared with an increase of 1.5 percentage points for those countries with less improved policies and a decline of 2.6 percentage points for those with a deterioration in policies. That may be the reason of higher inequality within regions.

Subregional inequality as a share of total inequality although was initially very small, increased from 2.56 percent in 1960 to 18.88 percent in 1992 which shows that distribution of income among regions within Africa is getting more skewed. It increased more during the 1980s. Most of the African countries are in Sub-Saharan Africa and this part of African continent has a faster growing population and slower GDP. It has been the site of the worst episode of famine and starvation in the 1980s.

3.2.2. Asia and Regions within Asia

Table 3 shows the results of income inequality analysis for Asia and its regions (South and West Asia and East and Pacific Asia). As shown the inequality worsened substantially during the period of analysis. There is 40.44 percent increase in total inequality, most of which is caused by inequality within sub regions. Total inequality shows a consistent increase from

Table 3
Income Inequality among African and Asian Countries

Year	Inequality in Africa	Subregional inequality	Average Within Subregions	3 as a % age of 2	Inequality in Asia	Subregional inequality	Average within subregions	7 as a % age of 6

1	2	3	4	5	6	7	8	9
1960	0.3435	0.0088	0.3347	2.56	0.9466	0.5676	0.3790	59.96
1961	0.3320	0.0041	0.3279	1.23	0.9887	0.5957	0.3930	60.25
1962	0.3007	0.0005	0.3002	0.17	1.0416	0.5536	0.4880	53.15
1963	0.3155	0.0030	0.3125	0.95	1.0645	0.5174	0.5471	48.60
1964	0.3233	0.0033	0.3200	1.02	1.0957	0.5311	0.5646	48.47
1965	0.3323	0.0040	0.3283	1.20	1.1348	0.5542	0.5806	48.84
1966	0.3269	0.0026	0.3243	0.80	1.1921	0.5851	0.6070	49.08
1967	0.3598	0.0043	0.3555	1.20	1.2229	0.6005	0.6224	49.10
1968	0.3675	0.0061	0.3614	1.66	1.2711	0.6301	0.6410	49.57
1969	0.3552	0.0072	0.3480	2.03	1.3091	0.6537	0.6554	49.94
1970	0.3484	0.0075	0.3409	2.15	1.3384	0.6740	0.6644	50.36
1971	0.3228	0.0039	0.3189	1.21	1.3592	0.6760	0.6832	49.74
1972	0.3365	0.0090	0.3275	2.67	1.4176	0.6977	0.7199	49.22
1973	0.3325	0.0093	0.3232	2.80	1.4438	0.7122	0.7316	49.33
1974	0.3407	0.0090	0.3317	2.64	1.3961	0.5207	0.8754	37.30
1975	0.3466	0.0127	0.3339	3.66	1.3689	0.5143	0.8546	37.57
1976	0.3532	0.0166	0.3366	4.70	1.3830	0.5016	0.8814	36.27
1977	0.3392	0.0203	0.3189	5.98	1.3701	0.5070	0.8631	37.00
1978	0.3507	0.0276	0.3231	7.87	1.3576	0.5347	0.8229	39.39
1979	0.3559	0.0322	0.3237	9.05	1.4025	0.5731	0.8294	40.86
1980	0.3775	0.0359	0.3416	9.51	1.3832	0.5961	0.7871	43.10
1981	0.3978	0.0367	0.3611	9.23	1.3637	0.6034	0.7603	44.25
1982	0.4060	0.0446	0.3614	10.99	1.3608	0.6006	0.7602	44.14
1983	0.4170	0.0553	0.3617	13.26	1.3393	0.5928	0.7465	44.26
1984	0.4346	0.0615	0.3731	14.15	1.3427	0.6124	0.7303	45.61
1985	0.4290	0.0697	0.3593	16.25	1.3462	0.6235	0.7227	46.32
1986	0.4177	0.0692	0.3485	16.57	1.3368	0.6387	0.6981	47.78
1987	0.4130	0.0689	0.3441	16.68	1.3385	0.6532	0.6853	48.80
1988	0.4005	0.0661	0.3344	16.50	1.3300	0.6659	0.6641	50.07
1989	0.4016	0.0667	0.3349	16.61	1.3275	0.6932	0.6343	52.22
1990	0.3939	0.0690	0.3249	17.52	1.3245	0.6862	0.6383	51.81
1991	0.3837	0.0705	0.3132	18.37	1.3391	0.6854	0.6537	51.18
1992	0.3904	0.0737	0.3167	18.88	1.3294	0.6789	0.6505	51.07

