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Demographic Factors and the Distribution of Income: Some Issues

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DEMOGRAPHIC FACTORS AND THE DISTRIBUTION OF INCOME :
SOME ISSUES

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A more equitable distribution of income and wealth has been a major goal of many of the development plans of developing countries as well as the United Nations Declaration proclaiming the Second Development Decade. Partly as a result, most attempts to evaluate the economic development of developing countries now seek to provide some evidence, usually based on sample surveys (but sometimes on the basis of questions canvassed in the population or economic census), on the distribution of income. A recent compendium of these data shows one or more distributions for 81 countries, with an indication of the coverage (whether they pertain to the entire country, rural or urban areas, the agricultural or the non-agricultural sector or a selected metropolis or city) and the population or the unit of aggregation (households, persons, workers, income recipients or the economically active population).^{1/} The value of

1/ Jain, Shail, *Size Distribution of Income: A Compilation of Data*, Washington, D.C., World Bank, 1975.

*The data used for preparing this paper were collected by the Bureau of Economics and Statistics in Gujarat and Maharashtra states of India, the Research Department of the Nepal Rastra Bank, the Department of Census and Statistics in Sri Lanka and the Bureau of Statistics in Taiwan. I am beholden to the Directors of these agencies who have permitted and encouraged me to use their data for the joint ESCAP-IBRD Research Project on Income Distribution in Asia.

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this growing volume of information is limited, however, by inadequate attention to the quality and comparability of the data for different countries (as also for some countries over time). The World Bank has, therefore, undertaken two fairly large research projects to evaluate the data available from some of the recent household surveys in selected countries of Asia^{1/} and Latin America.^{2/} This paper reports some results of an on-going analysis of the data collected in (a) a labor force and consumer expenditure survey undertaken as a part of the annual National Sample Survey (NSS) during October 1972-September 1973 in Gujarat and Maharashtra states of India^{3/}; (b) a household budget survey undertaken during 1973-74 and 1974-75 in 18 "towns" or development centers of Nepal; (c) a socio-economic survey of Sri Lanka conducted between November 1969 and October 1970; (d) the income and expenditure surveys of Taiwan conducted between 1968 and 1974. There is good reason to believe that the results based on these data have a wider validity.

THE DATA

A brief description of the conceptual framework used to collect data on expenditure and/or income and labor force in different surveys is given in Annex I. For Nepal, we have chosen to use only the expenditure data because of unresolved problems in reconciling the data on household income from different sources. The Indian NSS does not collect data on income, whereas in Sri Lanka and Taiwan the same surveys have collected data both on expenditure and income.^{4/} The expenditure data indicate disparities in consumption, which are normally less than the inequality of income or wealth; but expenditure or consumption is easier to recall or report; and the survey data on them are likely to be more reliable. Also, consumption might be more closely related to what is termed 'permanent income', taking account of the temporal fluctuations in the income stream.

THE RANKING CRITERION

An important first step in the analysis is to establish the appropriate criterion for ranking the population (or households) according

- ^{1/} A major criterion used to select the surveys of Asian countries for the project was the simultaneous collection of data on both labor force characteristics and income or expenditure. This criterion was adopted because of an emphasis on the analysis of the socio-economic characteristics of households with different levels of income or expenditure.
- ^{2/} The projects have been undertaken jointly with ESCAP (the Economic and Social Commission for Asia and the Pacific) and ECLA (the Economic Commission for Latin America), respectively.
- ^{3/} Although the survey was conducted in the entire country, we have had access to data for only the two states. Further, the detailed data on the pattern of consumption expenditure are not available.
- ^{4/} It has not been possible, however, to examine measures of inequality in expenditure in Taiwan in this paper.

to their level of income (or expenditure). In a majority of reports on income distribution, the ranking seems to be according to the size of total household income (or expenditure).^{1/} Only in a few countries like India and Indonesia are the surveyed households ranked according to the per capita expenditure or income (PCE or PCY).^{2/} The recent United Nations guidelines on the income distribution statistics recommend tabulations for income distribution mainly in terms of the (pre-tax) total household income and only two general tables on a per capita basis for comparative purposes.^{3/} Perhaps it is not recognised adequately that the two criteria lead to a significantly different ranking of the households, although this is not evident from the Gini coefficients or other measures of the concentration of income.

Table 1 shows three alternative indices of inequality^{4/} of expenditure or income for different countries or states. The indices for Sri Lanka conform to the expectation that inequality of expenditure tends to be less than that of income. The inequality indices based on the ranking of individuals according to the PCE or PCY of the household are significantly lower than those based on the distribution of households according to the total household expenditure (income) (THE or THY).

1/ One can speculate about the reasons for this practice. When the data sources collect information on income on the basis of one (or a few) question(s) in terms of rather broad class intervals, it is not possible to estimate per capita income with any reasonable precision. If the mid-point of a class interval is taken as the actual income of all households in that class, the households will be ranked essentially in terms of their household size (obviously with an inverse relationship between the latter and the estimated per capita income). The simple solution is to present the data for households ranked according to their total household income.

2/ In Indonesia, the published tables for the socio-economic survey (SUSENAS) of 1976 relate to only the total household expenditure (although the tables according to per capita expenditure are available). This is a departure from the procedure adopted in the report on the 1969-70 survey.

3/ United Nations, *Provisional Guidelines on Statistics of the Distribution of Income, Consumption and Accumulation of Households* (Economic Studies, No. 61), New York, 1977, pp. 58-59. Since the household is generally the production (or consumption) unit and the specific contribution (share) of individual members or workers is difficult to identify or measure, it is only natural that it should also be the basis of the reporting of income (or expenditure/consumption). That is particularly true of the family farms and enterprises which account for a substantial proportion of the population in the rural areas of developing countries (and for consumption or expenditure, it is true of all societies).

4/ See Annex II for a brief outline of the three measures. We have chosen to deal with deciles of households although it is possible to delimit deciles so that each decile has an equal proportion of population. The points raised in this paper would hold even if we were to deal with deciles of population, although in that case the decile limits would naturally be different.

TABLE 1
Indices of Inequality with Alternative Ranking Criteria

Country/State/Area	Ranking Criterion* for Households	Unit of Aggregation	Gini Coefficient	Kuznets Index	Entropy Measure
1. GUJARAT					
1972-73					
Rural	PCE	Individual	0.259	0.194	0.110
	THE	Household	0.328	0.246	0.169
	AEX <u>a/</u>	Adult-Equivalent	0.262	0.196	0.113
Urban	PCE	Individual	0.261	0.193	0.118
	THE	Household	0.304	0.223	0.148
	AEX <u>a/</u>	Adult-Equivalent	0.260	0.193	0.118
2. MAHARASHTRA					
1972-73					
Rural	PCE	Individual	0.272	0.201	0.126
	THE	Household	0.354	0.263	0.204
	AEX <u>a/</u>	Adult-Equivalent	0.273	0.202	0.126
Urban	PCE	Individual	0.331	0.250	0.177
	THE	Household	0.371	0.280	0.213
	AEX <u>a/</u>	Adult-Equivalent	0.327	0.247	0.173
3. NEPAL					
Eleven Towns 1973-74					
	PCE	Individual	0.312	0.235	0.164
	THE	Household	0.388	0.291	0.244
	AEX <u>a/</u>	Adult-Equivalent	0.305	0.230	0.157
Seven Towns 1974-75					
	PCE	Individual	0.303	0.229	0.154
	THE	Household	0.367	0.277	0.219
	AEX <u>a/</u>	Adult-Equivalent	0.294	0.222	0.144
4. SRI LANKA					
1969-70					
	PCE	Individual	0.309	0.231	0.156
	THE	Household	0.330	0.247	0.175
	AEX <u>a/</u>	Adult-Equivalent	0.312	0.233	0.159
	AEX <u>b/</u>	Adult-Equivalent	0.298	0.222	0.146
	PCI	Individual	0.364	0.273	0.218
	THY	Household	0.381	0.287	0.235
	AEI <u>a/</u>	Adult-Equivalent	0.366	0.274	0.220
	AEI <u>b/</u>	Adult-Equivalent	0.350	0.261	0.204
	5. TAIWAN				
1968					
	PCI	Individual	0.321	0.240	0.173
	THY	Household	0.353	0.247	0.175
	AEY <u>b/</u>	Adult-Equivalent	0.306	0.227	0.159
	AEY <u>a/</u>	Adult-Equivalent	0.319	0.234	0.171
1974					
	PCI	Individual	0.287	0.214	0.139
	THY	Household	0.301	0.223	0.151
	AEY <u>b/</u>	Adult-Equivalent	0.294	0.219	0.146
	AEY <u>a/</u>	Adult-Equivalent	0.308	0.229	0.161

*PCE: Per capita expenditure of the household
 THE: Total expenditure of the household
 AEE: Household expenditure per equivalent adult
 PCI: Per capita income of the household
 THY: Total household income
 AEY: Household income per adult equivalent

a/ With weights used in India by the NSS.

b/ With weights used by the Bureau of Statistics, Taiwan.

