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POVERTY MEASUREMENT AND DECOMPOSITION OF AGGREGATE POVERTY CHANGE IN THE PHILIPPINES

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Poverty assessment is influenced by how the issues on the definition and measurement of poverty are addressed. These conceptual issues include: the choice of welfare indicator, the determination of the poverty line, the unit of analysis, the choice of equivalence scales and the choice of poverty index. Using the household data set of the Family Income and Expenditures Survey, this study illustrates that the incidence of poverty differs, depending on the choice of poverty index.

Given a change in the poverty incidence between 1985 and 1988, this paper examines the factors underlying the observed change through the use of a decomposition method. This method quantifies the relative contribution of economic growth and changes in inequality to changes in poverty. The results indicate that the growth component at a given level of consumption largely contributes to the overall poverty reduction.

1. Introduction

Measurement of poverty involves the choice of a suitable index from among several measures that will summarize the data on the poor. But before we can come up with such a measure, we first define who the poor are.

There is no unique standard used in classifying whether an individual or a household is poor. In fact, there are several conceptual issues on the definition of poverty. These are: the choice of poverty indicator, the determination of the poverty line, the unit of analysis and the choice of equivalence scales.[1] Different treatments of these issues give rise to different poverty definitions, resulting in the selection of different population groups as poor.

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[1]See Atkinson (1991), Hagenaars (1986) and Srinivasan (1990) for a more thorough discussion of these issues.

In the Philippines, several studies on poverty have been undertaken using different definitions of poverty. Not until recently, these studies have used the headcount index to measure poverty. This index gives the proportion of families or households whose income fall below the poverty line. While the headcount index is the most commonly used and easiest to compute, it fails to satisfy a number of desirable properties of poverty measures.

There are other measures that satisfy some of the desirable properties and three of these measures will be estimated in this paper. Different poverty indices will yield different poverty incidence. Thus, the severity of the poverty problem should be evaluated with respect to how poverty is defined and measured.

This paper will likewise examine the factors underlying the observed change in poverty measures between 1985 and 1988. The decomposition method will quantify the relative contribution of economic growth and changes in inequality to changes in poverty.

This study will use the microdata of the 1985 and 1988 Family Income and Expenditure Survey (FIES).

2. Theory and Methodology

2.1 Poverty Measurement

There is a large body of theoretical literature on the measurement of poverty, establishing a number of desirable properties for such measures. However, most researchers agree that a list of these desirable properties of a poverty index[2] include the monotonicity, transfer and subgroup consistency axioms.

a. *Monotonicity Axiom*: Other things remaining the same, a reduction in the income of any household below the poverty line must increase the poverty measure.

b. *Transfer Axiom*: Other things remaining the same, a pure transfer of income from a poorer household below the poverty line to a richer household still below the poverty line must

[2]Foster (1984), Foster, et al. (1984), Kakwani (1980), Ravallion and Huppi (1989, 1991), Datt and Ravallion (1990) discuss the desirable properties of poverty measures more thoroughly.

increase the poverty measure. In other words, any increase in the inequality among the poor due to a pure transfer must be reflected as an increase in the poverty index.

c. *Subgroup Consistency Axiom*: Other things remaining the same, the overall level of poverty must decrease whenever poverty falls within some subgroup of population while it remains unchanged outside that group. This is sometimes referred to as the property of additive decomposability into population subgroups.

Three additively decomposable poverty measures will be estimated in this study. These are: (1) FGT class of poverty measures for $\alpha = 0, 1, 2$; (2) Watts' measure; and (3) Clark, Hemming and Ulph measure for $\beta = 0.25$, 0.50 and 0.75. The property of additive decomposability of any poverty measure, Θ, is illustrated as follows. Consider the population split into m subgroups with population n_i ($i = 1, \ldots, m$), thus

$$n = \sum_{i=1}^{m} n_i$$

Then, Θ can be written as:

$$\Theta = \sum_{i=1}^{m} \frac{n_i}{n} \Theta_i$$

which is the population-weighted mean of the subgroup poverty index Θ_i.

