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and
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ABSTRACT

This paper analyzes the issue of per capita income convergence and world level of intercountry income inequality within a geographical context. The evolution of the world level of intercountry income inequality and its decomposition between and within geographical clusters and regions between 1960 and 1990 are analysed by applying the income-weighted entropy measure into a dataset of national-output estimates adjusted for purchasing power parity. The computation reveals that, in general, the period can be divided into three distinct phases of strong divergence (1960-1968), slow convergence (1969-1983) and stagnation (1984-1990).

1 INTRODUCTION

Global trends in per capita income differences among countries have become a major research topic for economists over the last ten years. Neoclassical growth theories have suggested that diminishing returns to reproducible capital, transfer of technology, knowledge and inputs from leader economies to followers, and improved absorptive capacity in poor countries as human capital is accumulated tend to narrow the per capita GDP gaps among countries. This convergence hypothesis has been further supported by the diversion of productive energies into activities of self expression in rich countries (Olson, 1982), but has been challenged by the more recent theories of endogenous growth which emphasize the positive spillover effects of the extensive research and development effort and investment on the rich countries' level of technology, the adverse effects of labor supply on the poor countries' level of technology, and the productivity gains stemming from increasing variety of specialized inputs as international trade expands (Romer, 1986, 1987, 1990; Grossman and Helpman, 1991, ch. 6; Rivera-Batiz and Romer, 1991).

In more formal terms, a neoclassical growth theory is based on the following analytically convenient assumptions:

- i. the aggregate, or national, production function is

$$Y(t) = A_0 e^{\mu t} K(t)^\alpha L(t)^{1-\alpha}$$

- ii. the net accumulation of capital stock is given by

$$\dot{K}(t) = I(t) - \delta K(t)$$

- iii. the national saving is

$$S(t) = sY(t)$$

- iv. the population, or labour force, grows in accordance with the exponential function

$$L(t) = L_0 e^{nt}$$

where,

K = capital stock,

L = labour,

Y = aggregate product,

I = gross investment,

S = saving,

A_0 = initial level of technology,

μ = rate of technological change,

α = production elasticity of capital, $0 < \alpha < 1$,

δ = rate of capital depreciation, $0 < \delta < 1$,

s = propensity to save, $0 < s < 1$

L_0 = initial population, and

n = population growth rate.

Consequently, a neoclassical growth theory suggests that the rate of growth of per capita income can be expressed as:

$$\frac{\dot{y}(t)}{y(t)} = \mu + \alpha[sA_0 e^{\mu t} k(t)^{\alpha-1} - (\delta + n)]$$

where,

y = per capita income, and

k = capital-labour ratio.

The above equation displays the positive effects of technological improvement and saving rates and the adverse effects of capital depreciation and population growth rates on a country's per capita growth rate. It also indicates that due to diminishing marginal product of capital the rate of growth of per

capita income declines as the capital-labour ratio rises. Thus, if all other factors are the same, there is a scope for catching-up and convergence of per capita income across countries. In contrast, the A-K formulation of the aggregate production function adopted by the relatively new endogenous growth approach (i.e., $\alpha=1$ in terms of the above neoclassical model) suggests that accumulation of capital will not necessarily lead to a slowdown of per capita income growth even when all other factors are the same.

As can be seen from Figure 1 — in which cumulative distribution curves are constructed with Pennsylvania World Tables 5.5 (1993) estimates of income adjusted to purchasing power parity and ordered from the lowest to the highest and weighted by the respective countries' population share — per capita income rose, in real terms, considerably and almost continuously from 1960 to 1990 for the bottom 60 per cent and top 20 per cent but remained approximately stagnant for the middle 60 to 80 per cent of the world population. That is, during the last three decades there was a general process whereby the bottom 60 per cent caught up to some extent with the middle income group while the latter fell behind the forging ahead top 20 per cent.

Empirical analyses of the convergence-divergence hypothesis have typically considered groups of countries characterized by a similar stage of economic development and economic system. In the case of the technologically advanced countries, these analyses have lent support to the existence of a convergence process among the technologically advanced countries (e.g., Maddison, 1982; Abramovitz, 1986; and Dowrick and Nguyen, 1989), between these countries and the outward oriented developing countries (e.g., Dollar, 1992) and among the centrally planned economies (e.g., Summers, Kravis and Heston, 1984; Baumol, 1986). However, Summers, Kravis and Heston (1984) have found that

Figure 1: Global Cumulative Income Distributions, 1960-1990

despite these convergence phenomena, the worldwide level of income inequality remained approximately stagnant between 1950 and 1980. Correspondingly, Baumol (1986) and Baumol and Wolff (1988) suggested that there are several convergence-divergence clubs. He argued that income levels converged within the groups of the centrally planned economies and the middle-income market economies but not within the group of the low-income market economies. He also found that income levels have generally diverged among the aforementioned groups with the exception of the centrally planned economies which caught up with the advanced market economies to a slight extent. Yet by analyzing the determinants of growth rates with regression analyses and controlling for initial school enrolment rate, Barro (1991) has found a significant convergence process across countries. Similarly, Mankiw, Romer and Weil (1992) have concluded that, factoring out population growth and capital accumulation, the standards of living across countries converge at about the rate predicted by an augmented Solow model.

Although it is interesting to study the income differences and existence of convergence or divergence processes within and between general groups of countries characterised by similar economic development stage and economic system, a considerable level of income inequality exists between and within regions and the utmost adverse effects and expression of intercountry income inequality are likely to occur among neighbouring countries and regions. In an earlier study of intercountry income inequality we (Levy and Chowdhury, 1994) have found that the aggregate level of income inequality between and within regions overshadowed the inequality between clusters of countries of similar stage of development and market system. Hence, it is interesting to pursue this issue further and decompose the aggregate intercountry income inequality into interregional and intraregional categories

with a recent data base on international comparisons of real product and price levels.