Table 2 shows the proportions of households (and the proportion of total population in these households) falling in the same decile and the same quintile according to the two criteria. Less than 20 percent of the households in Gujarat, Maharashtra, Nepal, and Sri Lanka fall in the identical decile according to the PCE and THE criteria. In Sri

Lanka and Taiwan, with the ranking in terms of PCY and THY, between 20 to 30 percent of the households fall in the same decile. The classification of households in broader groups of quintiles naturally increases the proportion falling in identical quintiles according to the two criteria.^{1/} Too, the target groups of households for poverty alleviation programs would be different depending on whether the ranking is in terms of total or per capita consumption or income.

The major explanatory factor for the differences in the ranking of households according to the two criteria is the different relationship between (a) household size and (b) total or per capita expenditure or income. As shown in Table 3, the average household size rises with the decile in terms of THE/THY and it falls with decile in terms of PCE/PCY. The distributions of households in terms of THE or THY overstate the degree of inequality because they overlook the fact that the low total income (or expenditure) is associated with a lower average household size.^{2/} The inter-decile differences in household size are generally smaller with the per capita ranking than with the THE or THY ranking; that is not the case, however, for Taiwan in 1974 where inter-decile variation in household size is greater with the ranking in terms of per capita income.^{3/}

Tables 1 and 2 in Annex III attempt to shed some more light on the changes in the number of households by showing (i) THE, (ii) PCE and (iii) the average household size according to the age group of the household head.^{4/} It can be seen that the average household size tends

^{1/} Let us assume that the bottom 30 percent of households are considered "poor" with ranking according to THE or THY and also PCE or PCY. In our data sets, the THE or THY poor households would cover between 40 to 75 percent of the PCE or PCY poor households and between 41 to 64 percent of the population of the PCE/PCY poor households. This happens because of the smaller than average size of the households in the bottom deciles in terms of THE/THY. The PCE/PCY poor households would include the same proportion of THY/THY poor households but between 71 to 80 percent of the population of THE/THY poor households.

^{2/} Simon Kuznets has stressed this fact in his recent paper on "Demographic Aspects of the Size Distribution of Income: An Exploratory Essay", *Economic Development and Cultural Change*, Vol. 25, No. 1, October 1976, pp. 1-24.

^{3/} The relationship between the average size of households and the decile in terms of per capita expenditure or income is not monotonic in all cases, as seems to be the case with total expenditure or income deciles (except for Taiwan in 1968).

^{4/} A precise identification of the head of the household is not always easy; most surveys accept what the respondents report. However, the reliability of the data on the relationship to the household head is not always recognized. The available data tapes for Gujarat, Maharashtra and Sri Lanka do not explicitly identify the household heads; in other words, the information on the relationship to the head of the household has not been transferred to the tapes. However, we have been assured that persons having their serial number equal to one were the heads of households.

TABLE 2
 PERCENTAGE OF HOUSEHOLDS IN THE SAME DECILE OR QUINTILE
 ACCORDING TO THE ALTERNATIVE CRITERIA OF PER CAPITA AND
 TOTAL HOUSEHOLD EXPENDITURE (OR INCOME)

<u>Country/State/Area</u>	<u>Percentage of Households in the Same Decile</u>		<u>Percentage of Households in the Same Quintile</u>	
1. GUJARAT 1972-73				
Rural	17.4	(16.5)	32.9	(32.0)
Urban	17.7	(16.1)	31.3	(29.0)
2. MAHARASHTRA 1972-73				
Rural	15.9	(15.2)	32.1	(31.3)
Urban	15.3	(14.7)	26.0	(25.4)
3. NEPAL				
Eleven Towns 1973-74	14.7	(13.5)	31.3	(29.7)
Seven Towns 1974-75	14.5	(12.8)	29.4	(28.1)
4. SRI LANKA				
1969-70	19.5	(18.3)	35.9	(34.7)
1969-70*	23.2	(21.9)	39.2	(38.1)
5. TAIWAN				
1968*	20.2	(18.3)	36.0	(34.3)
1974*	28.3	(22.7)	43.4	(37.8)

*Deciles of income.

Figures in parentheses show the percentage of total population accounted for by the households in the same decile or quintile.

TABLE 3
Average Size of Households in Different Deciles with Alternative Ranking Criteria

Decile of Households	Rural	Rural	Urban	Urban	Nepal		Sri Lanka	Taiwan	
	Gujarat (1972-73)	Maharashtra (1972-73)	Gujarat (1972-73)	Maharashtra (1972-73)	11 Towns (1973-74)	7 Towns (1974-75)	(1969-70)*	(1968)*	(1974)*
<u>(A) Households Ranked by Per Capita Expenditure (or Income)</u>									
1	6.8	6.3	6.7	6.6	6.4	6.3	7.3	7.7	7.1
2	6.6	6.0	6.4	6.3	6.3	6.3	6.9	6.9	6.5
3	6.2	5.6	6.3	6.1	6.1	5.9	6.4	6.6	6.1
4	6.2	5.5	6.0	5.8	5.8	5.9	6.3	6.4	5.8
5	6.0	5.8	5.8	5.4	5.7	5.2	6.0	6.3	5.4
6	6.1	5.3	5.5	5.1	5.6	5.4	5.6	5.8	5.4
7	5.5	5.2	5.0	4.4	5.0	5.0	5.7	5.9	4.9
8	5.5	4.9	4.2	4.0	5.0	4.7	5.0	5.0	4.5
9	5.0	4.5	3.9	3.2	4.5	4.2	5.0	4.3	4.3
10	4.3	4.1	3.2	2.7	3.5	2.8	4.6	3.6	3.5
All	5.8	5.3	5.3	4.9	5.4	5.2	5.9	5.8	5.3
<u>(B) Households Ranked by Total Expenditure (or Income)</u>									
1	2.4	2.2	1.9	1.7	2.2	2.4	3.6	3.0	3.4
2	4.0	3.5	3.5	2.8	3.4	3.2	4.5	4.8	4.6
3	4.8	4.1	4.3	3.8	4.1	3.8	5.0	5.1	5.0
4	5.1	4.7	4.8	4.5	4.2	4.3	5.5	5.5	5.2
5	5.7	5.1	5.5	5.0	5.0	4.8	5.9	6.2	5.4
6	6.3	5.4	6.0	5.5	5.4	5.3	6.1	6.0	5.6
7	6.6	5.9	6.1	5.9	5.9	5.8	6.4	6.4	5.7
8	7.0	6.4	6.5	6.2	6.8	6.1	6.7	6.7	6.0
9	7.5	7.1	6.8	6.6	7.4	7.2	7.2	6.9	6.1
10	8.9	8.8	7.7	7.4	9.4	8.9	7.7	7.6	6.6
All	5.8	5.3	5.3	4.9	5.4	5.2	5.9	5.8	5.3
Sample Households	5,560	5,314	3,528	11,103	4,393	2,254	9,664	2,776	5,256

*Ranking in terms of per capita or total household income.

to rise with the age of the head, at least up to the age group 40-44; it levels off or declines for older heads. For many of the households headed by persons aged less than 30 or 35, total expenditure is likely to be below the average; but their per capita expenditure tends to be above the average. The decile of these households is altered when the ranking criterion changes from THE to PCE. A similar reclassification is likely to occur if the rankings were in terms of income rather than expenditure.

The PCE or PCY ranking has an advantage if the differences in income levels are to be related to welfare.^{1/} Insofar as both earnings or income and the size of the household take an inverted U-shape with respect to the age of the household head, the life cycle effects would probably be less important in differentials in PCE or PCY than in THE or THY.