2.1.1 FGT Class of Poverty Measures, P_α

There has been much interest in the class of poverty measures proposed by Foster, Greer and Thorbecke (1984), which will be referred to as the FGT index. This class of measures has a single parameter index which can be made to satisfy the axioms of poverty measurement through a suitable choice of that parameter. The parameter α indicates the importance given to the poorest of the poor: the larger the α, the greater is the emphasis given to the poorest families. Each member of the FGT class poverty measures is identified by the values of the parameter α. The formula is given by:

$$P_{\alpha} = \frac{1}{n} \sum_{j=1}^{q} \left[\frac{(z - Y_j)}{z} \right] \alpha$$

where Y_j = consumption per capita of the j^{th} family, z = poverty line, n = total number of families, q = number of poor families, $(z-Y_j)$ = the poverty gap, $(z-Y_j)/z$ = poverty gap ratio and $\alpha \geq 0$ is a measure of poverty aversion. Three members of the FGT class will be considered in this study:

(i) The FGT poverty measure for $\alpha = 0$, which is simply the headcount index. This gives the proportion of the population with a standard of living below the poverty line : $P_0 = q/n$.

While this is the most commonly used poverty measure, it lacks two desirable properties. A poor person may become poorer without an increase in the measure of poverty, violating the monotonicity axiom. Also, an income transfer from a poorer person below the poverty line to a richer person will not change the poverty measure, violating the transfer axiom.

(ii) The poverty measure for $\alpha = 1$, referred to as the average poverty gap in the population expressed as a proportion of the poverty line. This is given by:

$$P_1 = \frac{1}{n} \sum_{j=1}^{q} \frac{(z - Yj)}{z}$$

This index measures the amount of income necessary to bring every unit below the poverty line up to the poverty line. Also, it satisfies the monotonicity axiom because it is sensitive to the depth of poverty. However, since the poverty deficits are given equal weights, it is not sensitive to the distribution of living standards among the poor, thus violating the transfer axiom.

(iii) The poverty measure for $\alpha = 2$, which will be referred to as the preferred measure is based on the sum of squared poverty gaps of the poor. It satisfies the main axioms for a desirable poverty measure.

$$P_2 = \frac{1}{n} \sum_{j=1}^{q} \left[\frac{(z - Y_j)}{z} \right] 2$$

This index is sensitive to both the depth of poverty and the distribution of living standards among the poor, satisfying both monotonicity and transfer axioms.

2.1.2 Watts' Measure, *W*

Another additively decomposable poverty measure introduced by Watts,[3] which satisfies monotonicity and transfer axioms is given by:

$$W = \frac{1}{n} \sum_{i=1}^{q} \quad (\log z = \log Y_j)$$

where z = per capita threshold, Y_j = per capita consumption of the j^{th} family, q = number of families below the poverty line, n = total number of families.

2.1.3 Clark, Hemming and Ulph Measure of Poverty, C_β

Lastly, we'll consider another additively decomposable poverty measure by Clark, Hemming and Ulph[4]:

$$C_\beta = \frac{1}{\beta} \left[H - \frac{1}{n} \sum_{i=1}^{q} \left[\frac{Y_j}{z} \right] \beta \right]$$

where $H = q/n$ is the headcount index, Y_j is the per capita consumption of the j^{th} family, z is the per capita poverty threshold, q is the number of families below the poverty line and n is the total number of families.

This measure satisfies the monotonicity axiom for $\beta > 0$ and the transfer axiom for $\beta < 1$, thus b must lie in the range $0 < \beta < 1$.

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[3]Kakwani (1990) gives the computational form of Watts' poverty measure.

[4]Kakwani (1990) gives the computational form of the Clark, Hemming and Ulph measure of poverty.

2.2 Decomposition of Aggregate Poverty Change

For the decomposition of a change in aggregate poverty, the poverty measures will be limited to the FGT class of poverty measures.

The change in aggregate poverty will be analyzed according to the contribution of economic growth and changes in inequality. Following the decomposition method of Datt and Ravallion (1991), the poverty measure will be fully characterized in terms of the poverty line, the mean consumption (income) of the distribution and the Lorenz curve representing the structure of relative consumption (income) inequalities. The poverty measure P^t at date t may be written as:

$$(1) \quad P^t = p\,(z / u^t, L^t)$$

where z is the poverty line, u^t is the mean income and L^t is a vector of parameters fully describing the Lorenz curve at date t. The level of poverty may change due to a change in relative inequalities L^t.