It is worth noting that in addition to intercountry and interregional income differences, a complete and ideal measurement of changes in the world-wide level of income inequality should take into account changes in income inequality within countries. In this respect, the factor-price equalization theory has lent support to the argument that during the 1980s and 1990s the growing globalization of the world economy has narrowed the income inequality in developing countries in the South but widened the income inequality in advanced countries in the North. The underlying rationale provided by advocates of this theory such as Wood (1991, 1994, 1995), Batra (1993), Bloom and Brender (1993), Leamer (1993, 1994), Bhagwati and Kosters (1994) and Baldwin (1995) stems from the well-known Heckscher-Ohlin trade model. That is, the broadening implementation of the comparative-advantage principle in production and trade has raised the earnings of skilled labor in advanced countries and low skill workers in developing countries, but has immiserated low-skill workers in advanced countries and skilled labor in less developed countries. In contrast, Laurence and Slaughter (1993), Krugman and Laurence (1994), Freeman (1995) and Richardson (1995) have argued that trade liberalization is a moderate contributing source of income inequality and is likely to be overshadowed by other sources such as technological changes that occur independent of trade, political developments; such as the transition of the former centrally planned economies to market economies, fragmentates of the Soviet Union and Yugoslavia and the subsequent instability and ethnic conflicts, reunification of Germany; as well as trade union activities and educational, training, and social welfare policies. The incorporation of this interesting North-South trade effects on within countries income inequality to the analysis of global income-inequality levels and

trends is beyond the scope of the present analysis due to data constraint.

2 BRIEF HISTORICAL BACKGROUND

Our focus on income inequality between and within geographical regions is based on the proposition that intercountry and interregional income inequalities are indicators of relative national and regional deprivation, and hence they have important implications on the stability of political, social and economic systems. The history of the human kind lent support to such an argument. Large income and wealth differences between countries and regions generated acts of aggression which inflicted considerable human suffering, loss of resources and knowledge, destruction of civilizations and environmental damage.

The frontiers of the Roman Empire were assailed almost continuously by raiding parties of barbarians, who aimed to amass as much plunder as possible before retreating. Eventually, previously settled German tribes, driven by the Asian Huns, poured through the boundaries of the empire and sacked Rome in 455 AD. Later, the effective rule of the Carolingians in western Europe and of the Mercians in England gave some assurance of internal security that encouraged accumulation of wealth. However, the relative prosperity of these places and the negligence of the defence lines constructed earlier by the Romans attracted external raiders. In the 9th and 10th centuries western Europe was attacked by the Saracens from Islamic Spain and North Africa, the Magyars from the Hungarian Plain and the Vikings from Scandinavia. The destructive energies of these raiders devastated Europe economically and demographically and transformed it into an intricate interlacing of counties, communities, principalities and lordships. Despite the strong process of recovery that started in 955, Europe still stood at the

beginning of the 16th century on the periphery of the civilized world, overshadowed by the Ming Empire of China and by the rising Ottoman and Safavid empires of the Middle East and the Mughal empire of southern Asia.

The European exploration and expansion during the 16th, 17th and 18th centuries — which were motivated to a large extent by prospects of finding sources of precious metals, raw materials, spices, fertile land and subsequently slave work-force — brought all the continents for the first time into direct contact with each other. In many cases, non-Eurasians prosperous civilizations, such as the Aztec in Mesoamerica, the Inca in North-Andean region, the Songhay empire in west Africa and the Khoisan kingdom at the southern tip of Africa, found themselves unable to put more than a feeble resistance to foreign invasion and aggression. From 1450 to 1870, at least 11.5 million Africans were captured, transported, and traded as slaves. Moreover, the rapid industrialization of Europe during the 19th century generated demand for new sources of raw materials and large markets, which in turn increased the exploitation of overseas territories and the tension between European powers. The rivalries between the European states were transferred to the rest of the world. In Africa, even trivial incidents between competing European traders led to major international crises, and initiatives undertaken locally by European agents set in motion in the undignified scramble for possession of the continent.

The industrial revolution, which had spread from Great Britain to northwest Europe and the east coast of the United States, continued expanding to other places but at different rates, depending on economic, social and cultural conditions in the recipient countries. Societies in the new world formed or dominated by Europeans adopted industrialization with the same ease as the home country, with Anglo-Saxon areas of settlement well ahead of those of the Spanish and the Portuguese.

However, in most non-colonial societies, industrialization was not an integral and a widespread process but rather limited to certain enclaves where much of the economic and political control passed to Europeans and hardly improving the welfare of the majority native inhabitants.

Between 1871 and 1914 the European Great Powers established their control over the non-European world to an extent never seen before or since and their multi-faceted system of diplomatic alignments permitted peaceful resolutions of rivalries. This system, however, has been weakened by Germany's aspiration to dominate Europe and the rivalry between the European imperial powers escalated to a global war that inflicted an immense human and material losses and political and social changes including the Russian revolution and civil war and the dismantlement of the Ottoman and Hapsburg empires and the rise of the United States as an industrial giant and later also as a financial centre and military power that transformed and shaped the modern world. Although the British, French and Italian empires in Asia and North Africa had reached their greatest extent by the end of the First World War, their position was tremendously weakened by the war. It was weakened further by the growth of a new view of imperial rule as a temporary and limited order embraced by the League of Nations, the criticism and challenges voiced by the Soviet Union, the United States and later by Nazi Germany, and the revival of nationalist movements striving for independence in the controlled areas. Moreover, the destruction of the Habsburg Empire and the effects of the Russian Revolution and civil war drastically changed the balance of power in Europe. In terms of population and industrial strength, Germany was left without a counterbalance in central Europe.

The First World War also led to a large increase in productive capacity which was not matched by a comparable rise in demand due, among other things, to insufficient real-wage increase. The

increase productive capacity allowed food and raw material prices to decline throughout the 1920s, worsening the terms of trade for countries dependent on the export of such commodities and impoverishing farmers. In addition, the pre-war monetary system of fixed exchange rates and free convertibility was replaced by the Gold Exchange Standard, which never achieved the stability necessary to rebuild world trade. With the onset of the Great Depression, the financial and economic chaos led to the collapse of economic liberalism and liberal political institutions and to the revival of economic and militant nationalism in central and south Europe and in Japan, which broke the post First World War's fragile peace agreements and the international authority of the League of Nations. The Japanese expansionism in the 1930s, stemmed from a desire to achieve self-sufficiency in the supply of raw materials and energy, military security and leadership of eastern Asia, and, in particular, Germany's annexation of Austria and the Sudetens and assault on Poland in an attempt to build a 1000-year Reich led to the greatest and most global military confrontation and human catastrophe the world has ever seen.