DIFFERENTIALS IN AGE COMPOSITION OF THE HOUSEHOLD MEMBERS

Since the size of the household varies with the age or the stage of the life cycle of the household head, it is logical to presume that the age composition of the population in deciles with a higher average household size might be significantly different from the average and that of the upper deciles. Table 4 shows the age-dependency ratios (defined as the number of persons aged 0-14 and 60 and over -- or 65 and over -- per 1000 persons in the working ages of 15-59 -- or 15-64 --)^{2/} for different deciles in terms of both the per capita and total household expenditure of income.^{3/} With a ranking in terms of PCE or PCY, the age-dependency ratio varies inversely with decile, virtually monotonically. The variations are caused mainly by differences in the proportion of children aged 0-14, who account for a majority of the population in dependent ages. In rural areas of Gujarat and Maharashtra, the dependency ratios of the bottom and the top deciles of

1/ There may be some economies of scale in consumption which are overlooked in the per capita ranking. However, these economies are unlikely to exist with respect to all commodities and will seldom be so important that an increase in the size of the household would not raise the consumption requirements.

2/ We have chosen age 60 as the upper limit of working ages in Gujarat, Maharashtra, Nepal and Sri Lanka because the public sector employees usually retire before reaching that age. In Taiwan, on the other hand, the retirement age is around 65 years, and, therefore, ages 15-64 are taken as the working ages.

3/ The well-known errors of age reporting -- preference for ages ending in 5 or 0 and, to a lesser extent, 2 and 8 -- do not affect our survey data; but the smoothing of age data that is commonly used in the analysis of census data seems hazardous with the *relative* small number of sample households or persons in each decile. The broad age groups help to mitigate the influence of these errors. Besides, the differentials follow a consistent pattern and are so large that the errors cannot be a major contributory factor.

TABLE 4

Age Dependency Ratios by Deciles in Terms of Per Capita and Total Expenditure or Income of the Household

Decile in Terms of PCE/PCI*	GUJARAT		MAHARASHTRA		NEPAL		SRI LANKA ^{a/} (1969-70)	TAIWAN ^{a/}	
	Rural (1972-73)	Urban (1972-73)	Rural (1972-73)	Urban (1972-73)	Eleven Towns (1973-74)	Seven Towns (1974-75)		(1968)	(1974)
1	1165	1150	1304	1203	1279	1235	1319	1303	1173
2	1229	980	1203	1037	1135	1123	1138	1101	996
3	{1007	{890	{1100	{887	979	1073	1033	1124	877
4					915	914	886	976	880
5	{907	{808	{960	{733	787	815	846	842	761
6					779	812	749	745	650
7	{856	{618	{901	{555	669	819	707	724	570
8					628	653	575	397	499
9	707	549	810	409	577	592	608	510	439
10	657	388	776	331	417	352	506	404	305
ALL	922	790	1002	762	821	855	831	846	725
Decile in Terms of THE/THI*									
1	637	684	742	476	615	653	1005	815	870
2	814	715	774	598	750	656	931	944	932
3	928	759	938	732	900	708	919	917	923
4	958	781	910	839	775	771	931	1004	892
5	973	845	960	883	921	844	941	1014	862
6	990	921	1018	827	906	945	886	906	804
7	993	834	1038	862	865	920	815	866	674
8	935	835	1076	807	825	942	777	758	628
9	967	792	1056	739	853	833	723	752	557
10	863	680	1077	633	746	864	632	656	472
ALL	922	790	988	756	821	855	831	846	725

* PCE: Per capita expenditure of the household.

PCI: Per capita income of the household.

THE: Total expenditure of the household.

THI: Total income of the household.

^{a/}Deciles based on income data.

- Notes: (1) Dependency ratios for Gujarat, Maharashtra, Nepal and Sri Lanka show persons aged 0-14 and 60 and over per 1000 persons aged 15-59.
- (2) Dependency ratios for Taiwan show persons aged 0-14 and 65 and over per 1000 persons aged 15-64.
- (3) Dependency ratios for all deciles together for rural and urban Maharashtra differ slightly because some sample households were excluded during editing after the first runs in terms of PCE decile.

households differ by less than a factor of 2:1; but in other areas, the ratio of the two ratios approaches (or even exceeds) 3:1.

With a ranking of households in terms of total household expenditure or income, the inter-decile range of variation in dependency ratios is always smaller than that with the PCE or PCY ranking. There is no clear relationship between the THE or THY decile and the dependency ratio. In Sri Lanka, the dependency ratio falls with the THY decile; in rural Maharashtra, it tends to rise. In other data sets, the dependency ratios seem to take something like an inverted U or V shape with THY decile, with varying degrees of approximation. These differences in the relationship between the dependency ratios and the PCE(PCY) or THE(THY) deciles reflect changes in the age composition of the heads of households falling in various deciles when the ranking criterion is altered.

ESTIMATION OF ADULT EQUIVALENTS AND ALTERNATIVE INDICES OF INEQUALITY

Given the distinct age-related differences in the capacity to work or earn as well as what Kuznets calls "the volume of goods required to fulfill whatever may be considered acceptable or warranted needs",^{1/} differences in per capita income or consumption do not seem good indicators of differences in welfare. Some form of standardization of household members into adult equivalents seems necessary. The FAO, the WHO, as also some countries have attempted to identify the sex-age-specific differentials in caloric requirements, but no norms have been developed with respect to the requirements of other goods. The relationships between expenditure on food and other commodities and services, estimated from consumption expenditure data can hardly be taken as a good index of the "needs" because they are obviously influenced by the existing level and distribution of income, wealth and varying customs among different socio-economic groups. However, the Bureau of Statistics in Taiwan has been using some weights to estimate adult equivalents, which provide a starting point. For India, some weights for the conversion of individuals into adult consumption units have been estimated on the basis of caloric requirements. These weights are shown in Annex IV. The Indian weights have been used to estimate adult equivalents for Gujarat, Maharashtra and Nepal. For Sri Lanka and Taiwan, both the Indian and the Taiwanese weights have been used. As shown in Table 2 of Annex IV, the correlation between the number of members and the number of adult equivalents in a household is very high, a little higher when the Indian weights are used than with the Taiwan weights.

Table 5 shows the proportions of households that fall in the same decile or quintile according to alternative rankings in terms of per capita and per adult equivalent expenditure or income. With the Indian weights, between 58 to 73 percent of the households (accounting for about 61 to 76 percent of the population) fall in the identical decile according to the two criteria; the use of Taiwan weight, lowers these percentages significantly. The weights chosen to estimate adult equivalents can indeed influence the ranking of households.

^{1/} Simon Kuznets, *op.cit.*, p. 30.

TABLE 5
Percentage of Households in the Same Decile
or Quintile According to the Alternative Criteria of Per
Capita and Per Adult Equivalent Expenditure or Income

<u>Country/State/Area</u>	<u>Variable for Ranking</u>	<u>Weights Used*</u>	<u>Percentage of Households in the Same Decile</u>		<u>Percentage of Households in the Same Quintile</u>	
1. GUJARAT, 1972-73						
Rural	Expenditure	Indian	62.4	(65.1)	80.1	(82.6)
Urban	Expenditure	Indian	59.3	(62.1)	78.6	(80.6)
2. MAHARASHTRA, 1972-73						
Rural	Expenditure	Indian	57.6	(60.9)	78.0	(80.7)
Urban	Expenditure	Indian	63.4	(68.5)	81.5	(84.6)
3. NEPAL						
Eleven Towns 1973-74	Expenditure	Indian	64.3	(67.5)	82.1	(84.3)
Seven Towns 1974-75	Expenditure	Indian	62.7	(66.3)	80.7	(82.8)
4. SRI LANKA, 1969-70						
	Income	Indian	68.6	(70.7)	85.0	(86.4)
	Income	Taiwan	51.5	(55.0)	75.6	(77.6)
	Expenditure	Indian	64.6	(66.7)	81.6	(82.8)
	Expenditure	Taiwan	47.4	(50.8)	71.2	(73.1)
5. TAIWAN, 1968^{a/}						
	Income	Indian	63.4	(60.8)	81.7	(78.4)
	Income	Taiwan	49.5	(52.5)	73.2	(75.0)
TAIWAN, 1974						
	Income	Indian	60.7	(61.9)	79.9	(80.7)
	Income	Taiwan	44.5	(47.2)	68.3	(70.2)

*The weights are shown in Table in Annex III.

Note: Figures in parentheses show the percentage of total population accounted for by the households in the same decile or quintile.