A change in poverty may be decomposed into growth and distribution components. The *growth component* of a change in poverty measure is defined as the change in poverty due to a change in the mean consumption (income) while holding the Lorenz curve constant at some reference level L^r. The distribution component is the change in poverty due to a shift in the Lorenz curve while keeping the mean consumption (income) constant at the reference level u^r. The decomposition of the change in poverty over dates t and $t+n$ is given by:

$$(2) \quad \underset{\substack{\textit{growth}\\ \textit{component}}}{P^{t+n} = G(t,t+n;r)} + \underset{\substack{\textit{distribution}\\ \textit{component}}}{D(t,t+n;r)} + \underset{\textit{residual}}{R(t,t+n;r)}$$

where the growth and distribution components are:

$$(3) \quad G(t,t+n;r) = P(z / u^{t+n}, L^r) - P(z / u^t, L^r)$$
$$D(t,t+n;r) = P(z / u^r, L^{t+n}) - P(z / u^r, L^t)$$

while R( ) in (2) denotes the residual. The first two arguments in G( ) and D( ) refer to the initial and terminal dates of the decomposition, and the last argument makes explicit the reference date r with respect to which the observed change in poverty is decomposed.

For $r=t$ the growth and distribution components in (3) reduce to:

(4) $G(t,t+n;t) = P(z/u^{t+n}, L^t) - P(z/u^t, L^t)$
$D(t,t+n;t) = P(z/u^t, L^{t+n}) - P(z/u^t, L^t)$

while the residual in (2) may be written as:

$$R(t,t+n;t) = G(t,t+n;t+n) - G(t,t+n;t)$$
$$= D(t,t+n;t+n) - D(t,t+n;t)$$

The residual is thus interpreted as the difference between the growth (distribution) components evaluated at the terminal and initial Lorenz curves (mean consumption or income), respectively.

3. Empirical Results

3.1 *Poverty Incidence*

Focusing on the basic needs definition, different poverty measures were computed for 1988 based on the regional estimates of poverty threshold for the urban and rural sectors (Appendix Table 1). Poverty incidence by region using the following indices is shown on Table 1: FGT class of poverty measures ($\alpha = 0, 1, 2$), Watts' measure and Clark's measure ($\beta = 0.25, 0.50, 0.75$).

The proportion of families whose per capita consumption is less than the poverty threshold is estimated at about 58 percent while the average per capita consumption shortfall of the poor is about 21 percent of the poverty line. The preferred measure, which gives the mean of the squared per capita consumption shortfall of the poor, is estimated at about 9 percent. Watts' and Clark's measures yield incidence levels between the poverty gap index and the preferred measure. While the Watts' measure gives a closer estimate to the preferred measure, Clark's measures (for the three values of β) give closer estimates to the poverty gap index.

The incidence of poverty is higher in the rural areas than in the urban areas (generally higher even at the regional level). The headcount index estimated about 63 percent in the rural areas and 50 percent in the urban; poverty gap, 23 and 17 percent; preferred measure, 10 and 8 percent; Watts' measure, 13 and 10 percent; Clark's measure using $\beta = 0.25$, 25 and 17 percent; at $\beta = 0.50$, 23 and 16 percent; and at $\beta = 0.75$, 21 and 15 percent. About two-thirds of aggregate poverty levels were contributed by rural areas, mainly because of the greater number of households residing in these areas.

Variations in poverty incidence among the regions are evident from Table 1. For the headcount index, Bicol Region showed the highest incidence (72 percent) while Central Luzon, the lowest (41 percent). All measures give similar ranking of poverty incidence. The regions with the highest incidence are Bicol Region, Central, Eastern and Western Visayas while the regions with the lowest incidence are Central Luzon, Metro Manila and Ilocos Region.

Comparing the urban and rural sectors of the different regions, the rural sector shows a similar ranking of poverty incidence to that of the Philippines. However, the urban sectors of Eastern Visayas, Cagayan Valley and Western Visayas registered the highest incidence. It is worth noting that although Ilocos Region was among the regions with the lowest incidence of poverty in the Philippines and the rural sector, this region has the fourth highest incidence in the urban sector (fifth using Clark's measures).

On the characteristics of poor households, the following conclusions were drawn from the article on aggregate poverty by Balisacan (1991);

1. poor households in both urban and rural areas had more or less the same characteristics,
2. large families (more than 10) were the poorest groups based on the preferred measure,
3. poorest families had high dependency ratios (high child-adult ratio),
4. heads of the poorest families were mostly self-employed and have low educational attainment,
5. poor households were mostly headed by men.

