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Trends in Household Vulnerability

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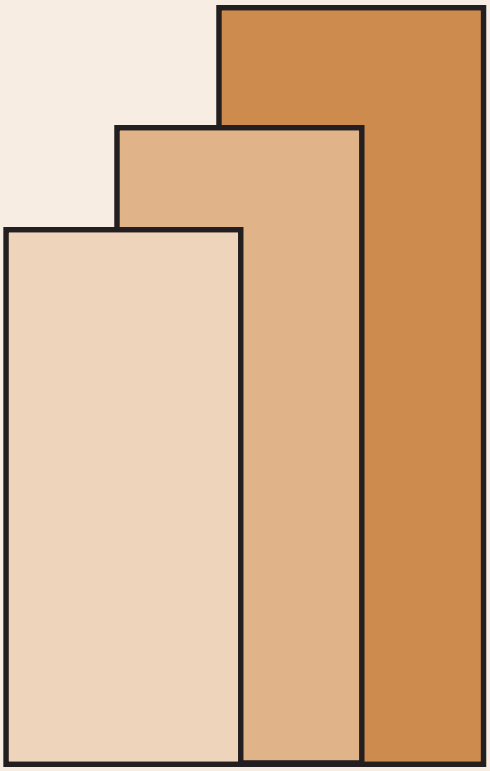

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Trends in Household Vulnerability

by

Jose Ramon G. Albert and Andre Philippe Ramos[1]

ABSTRACT

This paper presents a few of the latest statistics on income poverty, growth and inequality, and makes a case about the need not only to monitor current poverty, but also to reduce future poverty. An assessment of the trends in household vulnerability to income poverty is made for the years 2000, 2003, and 2006. Measurement of household vulnerability is based on the use of a modified probit model, income data from the Family Income and Expenditure Survey, as well as the official poverty lines. Policy implications about the vulnerability assessment are also discussed.

Key Words: vulnerability, poverty, growth, inequality

1. Introduction

Increasingly, development policy has taken a social reform focus. Public policies and government programs articulated in the Medium Term Philippine Development Plans reflect the thrust toward sustainable development. However, since all members of society do not equally benefit from economic growth, government has to develop and implement social protection mechanisms, and to work on reducing poverty.

Poverty reduction has been a growing concern in the public policy agenda especially in the wake of the global commitment to meet the Millennium Development Goals, which includes the (MDG1) goal of reducing poverty in 2015 to half of their levels in 1990. National poverty assessments describe the overall condition of poverty and the plight of the poor (Reyes, 2002; Reyes 2004). Factors that are associated with and that contribute to poverty have also been indentified (Albert and Collado, 2004) that should provide inputs in identifying strategies to reduce poverty.

Being poor is generally understood to mean manifest deprivation of some of life's basic needs. Accurately measuring and monitoring poverty, however, involves a number of technical issues. Poverty is a multifaceted, multi-dimensional phenomenon, and thus a single measurement system will not be able to provide a complete picture of poverty. In addition, the poverty metric that is used should be consistent and comparable across time and space, so that analysts can assess the success in meeting poverty reduction targets, and the outcomes of public interventions designed to help the poor, in particular (Albert, 2008).

A survey of national statistical offices, conducted by the United Nations Statistics Division (UNSD) in 2004-2005, indicated that countries typically measure poverty using monetary

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indicators sourced from household surveys, albeit with varying approaches to the choice of welfare indicator and the setting of the poverty line (UNSD, 2005). In the Philippines, official poverty statistics are released based on per capita income data sourced from the triennial Family Income and Expenditure Survey (FIES), conducted by the National Statistics Office (NSO), and on poverty thresholds, determined by the National Statistical Coordination Board (NSCB). The poverty thresholds represent the minimum level of per capita income required by an individual to fulfill his or her basic food and non-food needs. These poverty thresholds, together with the per capita income data, allow government to determine whether or not a household is poor, and ultimately, get a picture of the extent of poverty, a description of the poor and their living conditions, and an examination of the evolution of poverty across time.

International poverty monitoring is undertaken by the World Bank with its estimates of poverty rates (generated using consumption data and 1.25 US dollar per person per day poverty lines in purchasing power parity terms). Figure 1, which illustrates the World Bank estimates of MDG1 indicators across selected countries of the Association of South East Asian (ASEAN) suggests that, in comparison to its ASEAN neighbors, the Philippines has had a fairly modest poverty reduction. Thailand, which was at the same level of economic development as the Philippines in the 1960s and 1970s, has outpaced the Philippines in many socio-economic indicators, including its per capita Gross Domestic Product, poverty rates, poverty gap ratios, and declines in poverty rates and poverty gap ratios. Poverty reduction in the Philippines has been further slowed down in recent years in the wake of rising prices, especially on food. There is wide consensus that as a result of the still emerging global financial crisis, poverty conditions in the country may even further worsen. The slow pace of poverty reduction in the Philippines may suggest that those in the lower part of the income distribution experience a constant state of deprivation with little change from year to year.