After the Second World War and until the late 1980s the world was largely divided into two ideological, political, economic and military pacts led by the United states and the USSR. Despite the Glasnost and Perestroika, the disintegration of the Eastern Block and the Soviet Union and the transition to a new world order with the United States as a single super power, the world has seen major incidences of military aggression aimed at, to a large extent, achieving control on land, natural resources and people; such as the Iraq-Iran war, the Iraqi invasion of its rich neighbour Kuwait, ethnic cleansing and civil wars in Afghanistan, Ethiopia, Sudan, Somalia, Myanmar, Bosnia and Rwanda; that led to international crisis, military confrontation, massive loss of life, natural resources and infrastructure and environmental catastrophe. Moreover, the fragile political balance of one of the

world's most unstable regions, the Middle East, is threatened not only by ethnic, cultural and religious differences but also by disputes on utilization and control of depleting and deteriorating sources of fresh water. Nevertheless, the post Second World War era has also seen a substantial and general increase in regional and global economic cooperation and trade. This increase has likely been stimulated by interregional and intraregional income differences and, in turn, has affected those differences.

Finally, it is important to note that throughout the history of the human kind differences in income per capita and economic opportunities propelled migration from countries and regions with limited opportunities to richer ones. Since 1500 AD there has been a sequence of large waves of immigration from the Old World to the New World. After the Second World War there have also been a considerable stream of intraregional migration, most notably from Mexico to the United States and from South and East Europe to North Europe. On the one hand, immigration advanced the concept of multi-culturalism and the potential for higher degree of international awareness and openness and improved economic interactions among countries. On the other hand, immigration aggravated racial problems in the host countries in periods of economic recession.

3 DATA AND THE CONCEPTUAL FRAMEWORK

Our analysis of intercountry income inequality applies the information index of income inequality and its decomposition to income data adjusted for purchasing power parity for a hundred and fifty-four countries provided by Pennsylvania World Tables (PWT 5.5, 1993). The national income data are computed by multiplying the population figure by real gross domestic product per capita (RGDPCH) in constant dollars (Chain Index, expressed in international prices, base 1985). The incomplete

data for many developing countries and, in particular, those established after 1950, has restricted the analysis to the thirty-one year period between 1960 and 1990. The countries have been classified into fifteen regions of the four major continental clusters: North Africa, East Africa, Central and West Africa, and Southern Africa in the African cluster; North America, Central America, South America, and The Caribbean in the American Cluster; The Middle East and The Gulf, South Asia, and East Asia and the Pacific in the Asian cluster; and North Europe and The British Isles, Southern Europe, East Europe, and Scandinavia in the European cluster. The detailed classification of countries by clusters and regional groups is given in the Appendix.

Based on the notion of entropy in information theory, Theil (1967) has defined an income inequality measure, which is particularly useful for handling grouped data and for providing explanation for the degree of income inequality:

$$T = \sum_{i=1}^N y_i \log \frac{y_i}{x_i}$$

where y_i and x_i are the income and population shares of group i , respectively, and N is the number of groups. When income is equally distributed between the groups T is equal to zero and when all income is attained by one group, the index receives a value of $\log N$. This measure can be interpreted as the expected information of the indirect message that transforms the prior probabilities as represented by population shares of groups into the posterior probabilities as represented by the groups' income shares (Kakwani, 1980, pp. 88-89). When applied to cross-country data, the Theil's inequality index suggests that the aggregate level of intercountry income inequality in any given year is equal to the weighted sum of the logarithms of the countries' income share-population share ratios, where the weights are the

countries' income shares in the world income. Our choice of this index is based on its attractive decomposition properties. Theil's inequality index can be straightforwardly and conveniently decomposed between and within groups for any number of groupings specified. Moreover, the Theil's inequality index satisfies the Pigou-Dalton criterion of being adequately responsive to income transfer from rich to poor and, as has been proven by Bourguignon (1979), it is the only income-weighted decomposable inequality measure which is differentiable, symmetric, and homogeneous of degree zero in all incomes. Hence, it can be considered as a very satisfactory index for measuring income inequality between and within groups of countries.

Following Fishlow (1972), the computation of the world level of intercountry income inequality (WI) employs a decomposition formula of Theil's entropy coefficient that preserves and measures the contribution of the constituents of the aforementioned geographical classification — the continental clusters and their fifteen regions — whose sum is equal to the total income inequality between countries:

$$WI_{ijk} = \sum_{i=1}^4 y_i \log \frac{y_i}{x_i} + \sum_{i=1}^4 y_i \sum_j \frac{y_{ij}}{y_i} \log \frac{y_{ij}/y_i}{x_{ij}/x_i} + \sum_{i=1}^4 \sum_j \frac{y_{ij}}{y_i} \sum_k \frac{y_{ijk}}{y_{ij}} \log \frac{y_{ijk}/y_{ij}}{x_{ijk}/x_{ij}}.$$

Here,

- i = a continental cluster index,
- j = a region index,
- k = a country index,
- y_i = the income share of cluster i in the world income,
- x_i = the population share of cluster i in the world population,
- y_{ij} = the income share of region j affiliated to cluster i in the world income,
- x_{ij} = the population share of region j affiliated to cluster i in the world population,

y_{ijk} = the income share of country k affiliated to region j of
the i -th cluster in the world income, and
 x_{ijk} = the population share of country k affiliated to region j
of the i -th cluster in the world population.

While the first term on the right-hand-side of the equation indicates the level of income inequality between the continental clusters, the second term displays the weighted sum of income inequality levels between the regions of these clusters (i.e., aggregate *inter-regional* inequality), and the third term the weighted sum of income inequality levels within the regions (i.e., aggregate *intraregional* inequality).

The results of our empirical analysis are reported in the following sections. Section 4 summarises the global levels of intercountry income inequality and their decomposition between and within the geographical clusters of Africa, America, Asia and The Pacific, and Europe as well as between and within their fifteen distinct regions. Sections 5, 6, 7 and 8 describe the evolution of income inequality between and within the regions of the African, American, Asian and the Pacific, and European clusters, respectively.