1960 to 1973 and there after a mixed trend; in contrast inequality within subregions increased consistently from 1960 to 1974 and then decreased consistently from 1976 to 1990 except in 1979 which increased slightly from the previous year. There is no consistency in subregional inequality as a percentage share of total inequality. According to the World Bank (1991), there are disparities within groups of countries that are growing among the less advanced economies as a whole, and especially in East and South Asia. Despite the crises of 1991 Gulf war for Bangladesh, India, Pakistan, Philippines and Sri Lanka such as higher interest rates on debt services and less trade and service contract and worker's remittance, inequality went down slightly in 1991 and 1992.

3.2.3 Europe

Europe although has the best distribution among all the four continents analyzed, saw its inequality increased 19.24 percent from 1960 to 1992. Though the over all trend is mixed, there is some consistent increase from 1975 to onward.

3.2.4. The Americas

Like other continents the Americas and its sub regions (North and Central America and South America) show a considerable increase of 11.12 percent in inequality without any consistency, (Table 2). In contrast to the African continent the subregional inequality in the Americas is dominant, which has above 50 percent share in total inequality throughout the 33 years of analysis. Subregional inequality increased over time but its share as a percentage of total inequality is somewhat constant as compared to other continents. The inequality within subregions also increased without any consistent pattern over time.

North and Central America almost has 90 percent or above share in GDP, while population share never increased more than 65 percent. On the other hand South America with population share of 35 percent has only less than 10 percent share in GDP.

3.3. International Income Inequality by Regions

Table 4 shows the results of analysis of international income inequality with its constituents as DCs and LDCs. Overall inequality increased substantially during the period of analysis with a consistent increase in inequality during the 1960s; with fluctuations during the 1970s with its level being highest in 1973, the year of first oil price shock and an over all increase during the 1980s with slight fluctuations.

Despite the protectionism since the 1970s, the world economy remained highly integrated. This exposed countries to external shocks. The shocks of the 1970s and the 1980s have been severe. The collapse of Bretton Woods System, sharp rise in food and other commodity prices, and soaring oil prices in 1973-74 and 1979-80 affected nearly every economy.

Regional inequality increased during the 1960s and the early 1970s. During this period LDCs share in world GDP increased only slightly from 10.30 percent to 11 percent though their population share increased from 65.42 percent to 69.02 percent. In contrast DCs share in world GDP decreased slightly from 89.70 percent to 89 percent with a big drop in population share from 34.58 percent to 30.98 percent.