3.2 *Growth vs. Distribution Component of Aggregate Poverty Change*

Comparing poverty indices between 1985 and 1988, we see a decline in each of the three FGT measures (Table 2). The proportional decline in poverty is higher in the urban sector than in the rural sector for all poverty measures. Note also that as the level of α increases (as more weight is given to the poor), the proportional decline in poverty also increases. This suggests that poverty decline occurred among the poorest of the poor.

In this method of decomposition, poverty change is analyzed according to its growth and distribution components. The growth

Table 1 - Indices of Poverty Incidence By Region, Urban-Rural: 1988 (In percent)

Region/Area	Share of Region In Total Families	Headcount Index (α=0)	Poverty Gap Index (α=1)	Preferred Measure (α=2)	Watts' Measure	De Clark's Measure β=0.25	De Clark's Measure β=0.50
Philippines	100.00	57.75	20.55	9.49	11.85	21.76	20.00
NCR	13.63	42.69	12.92	5.45	7.09	11.87	11.02
Ilocos Region	7.30	55.09	17.49	7.37	9.71	17.85	16.52
Cagayan Valley	4.81	62.55	22.19	10.26	12.78	21.01	19.25
Central Luzon	9.86	41.19	11.16	4.27	6.04	12.42	11.56
Southern Tagalog	12.19	56.95	20.62	9.56	12.01	22.96	21.05
Bicol Region	7.01	72.10	28.20	13.52	16.50	32.60	29.87
Western Visayas	9.08	66.61	24.61	11.46	14.36	29.62	27.19
Central Visayas	7.87	66.73	27.10	13.72	16.41	27.02	24.75
Eastern Visayas	5.68	68.34	26.68	12.94	16.13	28.30	25.92
Western Mindanao	5.12	61.76	22.77	10.83	13.72	23.15	21.22
Northern Mindanao	5.76	59.40	21.67	10.20	12.93	23.90	21.86
Southern Mindanao	7.00	60.76	22.32	10.56	13.48	23.05	21.11
Central Mindanao	4.68	60.19	21.13	9.53	9.46	19.65	18.19
URBAN	37.83	49.53	17.20	7.93	9.92	17.17	15.82
NCR	13.63	42.69	12.92	5.45	7.09	11.87	11.02
Ilocos Region	1.75	59.94	23.22	11.25	13.71	22.52	20.72
Cagayan Valley	0.67	65.11	27.82	14.39	17.42	25.24	22.92
Central Luzon	4.11	42.00	12.54	5.20	7.11	12.26	11.36
Southern Tagalog	4.21	48.47	16.05	7.08	9.23	16.89	15.60
Bicol Region	1.48	57.82	22.50	11.01	13.44	24.81	22.78
Western Visayas	2.50	60.91	24.47	11.99	14.84	29.66	27.15
Central Visayas	2.51	51.54	19.49	9.48	11.75	18.63	17.14
Eastern Visayas	1.27	71.13	31.49	16.88	19.83	33.65	30.49
Western Mindanao	0.88	57.26	22.36	10.95	13.29	21.59	19.57
Northern Mindanao	1.48	57.08	21.31	10.37	12.76	21.27	19.55
Southern Mindanao	2.53	52.50	18.28	8.59	11.07	18.34	16.74
Central Mindanao	0.79	50.91	18.68	8.37	5.34	15.51	14.35
RURAL	62.17	62.75	22.58	10.45	13.03	24.55	22.55
NCR	-	-	-	-	-	-	-
Ilocos Region	5.55	53.57	15.68	6.15	8.45	16.38	15.19
Cagayan Valley	4.14	62.14	21.28	9.59	12.02	20.32	18.65
Central Luzon	5.75	40.60	10.17	3.61	5.28	12.53	11.71
Southern Tagalog	7.98	61.42	23.03	10.87	13.48	26.16	23.93
Bicol Region	5.53	75.92	29.73	14.19	17.31	34.68	31.77
Western Visayas	6.58	68.78	24.66	11.25	14.19	29.60	27.20
Central Visayas	5.36	73.85	30.66	15.70	18.59	30.94	28.31
Eastern Visayas	4.41	67.54	25.29	11.80	15.06	26.75	24.60
Western Mindanao	4.24	62.69	22.86	10.80	13.81	23.47	21.57
Northern Mindanao	4.28	60.21	21.80	10.14	12.99	24.81	22.66
Southern Mindanao	4.47	65.43	24.60	11.68	14.84	25.72	23.58
Central Mindanao	3.89	62.07	21.63	9.76	10.29	20.49	18.98