The indices of inequality in expenditure or income per adult equivalent (AEE or AEY) have been shown in Table 1, to facilitate comparison with measures of inequality in terms of other criteria. On the whole, the inequality indices based on AEE or AEY are not much different from those based on per capita ranking. The use of adult equivalents estimated with the Taiwan weights lowers the inequality indices to a slightly greater extent than those with the Indian weights. Pending further experimentation with different weights, one can conclude that although the ranking of households in terms of per capita expenditure or income does not seem conceptually ideal, the resulting measures of inequality are not very different from those in terms of adult equivalents.

IMPLICATIONS OF DIFFERENTIALS IN AGE DEPENDENCY BY PER CAPITA DECILES

As noted earlier, the steady inverse relationship between the age-dependency ratio and the PCE/PCY decile of household, observed in all the data sets, might reflect differences in the stage of the life cycle of household heads. With the passage of time, there would be some mobility and a different group or cohort of household heads might come to fall in the bottom decile. Ideally, we need longitudinal or panel studies which would trace the movement of the sample households in an initial survey and also include a sample of the new households formed since the initial survey was conducted. An alternative is to compare the decile distributions of households headed by persons from specific birth cohorts in surveys conducted at different time intervals; but the validity of inferences based on this approach would depend on the comparability of concepts and definitions based on this approach would depend on the comparability of concepts and definitions in the various surveys as well as the stability of the headship rates (i.e. the ratio of household heads to the total population of a given sex-age group).

Pending further exploration of the life cycle related issues, some implications of the differences in the age composition of population in different deciles of households may be noted. First, the poor households face a constraint in terms of the proportion of persons in working ages or potential earners; it would persist even with full employment. However, insofar as the incidence of unemployment and underemployment is greater among the poor,^{1/} programs to relieve unemployment can help the poor households in a very tangible manner.

Secondly, the effect of differences in age composition on the labor force participation rates of population in different deciles deserves careful consideration. The non-uniformity of labor force definitions in different surveys (outlined in Annex I) would probably not affect the relationship between decile and the participation rates. Table 6 shows participation rates for ages 10 and over or 15 and over.^{2/} The rates

^{1/} Although the measurement of unemployment is not based on uniform criteria in different surveys, the incidence of unemployment varies inversely with PCE or PCY decile, i.e. is greater among the poor, in four of the five areas studied in this paper. For Nepal, data on unemployment are not available.

^{2/} An analysis of the determinants of labor force participation, taking into account the characteristics of individual sample households, is yet to be undertaken.

TABLE 6

Labor Force Participation Rates of Population Ages 10 and Over
(or 15 and Over) by Sex and Decile of Households in Terms of Per Capita Expenditure or Income

Decile	GUJARAT		MAHARASHTRA		NEPAL		SRI LANKA [§]	TAIWAN [§]	
	Rural (1972-73)	Urban (1972-73)	Rural (1972-73)	Urban (1972-73)	Eleven Town (1973-74)	Seven Town (1974-75)	1969-70*	(1968)*	(1974)*
<u>MALES</u>									
1	77.6	63.3	72.2	63.3	76.8	84.3	78.6	90.6	87.8
2	76.7	63.4	74.0	64.7	76.0	80.4	81.8	92.2	86.4
3	77.2	66.3	76.5	65.3	75.8	79.0	82.8	90.2	84.1
4					73.2	77.1	84.0	86.5	85.6
5	75.7	63.5	77.6	64.9	74.4	76.8	83.1	85.1	86.1
6					67.6	73.9	82.5	84.5	78.4
7	73.0	68.9	77.0	69.6	72.9	74.3	83.0	83.8	79.2
8					68.4	72.9	82.6	79.2	76.6
9	73.3	66.8	79.2	73.6	69.6	68.4	83.9	80.2	74.7
10	76.2	71.2	75.2	75.1	74.7	76.6	80.0	78.7	81.5
All	75.6	66.2	76.2	67.1	72.9	76.3	82.3	85.2	82.1
<u>FEMALES</u>									
1	62.2	24.2	60.0	27.9	42.2	70.7	27.9	61.6	64.6
2	58.5	18.4	65.0	22.9	44.1	63.7	28.8	61.1	58.8
3	56.3	16.7	63.8	17.6	40.1	65.7	29.7	56.3	52.9
4					38.0	56.3	31.2	50.9	45.5
5	50.6	11.3	62.6	12.9	36.4	52.1	26.9	43.8	43.1
6					30.0	52.9	26.5	43.5	44.7
7	48.2	11.3	62.1	10.3	29.3	53.1	27.2	41.2	41.1
8					26.2	52.6	25.5	42.9	39.5
9	45.6	11.1	54.2	14.0	24.3	32.9	21.8	35.3	40.2
10	40.4	12.0	51.1	18.0	27.0	30.2	29.1	33.5	41.7
All	52.0	14.9	61.1	17.1	34.4	55.4	27.5	47.8	47.7
<u>PERSONS</u>									
1	70.1	43.3	62.2	45.4	58.7	77.2	51.7	75.3	75.9
2	67.8	42.0	69.6	44.2	59.9	72.0	54.9	76.0	72.3
3	66.9	42.1	69.5	42.3	57.4	72.2	55.6	73.0	68.2
4					55.4	66.7	56.9	68.2	64.6
5	63.3	38.3	70.0	41.0	55.5	64.5	55.0	64.0	64.1
6					48.9	63.7	54.6	64.1	61.6
7	61.0	41.5	69.8	43.5	51.2	63.9	55.8	61.6	59.9
8					47.8	63.5	55.1	61.2	58.4
9	59.5	40.4	66.8	48.7	48.8	54.0	54.0	58.9	57.9
10	58.9	45.0	64.4	51.6	55.5	61.5	55.6	58.1	62.4
All	64.1	41.4	68.7	43.9	54.0	66.3	55.0	66.3	64.8

* For persons aged 15 and over.

a/ For persons aged 15-64.

§ Deciles of income.

for males do not show any consistent relationship with PCE or PCY decile and, not unexpectedly, the differences are small. The female rates, on the other hand, vary inversely with decile and, except in Sri Lanka, the decile differentials are sizeable.

The "crude" participation rates (for all ages, i.e. including children in the denominator) show a positive relationship between the male rates and the PCE/PCY decile, which is *partly* offset by the inverse relationship between the female rates and decile. For both sexes together, the participation rates show a rise with decile in urban areas of Gujarat and Maharashtra and in Sri Lanka. In other cases, the decile difference in crude female participation rates or at least the participation rates for both sexes together are relatively small and show little consistent pattern.

On the whole, the poor households try to overcome the high burden of young dependents through greater labor force participation by their females.^{1/} But the decile differences in labor force participation of both sexes together (or for that matter, in the incidence of unemployment) are much smaller than those in the levels of consumption or income and are unlikely to explain much of the variance. To anticipate the results of some multivariate analysis in progress, the main variables explaining the differentials in PCE or PCY are likely to be differences in household size, educational attainment (or human capital) and the associated variations in the composition or the structure of employment in terms of occupation and/or industry and the status or class of workers. Some of these characteristics are characteristics of individuals or workers and not of households. When there is more than one worker in a household, one can take account of the characteristics of the main earner, if the data permit his identification;^{2/}

^{1/} The conventional wisdom suggests that the poor attempt to mitigate the burden of dependency by having their children participate in economic activity; but with the growth of population and labour force over the past two decades or so, the direct contribution of these child-workers to the income or earnings of the family tends to be quite limited, at least in the densely populated countries. Perhaps that factor and the rise in school enrollment ratios, rather than the biases of enumerators and interviewers, explain the very low labour force participation rates reported in our surveys for ages 5-9 and 10-14 and shown below. Of course, the children might contribute to family earnings by taking care of siblings and permitting women to work.

	Gujarat		Maharashtra		Nepal		Sri Lanka	Taiwan	
	Rural	Urban	Rural	Urban	11 Towns	7 Towns		1968	1974
Males 5-9	1.0	0.3	1.2	0.1	3.2	3.6	0.3	0.1	--
Males 10-14	19.4	4.5	20.1	5.0	16.0	25.7	6.3	12.3	1.6
Females 5-9	1.2	0.2	1.1	0.1	4.4	3.7	0.4	0.3	0.1
Females 10-14	20.3	1.5	22.7	2.8	14.3	35.0	3.5	20.1	3.9
Persons 5-9	1.1	0.2	1.1	0.1	3.8	3.7	0.4	0.2	--
Persons 10-14	19.9	3.1	21.4	4.0	15.2	30.1	4.9	16.1	2.7

^{2/} In households with self-employed or unpaid family workers, it is virtually impossible to estimate the earnings of individuals.

or else the characteristics of the household head may be assumed to reflect those of other members as well. It is important, however, that inequality is studied in terms of the per capita income or expenditure so that the greater burden of dependents in bottom deciles of households is not overlooked, as happens if the income distribution is examined in terms of only the earners or the economically active population.