Table 4
International Income Inequality by Groups of Countries

Year	LDCs, NICs, OECD, and OPEC				LDCs and DCs			
	International Inequality	Sub-regional Inequality	Average Within Regions	3 as a % age of 2	International Inequality	Regional Inequality	Average within Regions	7 as a % age of 6
1	2	3	4	5	6	7	8	9
1960	1.1394	0.9164	0.2230	80.43	1.1394	0.8795	0.2599	77.19
1961	1.1486	0.9293	0.2193	80.91	1.1486	0.8913	0.2573	77.60
1962	1.1656	0.9298	0.2358	79.77	1.1656	0.8929	0.2727	76.60
1963	1.1680	0.9250	0.2430	79.20	1.1680	0.8901	0.2779	76.21
1964	1.1799	0.9355	0.2444	79.29	1.1799	0.8987	0.2812	76.17
1965	1.2092	0.9530	0.2562	78.81	1.2092	0.9138	0.2954	75.57
1966	1.2362	0.9744	0.2618	78.82	1.2362	0.9332	0.303	75.49
1967	1.2451	0.9810	0.2641	78.79	1.2451	0.9409	0.3042	75.57
1968	1.2560	0.9915	0.2645	78.94	1.2560	0.9459	0.3101	75.31
1969	1.2593	0.9973	0.2620	79.19	1.2593	0.9488	0.3105	75.34
1970	1.2525	0.9923	0.2602	79.23	1.2525	0.9408	0.3117	75.11
1971	1.2583	0.9932	0.2651	78.93	1.2583	0.9377	0.3206	74.52
1972	1.2861	1.0087	0.2774	78.43	1.2861	0.9452	0.3409	73.49
1973	1.3017	1.0248	0.2769	78.73	1.3017	0.9512	0.3505	73.07
1974	1.2718	0.9260	0.3458	72.81	1.2718	0.8766	0.3952	68.93
1975	1.2483	0.9634	0.2849	77.18	1.2483	0.8617	0.3866	69.03
1976	1.2599	0.9681	0.2918	76.84	1.2599	0.8576	0.4023	68.07
1977	1.2574	0.9703	0.2871	77.17	1.2574	0.8604	0.397	68.43
1978	1.2612	0.9788	0.2824	77.61	1.2612	0.8775	0.3837	69.58
1979	1.2884	0.9961	0.2923	77.31	1.2884	0.8890	0.3994	69.00
1980	1.2784	0.9926	0.2858	77.64	1.2784	0.8892	0.3892	69.56
1981	1.2723	0.9900	0.2823	77.81	1.2723	0.8965	0.3758	70.46

1982	1.2646	0.9865	0.2781	78.01	1.2646	0.8940	0.3706	70.69
1983	1.2685	0.9983	0.2702	78.70	1.2685	0.9080	0.3605	71.58
1984	1.2853	1.0165	0.2688	79.09	1.2853	0.9249	0.3604	71.96
1985	1.2904	1.0287	0.2617	79.72	1.2904	0.9357	0.3547	72.51
1986	1.2934	1.0359	0.2575	80.09	1.2934	0.9413	0.3521	72.78
1987	1.2997	1.0430	0.2567	80.25	1.2997	0.9487	0.351	72.99
1988	1.2995	1.0496	0.2499	80.77	1.2995	0.9627	0.3368	74.08
1989	1.3023	1.0588	0.2435	81.30	1.3023	0.9770	0.3253	75.02
1990	1.3014	1.0578	0.2436	81.28	1.3014	0.9773	0.3241	75.10
1991	1.2981	1.0490	0.2491	80.81	1.2981	0.9641	0.334	74.27
1992	1.2980	1.0473	0.2507	80.69	1.2980	0.9601	0.3379	73.97

Regional inequality increased consistently during 1976-90 with the exception of 1982. It has a dominant share in international inequality that stayed above 68 percent for the whole period of analysis. According to World Bank (1991), in the 1980s international capital remained mainly in the industrialized countries. Many large countries, even the United States, became the net capital importer. International lenders and investors bypassed the developing countries mainly because of their high external debts and deteriorating economic and political conditions. This may also have increased the inequality in the distribution of income among developed and less developed countries.

3.4. International Inequality by Groups of Countries

Table 4 also shows the results of international inequality with LDCs, NICs, OECD, and OPEC as its constituents. Subregional inequality increased noticeably from 0.9164 to 1.0473. It increased almost consistently during the 1960s and 1980s with mixed trend during the 1970s. As a percentage share of international inequality it remained higher than 72 percent for the entire period. Average inequality within regions did not change much as compared to subregions inequality. LDCs as a group have a big share in total inequality and OECD having the minimum.