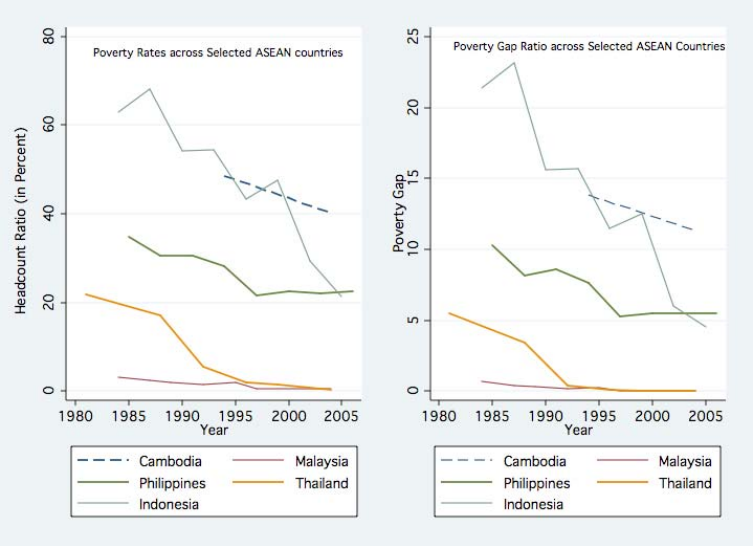

Figure 1: Trends in Headcount Poverty Rates and Poverty Gap Ratios across selected ASEAN countries

(Source: Povcalnet, World Bank)

While information on income poverty is useful, it is limited in that poverty is not merely about income poverty. While levels of income help to operationally determine who is poor and who is not, two households of similar per capita income would not be equal in welfare if one household has more assets, or better assets to social services. In addition, household welfare is not merely about present conditions but also about the vulnerability of households, i.e., the prospects of their future well being (Dercon, 2001). Households may lack the required assets, education, nutrition and preventive health care to help them cope with future conditions which may constrain them (if they are poor) from exiting poverty, or lower their incomes (if they are non poor). Some poor households are under threat of being persistently poor and even getting into acute destitution. Some non poor households may be at risk of being poor because of a high chance of experiencing some shock, such as rise in food prices, a bad harvest, natural calamities, epidemics, war, terrorism, the loss of job of the main income earner, poor health or death of a family member. As was pointed out in Albert *et al*. (2008), if such risks were absent, and the future did not involve uncertainty, then there would be no distinction between poverty and vulnerability. There are idiosyncratic effects to income that need to be considered when looking at the risks that households face. The income poverty status of a household is not necessarily a good guide to the households' vulnerability to income poverty in the future.

Although it is important to identify and providing assistance to the (*ex post*) poor, welfare goes beyond current conditions. It is also important to have a measurement of vulnerable households, i.e., those who are *ex ante* expected to be poor. Policy actions also should be effected to assist these vulnerable households in minimizing the chance that they will be poor in the future, mitigating the impact of shocks they are very likely to face that can bring a downward movement in their incomes, as well as preventing the intergenerational transmission of poverty. In the following section, we firstly give a brief assessment of income poverty, inequality and growth statistics. Section three then discusses the measurement of vulnerability to income poverty, and provides a profile of vulnerable households for the years 2000, 2003 and 2006. The estimation is based on a methodology espoused in Albert et al (2008) involving the use of a modified probit model, data from the FIES, and official poverty lines. The final section discusses some policy issues arising from this vulnerability assessment.

2. Assessment of Income Poverty. Growth and Inequality

Aggregating information from income poverty data helps provide a description of poverty conditions, and of how poverty varies across different groups within a population. When these poverty measures are compared across time, they provide a benchmark of progress. The simplest poverty measure, the (headcount) poverty rate, is defined as the percentage of the population that is poor. Since official poverty measurement involves classifying a household as poor if its per capita income is below the poverty threshold, thus the poverty rate is formally defined as

$$\frac{1}{N}\sum_{i=1}^{n} w_i f_i \, I(X_i < Z_i) \qquad (1)$$

where X_i represents the per capita income of sample household i, Z_i represents the poverty threshold[2] (for the area where the household resides), I(.) is an indicator function that takes the value 1 if the bracketed expression is true and 0 otherwise, $w_i$represents the raising factor (or number of households that the sampled household represents), f_i represents the family size, n represents the total number of sampled households, and $N = \sum_{i=1}^{n} w_i f_i$ is the number of persons in the country. While the poverty rate is readily understandable, its simplicity fails to take into account the depth and severity of poverty, i.e., the extent to which the income poor fall below the poverty line. The poverty gap ratio, defined as the aggregate short fall of incomes of the poor as a proportion of the poverty line, is

$$\frac{1}{N}\sum_{i=1}^{n} w_i f_i \left(\frac{Z_i - X_i}{Z_i}\right) I(X_i < Z_i) \qquad (2)$$

This measure addresses the limitations of the (headcount) poverty rate, and is meant to describe the depth of poverty. To measure of the severity of poverty, we can use the squared poverty gap, defined as a weighted averages of the poverty gap ratio where the weights are the poverty gaps themselves, i.e.,

$$\frac{1}{N}\sum_{i=1}^{n} w_i f_i \left(\frac{Z_i - X_i}{Z_i}\right)^2 I(X_i < Z_i) \qquad (3)$$

The poverty rate, poverty gap and poverty squared gap are members of the family of poverty measures proposed by Foster Greer and Thorbecke (1984). One of the major features of these measures is that they can also be decomposed by sub-populations, and that they provide an adequate way of monitoring socio-economic conditions, and of assessing overall progress in reducing poverty.