THE KUZNETS CURVE

The discussion so far has highlighted the differences in some of the characteristics of households ranked according to their PCE (or PCY) and THE (or THY). Much of the current discussion about changes in income distribution in the process of economic growth is conducted on the basis of ranking of households in terms of total income. Of course, the original formulation by Simon Kuznets was in terms of "the inequality in the size distribution of total income" of households.^{1/} The same is true of the recent cross-sectional regression analysis by Ahluwalia of the variations in the income shares of bottom 40 percent associated with the per capita GNP of 40 developing countries or a total of 60 countries because most of the income distribution data show the ranking of households by THY.^{2/} As shown earlier in Table 1, the indices of inequality based on the distribution of individuals ranked according to the PCY of their households would be smaller than those based on the distribution of households according to their THY. However, the differences are small and the ranking of countries according to the level of income inequality seems unlikely to change.

If the Kuznets curve can be assumed to hold even when inequality is measured in terms of THY, the earlier discussion of the characteristics of households in terms of size, age composition of the population and labor force participation provides some basis for speculation about the possible contribution of the process of demographic transition to the relationship between inequality and economic growth.

Let us assume that the process of demographic transition follows an idealized course, with (a) an initial condition of almost universal high levels of mortality and fertility (with low rates of natural increase); (b) a phase of declining mortality unaccompanied by fertility decline (and therefore a rise in the rate of natural increase); (c) a third phase in which fertility declines with a time lag (initially only offsetting the decline in mortality but eventually leading to a decline in the rate of natural increase); and (d) the final phase in which both mortality and fertility are low more or less throughout the society and the rate of natural increase is determined essentially by fluctuations in fertility. Differentials in fertility, or more importantly in the rates of natural increase by income class, which are mentioned as likely to contribute to the Kuznets curve^{3/} are important

^{1/} Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations: VIII Distribution of Income by Size", *Economic Development and Cultural Change*, Vol. XI, No. 2, Part II, January 1963, p. 67.

^{2/} Montek S. Ahluwalia, "Inequality, Poverty and Development", *Journal of Development Economics*, Vol. 3, 1976, pp. 307-342.

^{3/} Ahluwalia, *ibid.*

essentially during the second and third phases of the process of demographic transition. However, some other links in the chain can also be identified.

It seems to me reasonable to presume that in the initial situation before the start of mortality declines, differences between income groups in the household size or the age composition of household members would be relatively small except for those associated with the age of the household heads.^{1/} As the transition begins, the better-off or the rich would be the first to enjoy the benefits of mortality decline and subsequently they would take the lead in fertility control while the poor also begin experiencing a decline in mortality and an increase in the number of surviving children. The result would be a widening of the differentials in household size. Since the age composition of the population (of a group) responds quickly to the decline in fertility (more than to the decline in mortality), the rich would also begin to have a smaller dependency burden. The differentials in the age-dependency burden would also widen as a result. If social custom requires everyone above a certain age to take up some work, there would be a simultaneous widening of the differentials in labor force participation rates, and, therefore, in per capita output of the rich and the poor households. Insofar as the rich, whose dependency burden would be smaller than that of the poor, send their children to school to develop their skills and abilities, differences in productivity would also contribute to an increase in inequality. As the process of demographic transition completes the idealized third phase noted above, the differentials in household size, age dependency burden and labor force participation rates would once again tend to shrink. Of course, a narrowing of the income-related differentials in school enrollment rates and educational attainment of workers (that has occurred in most developed countries) would also lead to a decline in income inequality.

Obviously, the reasoning outlined above abstracts from several other factors contributing to disparities in income and consumption. Also, it is difficult to find any empirical evidence to test the validity of the speculation just outlined. Data on household size in the now developed countries for the pre-transition period seem to be virtually non-existent. However, there is strong evidence indicating an increase during the past two to three decades in the average household size in several Latin American and Asian developing countries.^{2/} In the presently developed countries on the other hand, the secular trend in

^{1/} The differentials in income in this situation may be a result of differential endowments of labor skills or property.

^{2/} Quite probably, the relatively rapid decline in mortality unaccompanied by fertility decline has been the main contributory factor. The tendency towards urbanization and a rise in the female participation rates would be expected to have the effect of lowering the average family size. See: United Nations, *Determinants and Consequences of Population Trends: New Summary of Findings on Interaction of Demographic, Economic and Social Factors*, Vol. 1, New York, 1973, p. 347.

average household size during the period for which data are available has been generally downward, although in England and Wales during 1811-1851 and 1961-1891 and in Japan during 1925-1950, there was some increase in average household size.^{1/}

Even with a declining or constant average household size, the range of variation or variance of household size could rise. In the United States, for example, while the average size of a household was 5.79 in 1790 and 4.76 in 1900, its standard deviation was 2.82 and 3.01, respectively. By 1950, however, the average size had declined to 3.52 with a standard deviation of 2.70.^{2/} In Taiwan, between 1968 and 1974, the decline in the average household size from 5.8 to 5.3 (shown in Table 3) has been accompanied by a decrease in its standard deviation from 2.74 to 2.26. More research into the variations in household size may provide some interesting further evidence.

While it may be possible to study the time-trends in the dispersion of the size of households in different countries, there is little hope of studying the age composition of members in different deciles of households. Even for recent dates, special tabulations of the primary data are necessary for such work. It seems to me quite likely, however, that differences in the age composition of the population and the proportions of workers (or earners) in households falling in different deciles would increase with the increased variations in household size, and would contribute towards an increase in the level of inequality during the process of demographic transition. These differentials would probably narrow as the low fertility becomes universal.

The attainment of the final phase of demographic transition with low levels of both fertility and mortality is usually associated with a substantial spread of literacy and education, as well as high levels of urbanization and industrialization. In other words, the demographic transition normally occurs simultaneously with substantial changes in the sectoral occupational and status distribution of workers and the narrowing of the inter-sectoral differentials in productivity, which have been emphasized by Kuznets. While it is not possible to quantify with any precision the contribution of the process of demographic transition to the observed inverted U-shaped relationship between inequality and economic growth, these phenomena seem to be inter-related to some extent and perhaps some simulations would yield interesting results.

^{1/} *Op.cit.*, pp. 341-342.

^{2/} Louis Winnick, *American Housing and Its Use: The Demand for Shelter* (New York, John Wiley & Sons, Inc., 1957, p. 79. For calculating the standard deviation from the size distribution of households shown by Winnick, it has been necessary to estimate the average size of households with 10 or more persons by taking into account the reported mean household size of the entire population. Note that the territorial coverage of the United States had changed substantially between 1790 and 1860. Therefore, the estimates are believed to be only crude indicators of the likely tendency.

THE PROSPECTS AHEAD

The Kuznets curve as well as the differentials in fertility that are an integral part of the process of demographic transition suggest that *ceteris paribus*, the inequality of income and consumption in the developing countries would increase in the decade or so ahead, when according to the United Nations projections, the birth rate (per 1000 population) in the LDC's is expected to decline from about 39.0 during 1970-75 to 34.9 during 1980-85 and 29.9 during 1990-95.^{1/} However, I believe there is nothing inevitable about the Kuznets curve and with a proper mix of policies, it would be possible to translate the aspirations for greater equality into reality.

As pointed out by Dudley Kirk, the time span required to complete the process of demographic transition appears to have shortened in some of the countries that have lowered their fertility since the 1950's.^{2/} Further, the official family planning programs do hold promise of lowering the threshold of development when fertility behavior of even the poor would begin to change.

One factor that strengthens such optimism is the substantial narrowing of the differentials in school-enrollment ratios for ages 5-14 in different PCE/PCY deciles, *relatively* to the differentials in literacy and educational attainment of the older age cohorts, evident in our data for Gujarat, Maharashtra, Nepal and Sri Lanka.^{3/} Of course, Gujarat and Maharashtra are among the more developed states of India and our data for Nepal pertain to only 18 development centers or towns. Further, even now differentials in school enrollment rates are not negligible and their elimination should be the goal of public policy. However, the data point to a significant narrowing of differentials, which could help both in shortening the time-lag between mortality and fertility declines and in reducing the differentials in earnings related to differences in schooling and education.