3.5. LDCs and Subregions

According to table 5 inequality in LDCs (with OPEC) increased significantly (22.91%) with a noticeable difference after the first oil price shock; but after the second oil price shock it started decreasing though it remained higher than the initial period of the analysis. There is a remarkable change in the subregional inequality as a percentage share of total inequality that decreased from 60 to 18 percent. The major decrease occurred after the first oil price shock.

As the World Bank development report (1989) mentioned "Some developing countries have taken advantage of the favorable world environment after the world wide recession of 1982. Most countries in Asia did well and their Gross National Product (GNP) grew at an annual rate of 10 percent whereas growth rate of many African nations remained zero. The heavily indebted economies continued to stagnate."

Table 5
Income Inequality among the LDCs

Year	WITH OPEC				WITHOUT OPEC				
	Inequality in the LDCs	Subregional Inequality	Average within Subregions	3 as a % age of 2	Inequality in the LDCs	Subregional Inequality	Average within Subregions	7 as a % age of 6	Excluding India
1	2	3	4	5	6	7	8	9	10
1960	0.3479	0.2101	0.1378	60.39	0.2512	0.1190	0.1322	47.37	0.3757
1961	0.3479	0.2094	0.1385	60.19	0.2552	0.1172	0.1380	45.92	0.3765
1962	0.3717	0.1843	0.1874	49.58	0.2617	0.1219	0.1398	46.58	0.4002
1963	0.3803	0.1561	0.2242	41.05	0.2621	0.1159	0.1462	44.22	0.4103
1964	0.3849	0.1560	0.2289	40.53	0.2593	0.1123	0.1470	43.31	0.4216
1965	0.4047	0.1623	0.2424	40.10	0.2754	0.1201	0.1553	43.61	0.4278
1966	0.4150	0.1619	0.2531	39.01	0.2840	0.1276	0.1564	44.93	0.4303
1967	0.4167	0.1581	0.2586	37.94	0.2805	0.1224	0.1581	43.64	0.4458
1968	0.4251	0.1585	0.2666	37.29	0.2838	0.1198	0.1640	42.21	0.4469
1969	0.4262	0.1579	0.2683	37.05	0.2847	0.1164	0.1683	40.89	0.4482
1970	0.4286	0.1602	0.2684	37.38	0.2852	0.1164	0.1688	40.81	0.4466
1971	0.4407	0.1623	0.2784	36.83	0.3005	0.1231	0.1774	40.97	0.4518
1972	0.4688	0.1679	0.3009	35.81	0.3207	0.1272	0.1935	39.66	0.4728
1973	0.4813	0.1703	0.3110	35.38	0.3230	0.1248	0.1982	38.64	0.4804
1974	0.5411	0.1160	0.4251	21.44	0.3313	0.1279	0.2034	38.61	0.5193
1975	0.5266	0.1132	0.4134	21.50	0.3178	0.1180	0.1998	37.13	0.5175
1976	0.5461	0.1077	0.4384	19.72	0.3252	0.1200	0.2052	36.90	0.5272
1977	0.5359	0.1073	0.4286	20.02	0.3183	0.1172	0.2011	36.82	0.5209
1978	0.5150	0.1093	0.4057	21.22	0.3160	0.1135	0.2025	35.92	0.5012