4 WORLD-WIDE INTERCOUNTRY INCOME INEQUALITY AND ITS CONSTITUENTS

The global changes and trends in intercountry income inequality are summarised by Figure 2, which displays the world-level of intercountry income inequality and its three aforementioned constituents, and by Figures 3 and 4, which depict the contribution of each continental cluster to the aggregate level of intraregional income inequality and interregional income inequality, respectively. Our computation of the Theil index indicates that the aggregate level of intercountry income inequality

rose by 16.52 per cent from 1.054 in 1960 to 1.228 in 1990. By recalling that the lower bound of the Theil index is zero and that the upper bound is equal to the log of the number of countries included in the analysis and by standardising the computation results to the unit interval we obtain that during the observed period the aggregate level of intercountry income inequality rose from 0.4819 to 0.5615 and reveal a high level of inequality. However, a close inspection of Figures 2–4 reveal that a large rise in the overall index took place during the 1960s and was followed by slow decline during the 1970s and a stagnation during the 1980s. These three distinct phases in the time trajectory of the world-wide level of intercountry income inequality are described and analysed in detail in the following sub-sections.

Figure 2: World-wide level of inter-country income inequality and its constituents*

* The numbers in parentheses indicate levels of total intercountry income inequality within the unit interval.

Figure 3: Income inequality within regions of the geographical clusters

Figure 4: Income inequality between regions of the geographical clusters

Phase 1 (1960-1968): Strong Diversion

Between 1960 and 1968 the aggregate level of intercountry income inequality rose considerably by 28.92 per cent to a peak of 1.35897, which is equivalent to 0.6212 in the unit interval. This rise indicates a strong divergence process of per capita income accross countries. As can be seen from Figures 3 and 4, this divergence process was predominantly fuelled by a spectacular increase of 133.62 per cent in income inequality within the regions of Asia and the Pacific and, until 1967, also by a large increase of 67.52 per cent in income inequality between the regions of that cluster, which, in turn, led to a rise of 72.04 per cent and 27.59 per cent in the aggregate levels of income inequality within and between regions, respectively.

The shifts in 1968 in the three aggregate components of income inequality of within regions, between regions and between continental clusters were caused by the inclusion of China into the analysis for the first time. The affiliation of China in 1968 as a member of the region of East Asia and the Pacific led to an immediate increase of 62.88 per cent in intercountry income inequality within that region and a decline of 66.24 per cent in income inequality between the regions of the Asian cluster. The resultant increase in both the aggregate income inequality within regions and income inequality between continental clusters exceeds the decline in aggregate level of income inequality between regions, and, consequently, the recorded level of world-wide intercountry income inequality hiked by 7.90 per cent in 1968. The inclusion of China reversed the relative shares of the constituents of global income inequality. By the end of this phase, income inequality within regions became the largest constituent with 42.62 per cent of global income inequality, followed by income inequality between continental clusters and income inequality

between regions with 29.29 per cent and 28.09 per cent, respectively. Figure 3 indicates that while intraregional income inequality soared upwards in the Asian cluster it remained approximately stagnant and relatively low in the African cluster, the American cluster and, in particular, the European cluster. In addition, Figure 4 reveals that between 1960 to 1967 inter-regional income inequality in the African and American clusters and, in particular, in the Asian cluster rose considerably while inter-regional income inequality in Europe declined. The major components of inter-regional income inequality were the American and the Asian clusters followed by the African and the European clusters. Following the inclusion of China to the analysis, the contribution of the Asian cluster to the overall inter-regional income inequality fell dramatically to a level below that of Africa, whereas the level of inter-regional inequality in the American cluster remained the highest.

Phase 2 (1969-1983): Slow Convergence

Figure 2 indicates that between 1969-1983 the aggregate intercountry income inequality declined along a decreasing, but oscillating, trajectory by 10.58 per cent indicating a considerable world-wide convergence of income. This convergence process was fuelled by a considerable decline in overall *intraregional* inequality and in income inequality between clusters of 16.47 per cent and 35.13 per cent, respectively, that dominates the 23.93 per cent rise in the overall *inter-regional* income inequality. By the end of this phase inter-regional income inequality caught up with intraregional income inequality, and each comprises about 39 per cent of the global level of income inequality. The rest 21 per cent were attributed to income inequality between the four continental clusters. As can be seen from Figure 3, the decline in the world-wide level of intraregional income inequality can be attributed to

the large decline in intraregional income inequality in the Asian cluster of 25.13 per cent. Despite this considerable decline and the slight increase in intraregional income inequality in Africa, most of the world intraregional inequality still stemmed from the Asian cluster. Figure 4 reveals that during the second phase the differences in inter-regional income inequalities between the four clusters were significantly reduced. Inter-regional income inequality in America declined between 1969 and 1976 but thereafter gradually returned to the initial level. After the 1968 downward shift, inter-regional income inequality in the Asian cluster considerably rose. The upward shift in the level of inter-regional income inequality within the European cluster in 1970 is due to the inclusion of data on the centrally planned economies in East Europe for the first time. This shift was considerably moderated thereafter as the centrally planned economies caught up to a certain extent with the advanced market economies of Europe. Between 1969 to 1977 inter-regional income inequality in Africa declined and became the world's lowest one, but later quickly rose to become the world's second largest.

Phase 3: Stagnation

As can be seen from Figure 2, during this phase the aggregate intercountry income inequality remained approximately stagnant. The slight increase between 1985 and 1990 can be attributed to a rise in the aggregate level of inter-regional income inequality. The share of inter-regional income inequality in global income inequality continuously rose from 38.94 per cent in 1983 to 43.80 per cent in 1990. Figure 4 reveals that the rise in the aggregate level of inter-regional income inequality was predominantly fuelled by the increase in inter-regional income inequality within the American cluster during the 1980s and, to a lesser extent, by the increase in inter-regional income inequality in Africa in 1984

and 1985 and by the slight and continuous increase in inter-regional income inequality in the Asian and the European clusters. However, much of the effect of the rise in the aggregate level of inter-regional income inequality on the global level of intercountry income inequality was moderated by the slight decline in both the aggregate intraregional income inequality and the inter-cluster income inequality. By 1990 the share of intraregional income inequality in the global income inequality level was reduced to 37.16 per cent and the share of inter-cluster income inequality to 19.04 per cent. Figure 3 indicates further that the decline in the aggregate level of intraregional income inequality was accommodated by the significant decline in intraregional income inequality in the Asian cluster that exceeded the rise in intraregional income inequality in the American cluster. This figure also indicates that intraregional income inequality in the African and European clusters remained stagnant. A possible explanation to the considerable rise in inter-regional and intraregional income inequality in the American cluster during this phase is the, non-uniform, economic slowdown in many of the debt-burdened countries of South America, Central America and the Caribbean.