In addition, of course, land reforms, progressive taxation, and public expenditure policies designed to maintain and raise the consumption standards of the poor and to give them equality of opportunity,

^{1/} The average annual rate of natural increase, however, would fall from 2.5 during 1970-75 to 2.4 during 1980-85 and 2.1 during 1990-95. See: United Nations, *The Determinants and Consequences of Population Trends*, *op.cit.*, pp. 564-567. These projections were made in 1968.

^{2/} Dudley Kirk, "A New Demographic Transition?" in: *Rapid Population Growth: Consequences and Policy Implications*, presented by a Study Committee of the National Academy of Sciences, Baltimore and London: The Johns Hopkins Press, 1971, pp. 123-147.

^{3/} In Taiwan, over 85 percent of the population aged 15 and over in 1974 was literate and almost 80 percent had completed primary school.

sometimes summed up under the "basic needs" oriented strategy of development, would also help to achieve a reduction of disparities in consumption and income. Since the demographic processes operate over relatively long time spans, these other policies would be more potent and critical over the next decade.

ANNEX I

CONCEPTUAL FRAMEWORK OF THE DATA ON (i) EXPENDITURE AND/OR INCOME AND (ii) LABOR FORCE IN THE SURVEYS SELECTED FOR ANALYSIS

Given below is a summary of the important procedures and rules adopted in different surveys for recording expenditure, income and labor force data.

INDIA

Expenditure

1. Consumer expenditure in cash and kind (and also quantities) were recorded for items purchased or consumed during the 30 days preceding the day of interview (including value of domestic consumption out of home-grown stock; rent and taxes -- but excluding income-tax).
2. Expenditure relating to productive enterprise was excluded.
3. For clothing and footwear, items purchased during the reference period but not brought into *maiden use* were excluded.
4. Expenditure on the purchase or repair of durable goods for domestic use was included.
5. Value was imputed for non-purchased consumption.
 - (a) for commodities received in exchange, at average local retail price.
 - (b) for consumption out of home-grown stock, at ex-farm or ex-factory price.
 - (c) for consumption out of transfer receipts, i.e., borrowing, gifts, charities, etc., at average local retail price.
 - (d) for consumption out of free collection on the basis of retail prices in a market nearest to the sample village.
6. Consumption on ceremonial and other occasions was included, with the appropriate information.
7. No value was imputed for owner-occupied housing.

Labor Force/Employment

- (a) Usual activity (determined on the basis of the "normal working pattern ... over a long period in the past") was recorded for every respondent. For persons pursuing more than one activity, that which accounted for more labor time was recorded as the usual activity.
- (b) Current activity or the activity of the week preceding the date of interview was recorded for every respondent.
- (c) For persons in the labor force during the reference week, the survey recorded (i) occupation; (ii) industry; (iii) class of worker; (iv) days worked during the last week; (v) days of unemployment; and (vi) days outside the labor force.
- (d) For persons usually in the labor force, the survey recorded: (i) usual occupation; (ii) usual industry; (iii) class of worker; (iv) preference for location of work and factors determining availability for additional work.

Notes: (1) Available data relate to the "monthly per capita consumer expenditure" (MPCE) of the household.

- (2) The participation rates shown in Table 6 are based on the usual activity data; but they are not significantly different from the rates based on the reference period of one week.

NEPAL

Income

- 1. Earnings during "last month" ("total" earnings for persons with more than one occupation), including "pay in kind" were recorded for employees.
- 2. "Net profit last month" was to be recorded for an employer or own-account worker. (However, the information was obtained for only about 47 percent of such workers in the eleven towns and 35 percent of those in the seven towns.)
- 3. An attempt was made to record the value of crops and other goods received as rental payments (presumably for "last" month only).
- 4. Changes in assets and liabilities were recorded.
- 5. Data were collected on the ownership of 28 "durable" goods for use in constructing an index of socio-economic status.

Expenditure

- (a) Expenditure on non-food consumption during the "past calendar month" was recorded.

- (b) For food expenditure, each household was visited for "six consecutive days" to report the purchases of food items and the use of home-produced food items. On the sixth day, food consumption was reported for the "previous two days". (It is not clear whether the procedure implied that the consumption of the fifth day was reported twice.) The relevant schedule was devised to make a "seven-day record".
- (c) Consumption of home-produced goods was valued at retail market prices.
- (d) Rental value of owner-occupied and free housing; was estimated and recorded.

Labor Force

- (a) No explicit reference period was specified; essentially the gainful worker approach was followed with an instruction to record "the occupation even though the person is not employed at the moment". However, for retired persons (those who have given up the occupation with no intention of working again), the current situation was to be recorded. Unpaid family workers were counted as "employed" if they worked "15 hours or more during the week".
- (b) Provision was made to record the employment status (i.e. class of worker of the employed and also unemployment) for every one with an occupation. A person with an occupation but "not working because he has no job, is sick, is a seasonal worker, or for any other reason" was to be classified as unemployed. (In fact, however, we have not found anyone coded as unemployed in the seven towns surveyed during 1974-75 and only 44 unemployed, i.e. 0.5 percent of the labor force in the 11 towns surveyed during 1973-74.)
- (c) The employed have been classified according to a one-digit industrial classification and a three-digit occupational classification. "Usual" hours of work were recorded for most workers.

- Notes: (1) The reported expenditure on marriages, funerals and festivals and government taxes has been excluded because only a few households had reported such expenditure. The inclusion of these items tended to distort the mean levels of expenditure.
- (2) The seven towns surveyed during 1974-75 have been kept distinct from the eleven towns surveyed during 1973-74 because of significant inflation during the intervening period and the non-availability of any suitable price index numbers for an adjustment.

SRI LANKA

Income

1. Income was defined as "receipts in cash or kind from work, property, transfers and other sources that contribute to the individual's or individual earner's spending power."
2. The households whose income was subject to considerable seasonal fluctuations were asked to report "average monthly income based on the total income over the year preceding the Survey". For others, the reference period was "last month".
3. Value was imputed for "home-grown" consumption, free goods and services and owner-occupied housing. The latter was valued at "pre-vailing market prices", adjusted for maintenance costs and taxes.
4. A distinct record was made of income from:
 - (a) Wages, salaries and related receipts;
 - (b) Profits from business enterprise or farm;
 - (c) Rent, dividends, and interest;
 - (d) Pension, remittances, and cash allowances;
 - (e) Other periodic cash receipts; and
 - (f) Non-monetary income.

Expenditure

- (a) For food, drink and tobacco, data were collected through *daily visits* on seven consecutive days (blown up to get monthly estimates).
- (b) For non-durable goods and services, data were collected for the calendar month immediately preceding the field survey.
- (c) For consumer durables, data were collected for the "preceding year" and then averaged to get monthly estimates.
- (d) No value was imputed for free ration of rice. (If the value of free rice ration - two pounds per week per person - is taken into account on the basis of the average price paid for rice purchased from the market, the indices of inequality would be lower.)
- (e) "Whenever possible", a responsible member of the household was asked to maintain a daily record of consumption.

Labor Force/Employment

- (a) For "regular" workers, the reference period was one month preceding the survey.
- (b) For persons in seasonal occupations, the "usual status" was recorded.

- (c) Persons working temporarily or casually on a contractual basis were classified as employed if they had worked for at least 10 days during the month preceding the survey.
- (d) The unpaid family workers in household enterprises were classified as employed if they had worked for at least 10 days during the month or the season preceding the survey.
- (e) The unemployed were defined as persons aged 15 to 55, who were not classified as employed in terms of (a) to (d), *and were seeking work* (excluding persons "mainly engaged" in household work and students).

TAIWAN

Income

1. Income during the previous year was recorded with a detailed accounting of all receipts (both in cash and kind), consumption, changes in fixed assets such as land, house, or other construction and also in financial assets and liabilities.
2. Personal income was recorded for all wage or salary earners.
3. Net farm or business income was recorded for the whole household.

Labor Force

- (a) No explicit reference period was used for the questions on occupation; but a distinction is made between major and secondary occupations.
- (b) Data on the major and secondary occupations of the employed are available in terms of:
 - (i) 12 industrial divisions;
 - (ii) 12 occupational divisions;
 - (iii) whether employed in (1) public corporations, (2) other government sector, or (3) the non-government sector; and
 - (iv) class of worker.
- (c) Unemployed persons have been identified, but there is no information on the duration of their unemployment.