1979	0.5343	0.1202	0.4141	22.50	0.3382	0.1218	0.2164	36.01	0.4975
1980	0.5177	0.1303	0.3874	25.17	0.3381	0.1138	0.2243	33.66	0.4887
1981	0.4966	0.1214	0.3752	24.45	0.3319	0.1072	0.2247	32.30	0.4742
1982	0.4881	0.1107	0.3774	22.68	0.3209	0.0978	0.2231	30.48	0.4688
1983	0.4715	0.0941	0.3774	19.96	0.3026	0.0822	0.2204	27.16	0.4650
1984	0.4686	0.0961	0.3725	20.51	0.3009	0.0821	0.2188	27.28	0.4634
1985	0.4588	0.0968	0.3620	21.10	0.2920	0.0799	0.2121	27.36	0.4579
1986	0.4537	0.1012	0.3525	22.31	0.2887	0.0793	0.2094	27.47	0.4558
1987	0.4509	0.1008	0.3501	22.36	0.2894	0.0772	0.2122	26.68	0.4564
1988	0.4307	0.0919	0.3388	21.34	0.2815	0.0674	0.2141	23.94	0.4482
1989	0.4146	0.0878	0.3268	21.18	0.2796	0.0633	0.2163	22.64	0.4344
1990	0.4115	0.0784	0.3331	19.05	0.2783	0.0567	0.2216	20.37	0.4364
1991	0.4233	0.0760	0.3473	17.95	0.2840	0.0560	0.2280	19.72	0.4445
1992	0.4276	0.0752	0.3524	17.59	0.2858	0.0539	0.2319	18.86	0.4538

Among the LDCs, OPEC are rich relative to other countries. Their per capita income is far distant from the LDCs mean income and therefore supposed to affect inequality in a substantial way. Table 5 also shows inequality results after excluding OPEC countries.

This results in somewhat higher inequality. There is no consistency in the increase but the inequality remained high during the 1970s and first half of the 1980s. Subregional inequality decreased substantially and its share in total inequality went down from 47 percent to 19 percent, which shows that inequality in individual countries is on the rise. Though the inequality in LDCs without OPEC is lower than with OPEC but its movement over time is the similar except for few years during the late 1970s.

After China, India is the largest sovereign state among LDCs with population share 24.99 percent and GDP only 1.95 percent in 1990 and this affected inequality substantially. When India was excluded from LDCs, inequality values went up reasonably and increased (20.79%) over time. The increase is consistent from 1960 to 1974 except 1970 when it slightly decreased. During the late 1970s and in the 1980s it decreased continuously. Despite the exclusion of India the trend of income inequality is the same as with including India.

3.6. DCs and Subregions

Table 6 shows the inequality in DCs and subregions. Inequality in the DCs dropped more than 50% during the observed period. After the first oil price shock its decline was arrested with slight fluctuations. Inequality within subregion has major share in total inequality that increased noticeably over time from around 54 percent to 72 percent. Fast growing Asia's newly industrializing countries contributed mostly to lower the subregional

Table 6
Income Inequality among the DCs and in Europe

Year	Inequality in the DCs	Subregional inequality	Average Within subregions	3 as a %age of 2	Inequality in Europe
1	2	3	4	5	6
1960	0.0935	0.0435	0.0500	46.52	0.1913
1961	0.0831	0.0363	0.0468	43.68	0.1923
1962	0.0798	0.0346	0.0452	43.36	0.1914
1963	0.0746	0.0320	0.0426	42.90	0.1864
1964	0.0721	0.0102	0.0619	14.15	0.1912
1965	0.0711	0.0297	0.0414	41.77	0.1931
1966	0.0694	0.0296	0.0398	42.65	0.1877
1967	0.0656	0.0267	0.0389	40.70	0.1879
1968	0.0617	0.0237	0.0380	38.41	0.1880
1969	0.0569	0.0196	0.0373	34.45	0.1914
1970	0.0514	0.0147	0.0367	28.60	0.1946
1971	0.0488	0.0140	0.0348	28.69	0.1915
1972	0.0473	0.0142	0.0331	30.02	0.1907
1973	0.0448	0.0136	0.0312	30.36	0.1931
1974	0.0421	0.0113	0.0308	26.84	0.1924
1975	0.0419	0.0110	0.0309	26.25	0.1888
1976	0.0414	0.0109	0.0305	26.33	0.1890
1977	0.0421	0.0116	0.0305	27.55	0.1906
1978	0.0428	0.0124	0.0304	28.97	0.1936
1979	0.0428	0.0113	0.0315	26.40	0.2033
1980	0.0416	0.0098	0.0318	23.56	0.2109
1981	0.0433	0.0111	0.0322	25.64	0.2129
1982	0.0417	0.0094	0.0323	22.54	0.2137
1983	0.0419	0.0100	0.0319	23.87	0.2174
1984	0.0443	0.0119	0.0324	26.86	0.2210
1985	0.0452	0.0123	0.0329	27.21	0.2238
1986	0.0440	0.0118	0.0322	26.82	0.2226
1987	0.0428	0.0120	0.0308	28.04	0.2204
1988	0.0424	0.0122	0.0302	28.77	0.2238
1989	0.0412	0.0120	0.0292	29.13	0.2277
1990	0.0412	0.0115	0.0297	27.91	0.2255
1991	0.0415	0.0115	0.0300	27.71	0.2294
1992	0.0417	0.0120	0.0297	28.78	0.2281