5 INTERCOUNTRY INCOME INEQUALITY IN AFRICA

Our calculations reveal that during the 1960s and the first half of the 1970s income inequality between the regions of North Africa, East Africa, Southern Africa and Central and West Africa changed slightly. In contrast, since 1977 inter-regional income inequality in Africa substantially rose by 76.52 per cent to a peak level of 0.13640 in 1985 and later slightly declined to a level of 0.12070 in 1990. Furthermore, although the aggregate level of intraregional income inequality in Africa was moderate during the last three decades, it gradually rose by 35.51 per cent. This considerable rise was fuelled by the large increase of intercountry

income inequality in Southern Africa and in Central and West Africa of 111.09 per cent and 96.94 per cent, respectively, over the entire period. While in Southern Africa the rise of intercountry income inequality was relatively steady, it was less so in Central and West Africa where much of the hike, 62.14 per cent, took place at the period of the first oil shock between 1973 and 1976 as some of the region's oil exporting countries (e.g. Nigeria) forged ahead while the others slowed down. It should be noted that also in the case of Southern Africa, the first oil crisis period was characterised by an accelerated rise in intercountry income inequality of 28.39 per cent as well as the initial period between 1960 to 1964 which saw a 34.50 per cent increase.

The figures for East Africa reveal that intercountry income inequality declined substantially during the first half of the 1960s by 28.14 per cent from a peak of 0.12316 in 1960 and thereafter slightly oscillated around the 0.09 level. The figures for the second half of the 1980s indicate a steady rise in intercountry income inequality in that region.

The lowest levels of intercountry income inequality in Africa have been enjoyed by the North African region. In this region, a substantial decline of 73.39 per cent was registered during the 1960s and intercountry income inequality remained very low until 1971. During the first half of the 1970s intercountry income inequality rose to a level of 0.04237 and thereafter gradually declined and converged, in the late 1980s, to the 1960s' low level.

A more detailed description of the evolution of intercountry income inequality in Africa is given in Table A.2 in the Appendix.

Figure 5: Inter-country income inequality in Africa

6 INTERCOUNTRY INCOME INEQUALITY IN THE AMERICAN CLUSTER

As indicated earlier, the American cluster has been the major constituent of inter-regional income inequality. Income inequality between the regions of North America, Central America, South America and the Caribbean slightly rose during the 1960s and then declined more substantially during the 1970s. However, a considerable rise of 43.85 per cent has been registered during the 1980s leading to a peak of 0.20876 in 1990. In contrast, the weighted sum of intercountry income inequality within the American regions was substantially lower but rose, almost continuously, from 0.06444 in 1960 to 0.07555 in 1990. Among the American regions, the Caribbean experienced an exceptionally high level of intercountry income inequality which continuously rose, with few downturns, by 95.22 per cent from 0.19860 in 1960 to 0.38771 in 1990. In contrast, intercountry income inequality in South America, which was the second highest in the American cluster during the 1960s, declined substantially between 1966 and 1990 by 74.98 per cent and became the lowest one in that cluster since 1979. Finally, intercountry income inequality rose substantially and almost continuously by 39.07 per cent in North America. Since 1972 this region has had the second highest level of intercountry income inequality in the American cluster. Similarly, intercountry income inequality rose by 203.81 per cent in Central America, which until 1979 had the lowest level of intercountry income inequality in America.

More detail about intercountry income inequality in the American cluster is given by Table A.3 in the Appendix.

Figure 6: Inter-country income inequality in America

7 INTERCOUNTRY INCOME INEQUALITY IN THE ASIA AND THE PACIFIC

The Asian cluster has been the major contributor to aggregate intraregional inequality over the entire observed period. While the inclusion of China since 1968 has enormously increased the recorded level of intraregional income inequality in Asia and world-wide in the short-run, it reduced drastically the computed level of inter-regional income inequality in Asia and world-wide in the short-run. However, these dramatic shifts have been largely and continuously moderated thereafter by the substantial and continuous decline of 42.66 per cent in intercountry income inequality within the region of East Asia and the Pacific from a peak of 0.56203 in 1968 to 0.32226 in 1990. Interestingly, during the observed period intercountry income inequality in the Middle East and the Gulf has been relatively low despite the large differences between the region's countries in oil resources. Between 1960 to 1973 there was a slight increase, in absolute terms, in intercountry income inequality in that region from 0.04538 to 0.07151. Despite the oil shock of 1973/4, intercountry income inequality in the Middle East and the Gulf had declined by 43.28 per cent between 1973 and 1978. In contrast, during the period of the second oil crisis intercountry income inequality in that region rose by 79.24 in 1979 but subsequently declined between 1980 to 1982 to a lower level than that of 1978. During the rest of the 1980s the level of intercountry income inequality in the region was significantly lower than in the previous decades, possibly because of the oil glut and the Iran-Iraq war that adversely affected the revenues of the oil exporting countries in the region. Finally, the lowest intraregional inequality in the Asian cluster was experienced by South Asia where intercountry income inequality remained stable over the entire period.

Figure 7: Inter-country income inequality in Asia and the Pacific

A detailed description of the evolution of intercountry income inequality in the regions of the Asian cluster is given in Table A.4 in the Appendix.

8 INTERCOUNTRY INCOME INEQUALITY IN EUROPEAN CLUSTER

As can be seen from Figure 3, the contribution of the European cluster to aggregate income inequality within regions was the smallest and slightly declined over the observed period. Similarly, the contribution of this cluster to the aggregate income inequality between regions was the smallest and declining, excluding the period between 1970 to 1978. In 1970 inter-regional income inequality in the European cluster rose by 165.60 per cent due to the inclusion of the East European region for the first time as data on this region has become available. Nevertheless, inter-regional income inequality has declined during the rest of the 1970s and the 1990s by 24.90 per cent. Much of this decline occurred between 1973 and 1975. Intercountry income inequality in the regions of the European cluster has been the lowest. However, there has been a significant difference between Southern Europe and the other European regions. While in the latter regions intercountry income inequality has been extremely low and generally declining, intercountry income inequality in the former was considerably larger and its trajectory conformed to a U-shaped curve reflecting a significant decline from 0.05773 in 1962 to 0.02661 in 1978 followed by a rapid increase in inequality and convergence to the initial level during the 1980s.