ANNEX II

INDICES OF INEQUALITY

The indices of inequality shown in Table 1 were calculated by using the computer programs developed at the World Bank for the compilation

of income distribution data for different countries.^{1/} These programs fit a Lorenz curve to the observed data on the basis of a mathematical function proposed by Kakwani and Podder^{2/} and derive the income (or expenditure) shares of 20 five-percentile groups of population, which are used for some of the inequality measures.

The *Gini coefficient* is a ratio of (a) the area on a graph that lies between the Lorenz curve and the egalitarian line (or line of perfect equality, which forms a 45-degree angle with both the x- and y-axes) to (b) the area of the entire triangle formed by the egalitarian line and the x- and y-axes. As a measure of income concentration, the Gini coefficient ranges from 0 to 1 -- the larger the coefficient, the greater the inequality. Our Gini coefficients are calculated directly from the estimated parameters of the Lorenz curve. As derived by Kakwani and Podder, the Gini coefficient is given by

$$G = 2 \int_0^{\sqrt{2}} a \pi^\alpha (\sqrt{2} - \pi)^\beta d\pi$$

$$= 2a(\sqrt{2})^{1+\alpha+\beta} B(1+\alpha, 1+\beta) ,$$

where $B(1+\alpha, 1+\beta)$ is the Beta function which has been widely tabulated.

The *Kuznets index* is estimated by calculating the absolute mean deviation of income (expenditure) shares of each five-percentile group of the population from five percent. The arithmetic average of the 20 absolute deviations ranges from zero in the case of perfect equality to 9.5 in the case of maximum inequality. Division by 9.5 is necessary to standardize the measure to a range of zero to one.

This gives:

$$D = \frac{\sum |d|}{20 \cdot 9.5} ,$$

where d is the absolute deviation of the income share of each 5 percentile group from 5 percent.

^{1/} Shail Jain, *Size Distribution of Income: A Compilation of Data*, Washington, D.C.: The World Bank, 1975, pp. xii-xv.

^{2/} N.C. Kakwani and N. Podder, "Efficient Estimation of the Lorenz Curve and Associated Inequality Measures from Grouped Observations", *Econometrica*, Vol. 44, No. 1, pp. 137-148.

The following entropy measure, or standardized E index, reported in the tables follows a suggestion by Marfels,^{1/} which can be written:

$$E^* = 1 - \text{antilog } H(y)/n$$

where $H(y)$ is the entropy measure defined as follows:

$$\begin{aligned} H(y) &= \sum y_i \log (1/y_i) \\ &= - \sum y_i \log y_i \end{aligned}$$

where y_i are income shares of the i^{th} individual. $H(y)$ is at a maximum when all income shares are equal, that is, when $y_i = 1/n$ for all i . In this case $H(y) = \log n$ and the inequality measure $E^* = 0$. Conversely, $H(y)$ is at a minimum when all income accrues to one individual. In this case, $H(y) = 0$ and $E^* = 1 - 1/n$. Thus, E^* varies from 0 to $1 - 1/n$. E^* can be standardized by dividing it by $(n - 1)/n$ to give an index of inequality E ranging from zero in the case of maximum equality to unity in the case of maximum inequality.

ANNEX III

Tables 1 and 2 below illustrate the changes in the relative position of households with heads of different five-year age groups, when the ranking criterion of total household expenditure is replaced by per capita expenditure. The data examined in these tables relate to Gujarat and Maharashtra states of India and the 18 towns or development centers of Nepal. A similar pattern is expected if the income data were available for these states/countries and when they are tabulated for Sri Lanka and Taiwan.

^{1/} Christian Marfels, "Absolute and Relative Measures of Concentration Reconsidered", *Kyklos*, Vol. 24 (1971), fasc. 4, pp. 753-66.

TABLE 1
 RURAL AND URBAN EXPENDITURE PER PERSON IN THE UNITED STATES: 1957-72

Sample Households Percent of Total	Number	Index of Per Capita Expenditure	Index of Per Capita Expenditure	Ratio of Rural to Urban	Sample Households*	
					Unweighted	Weighted
ALL	5560	100.0	100.0	100.0	100.0	100.0
Less than 20	213	1.3	1.5	1.5	1.5	1.5
20 - 24	70	3.8	3.6	3.6	3.6	3.6
25 - 29	52	9.4	8.8	8.8	8.8	8.8
30 - 34	25	14.3	13.5	13.5	13.5	13.5
35 - 39	79	14.9	14.5	14.5	14.5	14.5
40 - 44	83	13.5	13.0	13.0	13.0	13.0
45 - 49	66	11.9	11.5	11.5	11.5	11.5
50 - 54	61	11.1	10.9	10.9	10.9	10.9
55 - 59	38	6.9	7.2	7.2	7.2	7.2
60 - 64	27	6.8	7.4	7.4	7.4	7.4
65 & above	24	6.2	6.9	6.9	6.9	6.9
URBAN CLASSES						
ALL	3545	100.0	100.0	100.0	100.0	100.0
Less than 20	142	1.2	1.3	1.3	1.3	1.3
20 - 24	46	4.1	4.3	4.3	4.3	4.3
25 - 29	30	8.6	9.7	9.7	9.7	9.7
30 - 34	49	14.0	12.2	12.2	12.2	12.2
35 - 39	50	15.1	15.4	15.4	15.4	15.4
40 - 44	53	12.7	12.7	12.7	12.7	12.7
45 - 49	46	11.6	11.6	11.6	11.6	11.6
50 - 54	40	7.1	7.1	7.1	7.1	7.1
55 - 59	23	6.6	6.6	6.6	6.6	6.6
60 - 64	20	5.8	5.8	5.8	5.8	5.8
65 & above	21	6.0	5.8	5.8	5.8	5.8
RURAL MAINTENANCE						
ALL	531	100.0	100.0	100.0	100.0	100.0
Less than 20	56	1.1	1.1	1.1	1.1	1.1
20 - 24	20	4.6	4.6	4.6	4.6	4.6
25 - 29	14	8.1	8.1	8.1	8.1	8.1
30 - 34	6	10.0	10.0	10.0	10.0	10.0
35 - 39	8	15.7	15.7	15.7	15.7	15.7
40 - 44	7	13.7	13.7	13.7	13.7	13.7
45 - 49	6	11.1	11.1	11.1	11.1	11.1
50 - 54	5	8.6	8.6	8.6	8.6	8.6
55 - 59	3	6.7	6.7	6.7	6.7	6.7
60 - 64	2	7.9	7.9	7.9	7.9	7.9
65 & above	2	10.7	10.7	10.7	10.7	10.7
URBAN CLASSES						
ALL	351	100.0	100.0	100.0	100.0	100.0
Less than 20	139	4.9	5.1	5.1	5.1	5.1
20 - 24	43	11.1	11.1	11.1	11.1	11.1
25 - 29	28	12.2	12.2	12.2	12.2	12.2
30 - 34	10	15.2	15.2	15.2	15.2	15.2
35 - 39	12	12.4	12.4	12.4	12.4	12.4
40 - 44	15	15.4	15.4	15.4	15.4	15.4
45 - 49	14	14.7	14.7	14.7	14.7	14.7
50 - 54	9	11.4	11.4	11.4	11.4	11.4
55 - 59	7	7.4	7.4	7.4	7.4	7.4
60 - 64	3	5.3	5.3	5.3	5.3	5.3
65 & above	3	6.1	6.1	6.1	6.1	6.1
RURAL MAINTENANCE						
ALL	103	100.0	100.0	100.0	100.0	100.0
Less than 20	37	37.6	37.6	37.6	37.6	37.6
20 - 24	21	21.3	21.3	21.3	21.3	21.3
25 - 29	11	8.7	8.7	8.7	8.7	8.7
30 - 34	8	8.2	8.2	8.2	8.2	8.2
35 - 39	2	2.4	2.4	2.4	2.4	2.4
40 - 44	5	5.0	5.0	5.0	5.0	5.0
45 - 49	7	7.0	7.0	7.0	7.0	7.0
50 - 54	12	12.2	12.2	12.2	12.2	12.2
55 - 59	6	6.7	6.7	6.7	6.7	6.7
60 - 64	3	3.5	3.5	3.5	3.5	3.5
65 & above	2	2.2	2.2	2.2	2.2	2.2

* Sample Households are classified into rural and urban classes on the basis of the difference between the number of persons in the household and the number of persons in the labor force.