inequality whose GDP share in total DC's GDP rose from 11.51 percent to 22.73 percent where as population share rose only slightly from 11.60 percent to 18.99 percent.

4. The Determinants of Change in International Inequality

As mentioned earlier, investment, population and exports are supposed to have significance influence on economic growth and its distribution among countries. Oshima (1983) showed that the unprecedented drop in fertility in East Asia was accompanied by a rapid transformation of agricultural economy to an industrial economy followed by a rapid decline in income inequality.

Investment is another factor that affects inequalities across nations. Investment has two different effects 'own investment ' effects and 'spillover' effects. Productive domestic investment can potentially alters the level of income and its growth rate between countries, and it also provides spillover effects that improve foreign productivity growth and thereby help in decreasing income gap between countries. Increase or decrease in income inequality depends on which effect is stronger.

The theory of comparative advantage is regarded as a compelling argument to reduce legal barriers to international trade, as liberalized trade can provide important benefits to a nation's economy. But the past pattern of trade between DCs and LDCs has led to intense specialization of DCs in manufactures and of LDCs in primary products resulting in unequal distribution of gains from trade between these groups of countries.

To examine the relationship between income inequality and these three factors namely export, investment and population, index of world export, index of world investment, index of LDCs export, index of LDCs investment and share of LDCs population in world population were calculated and international inequality levels were regressed on the log

values of these variables from 1960 to 1992. The regression was tried in different ways but LDCs exports were found to be insignificant each time. The results of the semi-log model are presented in Table 7.

Table 7
Semi-Log Regression Model of International Income Inequality and its Determinants

Variable	Coefficient*	t-stat
1. Constant	0.967783 (0.003553)	
2. ln-World Exports	0.002830 (0.000861)	3.285134
3. ln-World Investment	-0.002853 (0.000792)	-3.603868
4. ln-LDCs' Export	-0.002189 (0.001467)	-1.492633
5. ln-LDCs' population	1.238940 (0.005061)	244.7868
6. ln-LDCs' Investment	-0.001694 (0.000619)	-2.736172
R-Squared	0.999835	
adjusted R-Squared	0.999799	

* Figures in parentheses are Std.Errors

World Export, World Investment, and LDCs' population are statistically significant variables at above 99 percent confidence level. LDCs' Investment is statistically significant at 98.82 percent of confidence level.

From the results it can be inferred that when World Export as a proportion of World GDP increases by 1 percent annually, the international inequality increases by 0.0028 percent whereas when World Investment as a share of World GDP increases by 1 percent annually, the inequality decreases by 0.0029 percent. DCs have 86 percent of total World

Export whereas LDCs have only 14 percent. LDCs mainly export demand inelastic primary products to the DCs. Since the terms of trade have deteriorated against LDCs, it caused world inequality to rise. This may also be the explanation as to why the coefficient of LDCs' Export is insignificant, although it has negative sign. The DCs' Investment has stronger spillover effect, which causes inequality to decrease, which is evident from the fact that World Investment Index has larger impact than LDCs own investment index. When LDCs own investment increases by 1 percent per year, the inequality decreases only by 0.0017 percent in contrast to almost twice the impact provided by world investment index. Population has very strong effect on inequality. When share of LDCs' population increases by 1 percent annually, inequality increases by 1.24 percent.