The evolution of intercountry income inequality in the regions of the European cluster is described further in Table A.5 in the Appendix.

Figure 8: Inter-country income inequality in Europe

9 CONCLUSION

The application of Theil's index of income inequality and its decomposition between and within continental clusters and regions to the Pennsylvania World Table (1993) of international comparison of per capita income adjusted for purchasing power parity revealed that between 1960 to 1990 the aggregate level of intercountry income inequality rose by 16.52 per cent and that three distinct phases can be identified. The first phase encompasses the period between 1960 and 1968 in which a strong divergence process took place. Between 1960 and 1967 the aggregate level of intercountry income inequality rose considerably by 19.47 per cent from 1.05413 to 1.25936. This increase was fuelled by intensifying inter-regional and intraregional income inequality. Moreover, in 1968 the computed aggregate intercountry income inequality hiked by 7.91 per cent to a peak of 1.31945 as the computed intercountry income inequality for the region of East Asia and the Pacific rose dramatically by the inclusion of data on China for the first time. In the second phase, 1969-1983, aggregate intercountry income inequality trajectory exhibited a decreasing trend, fuelled by a considerable decline in intraregional inequality, amounting to a 10.58 per cent decline indicating a significant and steady overall convergence process of per capita income. During the third phase, 1984-1990, the aggregate intercountry income inequality remained approximately stagnant, with a slight increase between 1985 to 1990 that can be attributed to an intensified inter-regional income inequality.

The decomposition of Theil's inequality index into the four continental clusters and their fifteen regions revealed that in general income inequality between the four clusters declined gradually and constituted only 19.03 per cent of the overall intercountry income inequality in 1990 *vis a vis* 28.89 per cent in 1960. In contrast, inter-regional income inequality, with the exclusion of the 1968 shift, rose gradually and kept pace with the

general increase in total intercountry income inequality. In 1990 inter-regional income inequality constituted 43.80 per cent of the total intercountry income inequality *vis a vis* 39.17 in 1960. In 1960 intraregional income inequality constituted 31.94 per cent of the total level of intercountry income inequality. The increase in this factor between 1960 and 1968 made it the largest constituent of income inequality between 1968 and 1982 and responsible to as much as 42.62 per cent of the total intercountry income inequality level in 1968. However, the gradual decline in this constituent thereafter reduced its share in total intercountry inequality to 37.16 per cent in 1990.

It is important to note that, in addition to the choice of the inequality index, the validity of the abovementioned findings rests upon the accuracy of official statistics. Although the PWT 5.5 (1993) national-output estimates are adjusted for purchasing power parity, they are still likely to suffer from considerable measurement problems due to quality improvement, and in some cases price decline, of existing products, introduction of new goods, shortening of product life-cycle, growing share of intangible products such as ideas in human-capital intensive industries, and the increasing role of multinational corporations.

Since 1990 the world has seen dramatic changes in the centrally planned economies. The collapse of the communist regimes and the Comecon in Central and Eastern Europe and the fragmentation of the former Soviet Union and Yugoslavia might worsen the global level of intercountry income inequality during the first half of the 1990s considerably. The shift of these formerly centralised economies to market economies started with an extremely deep recession and economic hardship. Stanley Fischer, Ratna Sahay and Carlos Vegh (1996) have found that the average transitory recession lasted 3.6 years in nine of the ten economies in Central and Eastern Europe, Mongolia, the Baltic countries, Armenia and the Kyrgyz Republic with an average reported

output decline of 33.6 per cent. In the other former centrally planned economies which have been less committed to reforms, including Russia and most of the other former Soviet Union republics, the recession still continues and the cumulative reported average decline of output as of 1994 has been almost 50 per cent and has been accompanied by a high rate of inflation.

In contrast, the liberalising economic reforms in China has led to a spectacular two-digit rate of economic growth per annum during the first half of the 1990s. Given China's initial low per capita income, high share in the world population, and low population growth rate, this spectacular growth has played a crucial role in moderating the global level of intercountry of income inequality. The effects of these dramatic political and economic events as well as the effects of the formation of special trade zones in East Asia and in the Americas on the global level of inter-country income inequality are likely to be substantial and deeply extended into the twenty-first century.

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APPENDIX

Countries Affiliation by Cluster and Region

The African Cluster

North Africa: Algeria, Egypt, Morocco, Tunisia, and Malta.

East Africa: Burundi, Comoros, Ethiopia, Kenya, Seychelles, Somalia, Sudan*, Tanzania, and Uganda.

Central and West Africa: Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mauritania, Niger, Nigeria, Senegal, Sierra Leone*, Togo, and Zaire.

Southern Africa: Angola, Botswana, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Reunion, Rwanda, South Africa, Swaziland, Zambia, and Zimbabwe.

The American Cluster

North America: Canada, United States of America, and Mexico.

Central America: Guatemala, Belize*, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama.

The Caribbean: Bahamas*, Barbados, Dominica*, Dominican republic, Grenada*, Haiti, Jamaica, Puerto Rico, Lucia*, St. Vincent and Gre.*, Trinidad and Tobago.

South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Surinam, Uruguay, and Venezuela.

The Asian Cluster

The Middle East and The Gulf: Afghanistan, Bahrain*, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait*, Oman*, Qatar*, Saudi Arabia*, Turkey, Syria, United Arab Emirates*, and Yemen*.

South-Central Asia: Bangladesh, Bhutan*, India, Myannar, Nepal, Pakistan, and Sri Lanka.

East Asia and The Pacific: Australia, China*, Fiji, Hong Kong, Indonesia, Japan, Korea (Rep. of), Laos*, Malaysia, Mongolia*, New Zealand, Papua New Guinea, Philippines, Singapore, Solomon Islands*, Taiwan, Thailand, Tonga*, Vanuatu*, and Western Samoa*.

The European Cluster

North Europe and The British Isles: Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, and United Kingdom.

Southern Europe: Greece, Italy, Portugal, Spain, and Yugoslavia.

East Europe: Bulgaria*, Czechoslovakia, Germany (Democratic Republic), Hungary*, Poland*, Romania*, and USSR*.

Scandinavia: Denmark, Finland, Iceland, Norway, and Sweden.