Table 2 - Changes in Aggregate Poverty Incidence, Urban-Rural: 1985 and 1988 (In percent, unless otherwise stated)

Year/Area	Total No. of Families (1000)	Headcount Index (α=0)	Poverty Gap Index (α=1)	Preferred Measure (α=2)
Philippines				
1985	9,847.36	64.62	25.12	12.41
1988	10,533.90	57.75	20.55	9.49
Total Change in Poverty	-	-6.87	-4.57	-2.92
Proportional Changes		-10.63	-18.19	-23.53
Urban				
1985	3,726.00	56.80	21.59	10.59
1988	3,985.10	49.53	17.20	7.93
Total Change in Poverty	-	-7.27	-4.39	-2.66
Proportional Change		-12.80	-20.33	-25.12
Rural				
1985	6,121.30	69.38	27.27	13.52
1988	6,548.80	62.75	22.58	10.45
Total Change in Poverty	-	-6.63	-4.69	-3.07
Proportional Change		-9.56	-17.20	-22.71

component is the change in poverty given the change in mean consumption holding the 1985 Lorenz curve constant while the distributional component is the change in poverty given the shift in Lorenz curve holding the 1985 mean consumption constant. The residual is the interaction between the effects of growth and changes in distribution.

Table 3 shows an increase in the mean per capita consumption (in nominal terms) from 1985 and 1988. The increase in the urban sector is higher (34 percent) compared to the increase in the rural sector (25 percent). To determine if there has been an increase in the mean per capita consumption in real terms, we compare the change

Table 3 - Mean Per Capita Consumption, Urban-Rural: 1985 and 1988 (In pesos)

Area	1985	1988
Philippines	6,132.83	8,054.00
Urban	8,614.10	11,609.17
Rural	3,943.03	4,921.53

in nominal values with the change in prices from 1985 to 1988. Since prices between these two periods have increased by much less than 31 percent (CPI indicates about 14 percent increase for the national average), then mean per capita consumption has increased in real terms.

A look at the Lorenz curve values of per capita consumption distribution (Table 4) shows that in 1988, 90 percent of families in the urban sector accounted for a little more than half (52 percent) of the consumption distribution while the last decile accounted for 48 percent, compared to the 86 percent accounted for by the first nine deciles and 14 percent for the last decile in the rural sector. This suggests a more equitable consumption distribution in the rural sector than in the urban sector, as supported by a Gini index of 0.1546 in the rural sector compared to 0.6172 in the urban sector. A comparison of the Lorenz curve values between the two periods shows that the 1988 Lorenz curves unambiguously dominate the 1985 curves for the Philippines and the rural sector. Thus, all well-behaved inequality measures for these two areas will indicate a reduction in inequality over the period. The Gini index for the Philippines declined from 0.4120 to 0.4074 and for the rural sector, from 0.1678 to 0.1546. The Gini index for the urban sector slightly increased from 0.6170 to 0.6172. However, other inequality measures may indicate otherwise because the 1985 Lorenz curve dominates the 1988 curve for the first seven deciles while the 1988 curve dominates the 1985 curves for the remaining deciles.

Table 4 - Distribution of Per Capita Consumption: Lorenz Curve Values, Urban-Rural: 1985 to 1988

	Philippines		Urban		Rural	
Percentile	1985	1988	1985	1988	1985	1988
10	2.5	2.6	0.6	0.5	4.8	5.1
20	6.2	6.3	1.7	1.5	11.5	12.0
30	10.7	10.8	3.4	3.3	19.4	19.9
40	16.1	16.2	5.9	5.7	28.3	28.9
50	22.5	22.6	9.5	9.0	38.0	39.1
60	30.1	30.2	14.8	14.2	48.3	49.8
70	39.2	39.5	22.3	22.0	59.4	61.1
80	50.6	51.2	33.0	33.5	71.6	73.1
90	66.1	66.9	50.3	51.7	84.8	85.8
Gini Index	0.4120	0.4074	0.6170	0.6172	0.1678	0.1546

This decomposition illustrates that the decline in all poverty measures is largely accounted for by the growth component at a given consumption level (Table 5). Higher mean per capita consumption would have caused all poverty measures to decline, given that there is no change in the per capita consumption distribution. About 85 percent of the poverty decline of the preferred measure is accounted for by the growth component. For the headcount and the poverty gap indices, higher mean consumption would have decreased poverty more than the actual poverty decline had there been no change in the consumption distribution. The number of families considered poor would have decreased by about 49 percent more or the average per capita consumption shortfall of the poor would have decreased by about 22 percent more due to a distributionally neutral growth.