TABLE 2

NEPAL: PER CAPITA AND TOTAL HOUSEHOLD EXPENDITURE (IN NEPALI RUPEES) BY AGE GROUP OF THE HEAD OF HOUSEHOLD, AND (A) ELEVEN TOWNS, 1973-74 AND (B) SEVEN TOWNS, 1974-75

Age of Household Head	Number of Households	Average Household Size	Average Household Expenditure	Average Per Capita Expenditure	Index of Household Expenditure	Index of Per Capita Expenditure
(A) <u>Eleven Towns, 1973-74</u>						
All	4393	5.4	500.0	92.9	100.0	100.0
less than 20	62	3.5	334.6	95.8	66.9	103.1
20-24	228	3.4	418.7	122.9	83.8	132.3
25-29	486	4.0	406.0	101.2	81.2	108.9
30-34	595	4.8	451.0	94.5	90.2	101.7
35-39	646	5.4	487.5	90.5	97.5	97.4
40-44	599	5.9	528.5	90.1	105.7	97.0
45-49	474	5.9	513.9	86.7	102.8	93.3
50-54	469	6.0	591.2	98.8	118.2	106.4
55-59	297	6.2	580.5	93.6	116.1	100.8
60+	602	6.3	545.2	86.5	109.0	93.1
(B) <u>Seven Towns, 1974-75</u>						
All	2254	5.2	583.6	113.1	100.0	100.0
less than 20	76	2.8	397.2	143.1	68.1	126.6
20-24	203	3.3	475.3	142.0	81.5	125.6
25-29	268	4.0	483.9	121.2	82.9	107.2
30-34	321	4.9	608.1	125.1	104.2	110.7
35-39	309	5.4	544.6	101.8	93.3	90.0
40-44	283	6.1	644.4	106.1	110.4	93.8
45-49	246	6.1	651.6	106.2	111.6	94.0
50-54	199	5.9	617.5	104.9	105.8	92.8
55-59	116	6.6	676.3	113.6	115.9	103.5
60+	259	5.9	651.4	110.7	111.6	97.9

ANNEX IV

ESTIMATION OF ADULT EQUIVALENTS

Table 1 below shows the two sets of weights or coefficients for different sex-age groups used to convert individuals into adult equivalents. The basis for the weights used by the Bureau of Statistics of Taiwan is not known. The Indian coefficients were calculated on the basis of the recommendations of a Committee constituted by the WHO and the FAO. They were used to standardize the estimates of caloric consumption from the data on quantities of different food items consumed by sample households during the month preceding the date of survey, during July 1971-June 1972. The weight for males aged 13-15 is lower than that for ages 10-12 or 16-19 because of similar differences in the FAO estimates of daily caloric requirements. The weights do not take account of the increased caloric needs of women during pregnancy and lactation.

The estimation of equivalent adults in Maharashtra has required some arbitrary assumptions because the specific ages of children aged less than five years were not recorded on the tape. An average weight of 0.53 was estimated on the basis of the detailed age composition of the age group 0-4 reported by the 1961 Census of Maharashtra. This weight was applied to all children below five years of age in every household.

To some extent, the usefulness of fine age-specific weights for estimating equivalent adults is limited by the errors in age reporting which are particularly large in single-year age distributions. However, as shown below in Table 2, the correlation between the number of persons and the number of adult equivalents in households has been exceedingly high -- a little higher when the Indian weights were used than when the Taiwan weights were applied.

TABLE 1
Weights for Estimating Equivalent Adult Consumers

India, 1971-72			Taiwan, 1974		
Age Group	Males	Females	Age Group	Males	Females
0	0.43	0.43	0-1	0.3	0.3
1-3	0.54	0.54	2-4	0.4	0.4
4-6	0.72	0.72	5-7	0.5	0.5
7-9	0.87	0.87	8-10	0.7	0.7
10-12	1.03	0.93	11-14	0.8	0.8
13-15	0.97	0.80	15-20	0.9	0.9
16-19	1.02	0.75	21 and over	1.0	0.9
20-39	1.00	0.71			
40-49	0.95	0.68			
50-59	0.90	0.64			
50-69	0.80	0.51			
70+	0.70	0.50			

Sources:

(1) For the Taiwan data, figures supplied by the Bureau of Statistics, Taipei, Taiwan.

(2) The National Sample Survey, Draft Report No. 258/10, Calorie and Protein Content of Food Items Consumed Per Diem Per Consumer
Unit: All India, Rural, 26th Round, July 1971-June 1972, mimeo.

TABLE 2
Measures of Association between Household Size
and the Number of Adult Equivalents in
Households for Some Data Sets

<u>State or Country</u>	<u>Household Size and Adult Equivalents (Indian Weights)</u>		<u>Household Size and Adult Equivalents (Taiwanese Weights)</u>	
	<u>Correlation Coefficient</u>	<u>Coefficient of Determination</u>	<u>Correlation Coefficient</u>	<u>Coefficient of Determination</u>
GUJARAT, 1972-73				
Rural	0.99	0.97	--	--
Urban	0.99	0.98	--	--
MAHARASHTRA, 1972-73				
Rural	0.99	0.97	--	--
Urban	0.99	0.98	--	--
SRI LANKA, 1969-70	0.99	0.97	0.96	0.92
TAIWAN				
1968	0.98	0.97	0.97	0.94
1974	0.98	0.96	0.96	0.91

NOTE: All figures are independently rounded.

Facteurs démographiques et répartition des revenus:
Etude de certaines questions

Résumé

L'un des objectifs de ce document est de mettre en lumière les conséquences qu'a l'application de l'un ou l'autre des deux critères possibles de classement par rangs lorsqu'on veut calculer les inégalités de revenus et identifier les populations pauvres au profit duquel peuvent être conçus des programmes spéciaux d'aide ou de secours. S'il est vrai que le ménage est l'unité logique pour le recensement du revenu (ou des dépenses), la répartition des ménages en fonction du revenu de chacun d'eux n'est pas un indicateur valable du degré d'inégalité qui existe entre eux, car la taille des ménages n'est pas la même selon le décile où ils se situent. L'autre solution, qui est évidemment plus simple, consiste à classer les ménages ou la population d'après le revenu ou les dépenses par personne (du ménage). La proportion de ménages et de population que l'on retrouve dans le même décile du fait de l'application de ces deux critères est extrêmement faible, et de ce fait, les groupes de population pauvre ainsi identifiés pour l'établissement de programmes d'aide seront très différents selon le critère utilisé.

La taille moyenne du ménage diminue d'un décile à l'autre lorsqu'on prend comme critère le revenu ou les dépenses par personne; elle augmente par contre lorsque le critère est le revenu ou les dépenses totales du ménage. Ces différences tiennent au fait que la taille moyenne du ménage augmente en fonction de l'âge du chef de famille jusqu'à 40 à 44 ans environ. En outre, beaucoup de ménages dont les chefs de famille sont jeunes se retrouvent dans les déciles inférieurs si l'on utilise le critère des dépenses totales du ménage et dans les déciles supérieurs si l'on utilise le critère du revenu ou des dépenses par personne.

On note des différences importantes dans la répartition par âge des personnes dont se composent les ménages situés dans différents déciles et rangés selon le revenu (ou les dépenses) par personne. De ce fait, le revenu (ou les dépenses) par équivalent adulte semble être un critère plus valable; toutefois, les estimations des inégalités qui résultent de l'application de ce dernier critère ne sont pas sensiblement différentes de celles qui se fondent sur la répartition des ménages d'après le revenu (ou les dépenses) par personne, du moins pour les deux séries de pondération choisies pour convertir les individus en équivalents adultes.

La deuxième partie du document est un essai de caractère assez spéculatif, sur la "courbe de Kuznets", que l'auteur explique par le fait que les écarts entre les composantes de taille et d'âge des ménages augmentent au cours d'une phase de "transition démographique" où le rythme de croissance de la population augmente en raison du décalage entre l'abaissement de la mortalité et de la fécondité. Il reste, pour vérifier cette hypothèse, à réunir les preuves empiriques qui devront s'appuyer sur des données historiques et certains modèles de simulation. L'auteur s'efforce également de présenter certaines hypothèses sur les tendances futures et probables de la répartition des revenus (ou des dépenses) dans les pays en développement au cours de la décennie à venir.

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