* Early observations are not available.

Table A.1: World-wide level of intercountry income inequality and its constituents

Year	Income Inequality between Geographical Clusters	Income Inequality between regions of Geographical Clusters	Income Inequality within Regions of Geographical Clusters	Total Level of Intercountry Income Inequality
1960	0.30454	0.41293	0.33666	1.05413
1961	0.30590	0.42849	0.34442	1.07882
1962	0.30780	0.43136	0.35002	1.08918
1963	0.30114	0.43521	0.36852	1.10488
1964	0.29848	0.45121	0.38277	1.13246
1965	0.30851	0.47890	0.39264	1.18004
1966	0.31467	0.51516	0.40874	1.23857
1967	0.30881	0.52684	0.42371	1.25936
1968	0.39802	0.38176	0.57919	1.35897
1969	0.38284	0.37581	0.56080	1.31945
1970	0.29807	0.46064	0.54878	1.30748
1971	0.30173	0.45356	0.54166	1.29695
1972	0.30779	0.47118	0.55937	1.33833
1973	0.30905	0.46857	0.56672	1.34434
1974	0.30929	0.45005	0.55639	1.31573
1975	0.29497	0.42990	0.53855	1.26342
1976	0.30452	0.44118	0.56978	1.31548
1977	0.30004	0.42662	0.55580	1.28246
1978	0.29748	0.42223	0.53690	1.25660
1979	0.29477	0.44897	0.52443	1.26817
1980	0.28659	0.43837	0.51121	1.23617
1981	0.28036	0.44402	0.50878	1.23326
1982	0.26639	0.44871	0.49610	1.21120
1983	0.25818	0.47313	0.48381	1.21513
1984	0.25606	0.50669	0.47355	1.23630
1985	0.25135	0.51465	0.45969	1.20952
1986	0.25143	0.50118	0.45692	1.20952
1987	0.24858	0.51066	0.45757	1.21680
1988	0.24343	0.51949	0.45927	1.22219
1989	0.24037	0.53247	0.45556	1.22840
1990	0.23382	0.53797	0.45646	1.22825

Table A.2: Intercountry income inequality in Africa

Year	North Africa	East Africa	Central and West Africa	Southern Africa	Total Inequality Within Regions	Total Inequality Between Regions
1960	0.06317	0.12316	0.04056	0.13170	0.08524	0.07543
1961	0.04437	0.11698	0.04899	0.13493	0.08379	0.08124
1962	0.01681	0.11755	0.04186	0.14270	0.07781	0.07700
1963	0.02513	0.12026	0.04518	0.15664	0.08487	0.08056
1964	0.01816	0.10203	0.04801	0.17713	0.08847	0.08375
1965	0.01715	0.08850	0.04602	0.17391	0.08577	0.08508
1966	0.01638	0.09431	0.04733	0.17103	0.08665	0.08502
1967	0.01919	0.09688	0.06376	0.17042	0.09389	0.09784
1968	0.02275	0.09328	0.07680	0.17612	0.09918	0.10123
1969	0.02396	0.08655	0.05174	0.18091	0.09251	0.09541
1970	0.02206	0.08311	0.04679	0.19521	0.09468	0.09525
1971	0.01328	0.09462	0.04665	0.19335	0.09316	0.08714
1972	0.02910	0.09586	0.05206	0.18622	0.09564	0.09078
1973	0.03164	0.08767	0.05274	0.19620	0.09952	0.09164
1974	0.04237	0.08855	0.05767	0.21947	0.11069	0.08863
1975	0.03744	0.08893	0.06914	0.23918	0.11658	0.08532
1976	0.03527	0.08498	0.08551	0.25190	0.12229	0.08788
1977	0.03742	0.09916	0.08716	0.24315	0.11901	0.07727
1978	0.03790	0.09646	0.08801	0.24374	0.11860	0.07810
1979	0.03727	0.10093	0.08199	0.24088	0.11630	0.09037
1980	0.03145	0.08906	0.08460	0.25793	0.11825	0.09748
1981	0.02996	0.09433	0.08709	0.27712	0.12507	0.09520
1982	0.02948	0.08960	0.08685	0.27327	0.12227	0.10290
1983	0.02971	0.08246	0.09053	0.26396	0.11860	0.11519
1984	0.02722	0.08344	0.09660	0.28480	0.12569	0.13241
1985	0.02443	0.08061	0.09311	0.27729	0.11909	0.13640
1986	0.02288	0.08784	0.09309	0.27291	0.11713	0.12949
1987	0.02227	0.09153	0.09224	0.28039	0.12039	0.13103
1988	0.01999	0.08958	0.08315	0.28947	0.12008	0.12937
1989	0.02114	0.09259	0.08401	0.28131	0.11850	0.13029
1990	0.01941	0.09872	0.07988	0.27801	0.11551	0.12070

Table A.3: Intercountry income inequality in America

Year	North America	Central America	South America	The Caribbean	Total Inequality Within Regions	Total Inequality Within Regions
1960	0.05826	0.01732	0.09529	0.19860	0.06444	0.16215
1961	0.05880	0.01882	0.09275	0.23554	0.06511	0.15667
1962	0.06122	0.01768	0.09215	0.21717	0.06685	0.16041
1963	0.06102	0.01975	0.09708	0.23086	0.06746	0.16703
1964	0.05934	0.01939	0.10657	0.24099	0.06753	0.16793
1965	0.06170	0.02124	0.11410	0.26189	0.07057	0.17505
1966	0.06324	0.02165	0.10544	0.25641	0.07056	0.17997
1967	0.06291	0.02323	0.10238	0.27404	0.07010	0.17986
1968	0.06266	0.02191	0.09246	0.26911	0.06850	0.17898
1969	0.06341	0.02447	0.09064	0.29536	0.06938	0.17629
1970	0.06109	0.02682	0.08333	0.29735	0.06666	0.16675
1971	0.06316	0.03030	0.07077	0.29481	0.06656	0.16256
1972	0.06432	0.03083	0.05810	0.29221	0.06553	0.16391
1973	0.06514	0.03000	0.04705	0.28405	0.06419	0.16282
1974	0.06139	0.03330	0.04498	0.26271	0.06042	0.15121
1975	0.05735	0.03229	0.04480	0.28512	0.05738	0.14717
1976	0.06102	0.02870	0.04478	0.28693	0.06025	0.14713
1977	0.06624	0.02798	0.04697	0.30316	0.06497	0.14770
1978	0.06548	0.02923	0.04548	0.32422	0.06442	0.15490
1979	0.06024	0.04097	0.04161	0.33066	0.05961	0.15210
1980	0.05276	0.04301	0.03228	0.31505	0.05174	0.14512
1981	0.04905	0.04363	0.02916	0.32027	0.04838	0.15831
1982	0.05254	0.04551	0.02755	0.32795	0.05098	0.15548
1983	0.06398	0.04493	0.02928	0.32371	0.06068	0.16853
1984	0.06891	0.04699	0.02815	0.30501	0.06423	0.18081
1985	0.07019	0.04907	0.02719	0.34699	0.06562	0.18392
1986	0.07834	0.05408	0.02816	0.36545	0.07236	0.17784
1987	0.08226	0.05499	0.02721	0.35671	0.07530	0.18074
1988	0.08447	0.04259	0.03002	0.37436	0.07793	0.19223
1989	0.08392	0.04494	0.02800	0.36678	0.07739	0.20072
1990	0.08102	0.05262	0.02855	0.38771	0.07555	0.20876