5. Conclusions

By using Theil's decomposition measure to the data for 108 countries from 1960-92, we found that inequality at international level increased about 14 percent during this period, which is in line with Ram (1989) and Theil (1989). Decomposition analysis shows that in terms of continents regional inequality has less shares in international inequality, and it decreased considerably over time from 42 to 30 percent. Asia has the highest inequality that increased almost 40 percent during the period of analysis, the Americas next after Asia shows an increase of 11 percent. Africa though has higher inequality than Europe; it increased less (14%) in the former than (19%) in the latter over time. In Asia and the Americas subregional inequality has greater share, while in Africa it has the least.

Subregional inequality is dominant when world is divided into DCs and LDCs and also into LDCs, OPEC, OECD and NICs. Inequality is lower in LDCs, when OPEC countries are excluded. It increased 23 percent over time with OPEC and 14 percent without OPEC. When India was excluded along with OPEC from the LDCs inequality values went up considerably. DCs have more equal distribution both among and within countries that also improved over time.

Exports, investment, and population are important determinants of inequality. When world exports as a proportion of world GDP increased by one percent, inequality increased by 0.003 percent. On the other hand it decreased almost by the same percentage, when world investment as a share of world GDP increased by 1 percent. LDCs exports and investment have inverse effect on inequality, whereas LDCs population has very strong positive effect.

Different data source effects magnitudes of inequality more in developing than developed countries. Comparison of our results with Theil (1989) shows that values of inequality for the North (rich countries) are almost double than values in our study. On the other hand values of inequality in Asia from our study are more than 8 times that in Theil.¹

¹ Countries included in both these regions are not exactly the same in both studies, but they are very close.

REFERENCES

- Altimir, Oscar and Sebastian Pinera (1977),"Decomposition Analysis of the Inequality of Earnings in Latin American Countries." Economic Commission for Latin America and World Bank, memo.
- Berry, A.,F. Bourguignon, and C. Morrission (1983a),"Changes in the World Distribution of Income Between 1950 and 1970", Economic Journal vol. 93 pp. 331-350.
- Chiswick, Carmel U., (1976)," Application of the Theil Index to Income Inequality." International Bank for Reconstruction and Development, Working Paper Ser. B-2.
- Fisher, Albert, (1972)," Brazilian Size Distribution of Income." American Economic Review, pp.391-402.
- Levy Amnon and Khorshed Chowdhury, (1994)," Intercountry Inequality: World Levels and Decomposition Between and Within Developmental Clusters and Regions."
- Oshima, Harry T., (1983)," The Industrial and Demographic Transition in East Asia." Population and Development Review, vol. 9.
- Ram Rati (1989),"Level of Development and Income Inequality:An Extension of Kuznets Hypothesis to the World Economy". Kyklos, vol. 42, pp. 73-87.
- Seale, James L. Jr., Hanri Theil and Sri Devi Deepak, (1995), "Growth and its Disparity in Rich and Poor Regions", Economics Letters, vol. 45, pp. 467-470.
- Theil,H., (1967),"Economics and Information Theory", North Holland, Amsterdam, The Netharlands.
- _____ (1979)," World Inequality and Its Components." Economic Letters, vol.2 pp.8- 14.
- _____ (1989),"The Development of International Inequality Between 1960-1985." Journal of Econometrics, vol.42, pp.145-155.
- World Bank, (1989),"World Bank Development Report, 1989." Washington, DC: Johns Hopkins University Press for the World Bank.

_____, (1991), "World Bank Development Report, 1991." Washington, DC: Johns Hopkins University Press for the World Bank.

_____, (1994), " Adjustment in Africa: Reforms, results, and the Road Ahead." World Bank Policy Research Report.

_____, (1994), "World Bank Indicators on CD-ROM", The World Bank.