Table 5 - Decomposition of Poverty Measure into Growth and Distribution Effects (In Percent)

Poverty Measure	Growth Component	Distribution Component	Residual
Headcount Index (α=0)			
Philippines	148.74	-49.41	0.67
Urban	144.10	-44.60	0.58
Rural	91.05	9.67	-0.72
Poverty Gap (α=1)			
Philippines	121.50	-26.74	5.24
Urban	116.62	-24.50	7.87
Rural	96.22	4.81	-1.03
Preferred Measure (α=2)			
Philippines	86.09	10.60	4.31
Urban	85.02	7.02	7.97
Rural	96.12	4.36	-0.48

A positive percentage of the distribution component suggests that an improvement in the consumption distribution, holding the mean per capita consumption level constant, will result to a poverty decline. The preferred measure, which is sensitive to both the level of poverty and the distribution of living standards among the poor, registered a positive contribution (about 11 percent) to poverty decline.

However, both the headcount and poverty indices (except for the rural sector) registered negative contributions (-49 percent and -27 percent, respectively) to poverty decline. This may be due to the failure of these two indices to satisfy the transfer axiom, making them insensitive to the distribution of living standards among the poor. Thus, poverty measures which satisfy the desirable properties of such measures are expected to support the notion that greater equity, at a given consumption level, will contribute to a poverty decline.

Since the growth component dominated the poverty decline, it is worth looking into the elasticity (point) of poverty with respect to a distributionally neutral growth. If the absolute magnitude of the growth elasticity of poverty is greater than unity, poverty is highly sensitive to economic growth. This means that poverty decreases faster than the rate of increase in mean per capita consumption, provided that the growth process does not lead to a change in the consumption distribution.

Table 6 shows the elasticity of poverty with respect to the distributionally neutral growth for the FGT class of poverty measures. Except for the headcount index (total and rural), poverty decline is

Table 6 - Elasticity of Poverty Measures for Mean Income: 1985

Poverty Measure	Values of 1985 Poverty Measure	Elasticity for Mean Income
Headcount Index (α=0)		
Philippines	64.62	-0.7368
Urban	56.80	-1.1295
Rural	69.38	-0.7972
Poverty Gap (α=1)		
Philippines	25.12	-1.5725
Urban	21.59	-1.6308
Rural	27.27	-1.5442
Preferred Measure (α=2)		
Philippines	12.41	-2.0483
Urban	10.59	-2.0774
Rural	13.52	-2.0340

sensitive to increased mean per capita consumption. For the poverty gap index, the growth elasticity is -1.57, i.e., a 1 percent increase in mean per capita consumption reduces the average poverty gap by about 1.57 percent. The value of the elasticity of the headcount index is -0.74, implying that a 1 percent increase in mean per capita consumption reduces the proportion of poor families by 0.7 percent.

The absolute value of the growth elasticity increases as α increases, implying that economic growth will benefit the ultra poor more than the moderate poor, provided that there is no change in inequality.

4. Conclusions

Different poverty indices yield different poverty incidence. Although the levels differ, there are common observations among these indices. Rural poverty is higher than urban poverty (generally true even among regions) and regional poverty incidence varies widely among regions. All three indices exhibit similar ranking of regions with high and low levels of poverty incidence.

From 1985 to 1988, mean per capita consumption increased while inequality decreased. Aggregate poverty has likewise declined, with the proportional decline in poverty increasing as more weight is given to the poor.

The growth component at a given level of consumption largely accounted for the poverty as illustrated by the decomposition method. The distribution component of the headcount and the poverty gap indices (measures which are not sensitive to living standards among the poor) contributed to increased poverty (except in the rural sector) while the preferred measure contributed to poverty decline. Thus, the notion that improved distribution will reduce poverty can be generalized only to poverty indices that satisfy the monotonicity and transfer axioms. Poverty is sensitive to economic growth and should decrease faster than the increase in mean consumption provided that no change in inequality occurs. This is evidenced by the values of the growth elasticities of poverty. As α increases, these values (absolute) increase, suggesting an improvement of the plight of the poorest of the poor as mean consumption increases provided that the consumption distribution remains the same.