Table A.4: Intercountry income inequality in Asia and The Pacific

Year	Middle-East and The Gulf	South-Asia	East Asia and The Pacific	Total Inequality Within Regions	Total Inequality Between Regions
1960	0.04538	0.01515	0.30367	0.16872	0.13154
1961	0.04813	0.01461	0.30712	0.17691	0.15172
1962	0.04649	0.01426	0.32119	0.18544	0.15775
1963	0.03949	0.01289	0.34491	0.19705	0.15385
1964	0.04583	0.01184	0.36350	0.20984	0.16256
1965	0.05738	0.01942	0.36806	0.21966	0.18270
1966	0.05029	0.02424	0.37849	0.23450	0.21898
1967	0.04166	0.02531	0.39007	0.24200	0.22036
1968	0.05336	0.02310	0.56203	0.39417	0.07440
1969	0.05296	0.02213	0.53510	0.38225	0.07882
1970	0.06267	0.01714	0.51310	0.37145	0.08227
1971	0.05651	0.01322	0.50739	0.36925	0.08997
1972	0.05685	0.01117	0.52668	0.38645	0.10211
1973	0.07151	0.01446	0.52855	0.39159	0.10620
1974	0.05917	0.01749	0.50820	0.37452	0.11167
1975	0.05075	0.01562	0.48675	0.35496	0.10912
1976	0.05368	0.01747	0.52216	0.37672	0.11936
1977	0.05261	0.01634	0.50483	0.36286	0.11737
1978	0.04056	0.01900	0.47185	0.34553	0.10654
1979	0.07270	0.02360	0.44960	0.34002	0.11818
1980	0.06597	0.02342	0.43463	0.33119	0.10733
1981	0.03421	0.01831	0.42875	0.32534	0.10587
1982	0.02882	0.01891	0.41302	0.31336	0.10727
1983	0.03362	0.01777	0.38942	0.29513	0.10893
1984	0.02838	0.01686	0.35714	0.27354	0.11394
1985	0.02541	0.01846	0.34386	0.26440	0.11380
1986	0.02197	0.01875	0.33275	0.25685	0.11321
1987	0.02640	0.01833	0.32195	0.25099	0.11764
1988	0.03144	0.01963	0.31812	0.24988	0.11690
1989	0.03079	0.01535	0.31636	0.24847	0.11850
1990	0.03137	0.01399	0.32226	0.25254	0.12111

Table A.5: Intercountry income inequality in Europe

Year	North Europe and The British Isles	Southern Europe	East Europe	Scandinavi a	Total Inequality Within Regions	Total Inequality Between Regions
1960	0.00744	0.05773	NA	0.00950	0.01827	0.04381
1961	0.00772	0.05681	NA	0.00899	0.01861	0.03885
1962	0.00744	0.06205	NA	0.00979	0.01992	0.03620
1963	0.00701	0.05855	NA	0.01045	0.01914	0.03377
1964	0.00672	0.05097	NA	0.01124	0.01692	0.03698
1965	0.00680	0.04967	NA	0.00974	0.01663	0.03606
1966	0.00654	0.05110	NA	0.00894	0.01703	0.03119
1967	0.00619	0.05347	NA	0.00912	0.01772	0.02878
1968	0.00584	0.05223	NA	0.01036	0.01734	0.02715
1969	0.00664	0.04701	NA	0.00856	0.01667	0.02528
1970	0.00949	0.04637	0.00257	0.00688	0.01598	0.11636
1971	0.00782	0.03621	0.00283	0.00548	0.01269	0.11390
1972	0.00631	0.03690	0.00332	0.00419	0.01174	0.11437
1973	0.00548	0.03782	0.00350	0.00350	0.01142	0.10792
1974	0.00619	0.03233	0.00489	0.00302	0.01076	0.09854
1975	0.00489	0.02932	0.00637	0.00368	0.00963	0.08829
1976	0.00497	0.03385	0.00631	0.00341	0.01052	0.08681
1977	0.00455	0.02827	0.00603	0.00255	0.00896	0.08427
1978	0.00406	0.02661	0.00560	0.00255	0.00835	0.08270
1979	0.00426	0.02825	0.00371	0.00160	0.00850	0.08831
1980	0.00530	0.03396	0.00242	0.00123	0.01003	0.08843
1981	0.00531	0.03395	0.00235	0.00132	0.01000	0.08463
1982	0.00467	0.03376	0.00340	0.00072	0.00949	0.08306
1983	0.00406	0.03529	0.00293	0.00081	0.00939	0.08048
1984	0.00392	0.03900	0.00256	0.00114	0.01009	0.07954
1985	0.00374	0.04179	0.00188	0.00137	0.01059	0.08053
1986	0.00379	0.04101	0.00168	0.00177	0.01057	0.08064
1987	0.00332	0.04411	0.00170	0.00135	0.01090	0.08124
1988	0.00316	0.04793	0.00156	0.00068	0.01138	0.08099
1989	0.00288	0.04775	0.00178	0.00043	0.01120	0.08296
1990	0.00286	0.05515	0.00575	0.00037	0.01286	0.08739

(NA=Data are not available.)

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