If the growth component is responsible for much of the poverty reduction and that poverty is indeed growth-elastic, a greater emphasis should be placed on growth-oriented policies that at least maintain the income share of the poor.

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Appendix Table 1 - Poverty Lines By Region, Urban-Rural: 1985 and 1988 (Peso/Person/Year)

Region	1985		1988	
	Rural	Urban	Rural	Urban
NCR	-	6,564	-	8,120
Ilocos Region	4,278	6,186	4,650	6,724
Cagayan Valley	4,184	5,794	4,898	6,782
Central Luzon	4,208	6,306	4,750	7,118
Southern Tagalog	4,348	6,096	4,983	6,987
Bicol Region	4,094	5,250	4,667	5,985
Western Visayas	4,498	6,138	4,867	6,642
Central Visayas	3,638	4,852	3,978	5,306
Eastern Visayas	3,644	5,466	4,089	6,134
Western Mindanao	4,050	5,300	4,374	5,724
Northern Mindanao	4,044	5,904	4,386	6,404
Southern Mindanao	4,158	5,996	4,809	6,934
Central Mindanao	4,322	5,248	4,821	5,854

Source: National Statistics Office.

Appendix 1. Lorenz Curve Parameterization and Simulation of Poverty Measures

The decomposition of poverty change into growth and distribution components uses Kakwani's (1989) parameterization of the Lorenz curve:

$$L(p) = p - \alpha p^{\beta}(1 - p)^{\delta}e^{\varepsilon} \qquad (1)$$

where $L(p)$ is the cumulative proportion of total consumption expenditure held by the poorest p proportion of the population. The parameters α, β and δ are positive and ε is a random error term. The parameters β and δ not exceeding unity are sufficient to ensure the convexity of the Lorenz curve. The parameters of the Lorenz curve are estimated by the following linear regression:

$$ln\,[p - L(p)] = ln\,\alpha + \beta ln(p) + \delta ln(1 - p) + \varepsilon$$

The simulated poverty measure, P^t is expressed as:

$$P^t = P(z/\mu^t, L^t)$$

where z is the poverty line, μ^t is the mean of the consumption (income) distribution and L^t is a vector of parameters (α, β, δ) fully describing the Lorenz curve at date t. Given the mean and the Lorenz function, the distribution function is fully characterized noting that the slope of the generalized Lorenz curve, $L'(p) = x/\mu$ is simply the inverse of the distribution function $p = F(x)$.

Using the formula in Datt and Ravallion (1989), the FGT povery measures at any date t are calculated as follows. Since $L'(P_0) = z/\mu$ (Kakwani, 1980), (1) implies:

$$1 - \alpha P_0^{\beta}(1-P_0)^{\delta}\left[\frac{\beta}{P_0} - \frac{\delta}{(1 - P_0)}\right] = \frac{z}{\mu} \qquad (2)$$

The poverty gap measure, P_1, can be solved by:

$$P_1 = \int_0^{P_0} [1 - (\mu/z)L'(p)]\,dp \qquad (3)$$
$$= P_0 - (\mu/z)L(p)$$

The preferred measure, P_2 is evaluated as follows:

$$P_2 = \int_0^{P_0} [1-(\mu/z)L'(p)]^2\, dp$$
$$= (1 - \mu/z)^2 P_0 + 2\,(\mu/z)\,(1-\mu/z)\,P_1$$
$$+ (\mu/z)^2 \int_0^{P_0} a^2 p^{2\beta}(1-p)^{2\delta} \left[\frac{\beta^2}{p^2} - \frac{2\beta\delta}{p(1-p)} + \frac{\delta^2}{(1-p)^2}\right] dp$$

$$= (1 - \mu/z)^2 P_0 + 2(\mu/z)\,(1 - \mu/z)\,P_1$$

$$+ \left[a\ \frac{\mu}{z}\right]^2 \left[\beta^2 B(P_0, 2\beta\text{-}1, 2\delta\text{+}1) - 2\beta\delta B(P_0, 2\beta, 2\delta) = \delta^2 B(P_0, 2\beta\text{+}1, 2\delta\text{-}1)\right] \quad (4)$$

where $B\,(k, m, n) = \int_0^k p^{m-1}\,(1-p)^{n-1} dp$. (SAS allows one to estimate this using the incomplete beta functions.) Thus, given the mean (μ) and the parameters of the Lorenz function at any date t, the FGT poverty measures for any poverty line can be calculated using (2), (3) and (4).