Table 1, which provides the (headcount) poverty rate, poverty gap and poverty squared gap measures for these years 2000, 2003 and 2006, broken down across urban and rural areas, suggests that we have had a rather modest poverty reduction in the country for the entire six year period. The poverty headcount in the country went down slightly from 2000 to 2003. In 2006, the rates went practically back to the 2000 rates. In addition, we see that among ten poor persons, seven reside in rural areas, and this picture of poverty being a rural phenomenon, has remain unchanged. Similar trends observed for the poverty gap and poverty squared gap.

[2] Official (per capita) poverty lines vary across urban and rural areas in each of the provinces, and the four "divisions" of Metro Manila. The NSCB develops the poverty lines by firstly estimating the food component of the poverty, and then adjusting it upward to account for the non-food component of the poverty line. The food component of the poverty line is estimated with the use of low-cost one day menus for rural and urban areas in each region to meet 100 percent requirements for energy and protein, and 80 percent adequacy for vitamins and other minerals. These menus are valued with provincial prices to obtain the food component of the poverty line for urban and rural areas of each province. The non-food component of the poverty line involves an indirect estimate of Engle's coefficient as the average food share of household expenditure of those households within a plus or minus ten percentile band of the food poverty line within the per capita income distribution, and subsequently taking the ratio of the food component of the poverty line to the estimated Engle's coefficient to generate the (total food and non-food) poverty threshold.

Table 1. Selected Poverty Statistics (in Percent) for Years 2000, 2003 and 2006, by Urban and Rural Areas.

	Urban			*Rural*			*National*		
	2000	***2003***	***2006***	***2000***	***2003***	***2006***	***2000***	***2003***	***2006***
Poverty Rate									
Index	18.47	16.29	19.17	48.35	43.31	46.23	33.59	30.03	32.89
Share (to National)	27.15	26.66	28.73	72.85	73.34	71.27	100.00	100.00	100.00
Poverty Gap									
Index	4.96	4.32	5.28	15.70	13.72	14.60	10.40	9.10	10.01
Share (to National)	23.58	23.33	26.02	76.43	76.67	73.99	100.00	100.00	100.00
Poverty Squared Gap									
Index	1.95	1.67	2.10	6.75	5.91	6.21	4.38	3.83	4.18
Share (to National)	21.94	21.43	24.73	78.06	78.57	75.27	100.00	100.00	100.00

Data Source: FIES and official poverty lines.

A simulation on the latest available income poverty data from the 2006 FIES (see Figure 2) suggests that even if income per capita of the poor were to increase uniformly by 2 per cent annually (in real terms, i.e., adjusted for inflation), half of the poor will take more than 17 years to exit poverty. If per capita income of the poor increases uniformly by 1 per cent per year (in real terms), the average time for the poor to exit poverty stands at 40 years.

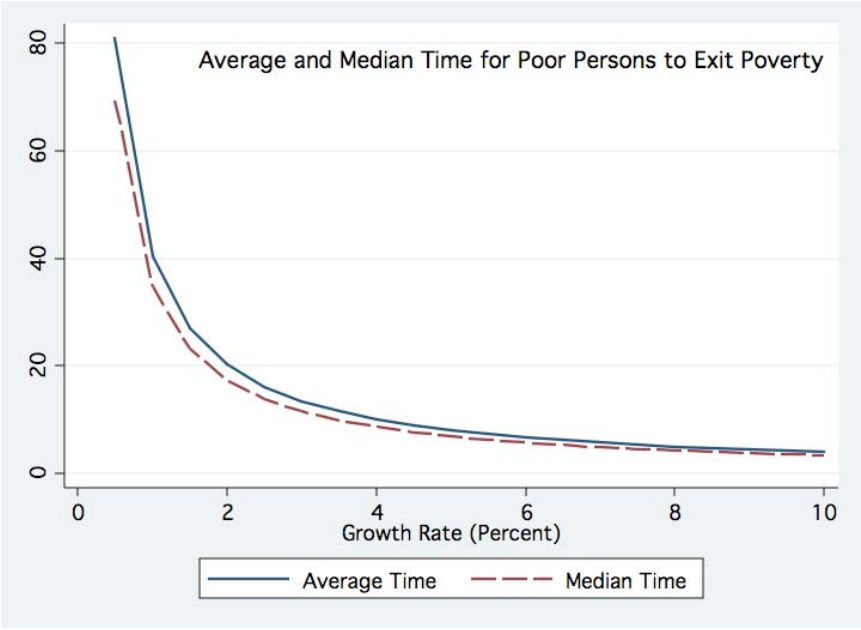

Figure 2: Average (and Median) Time to Exit Poverty in the Philippines
Note: Authors' calculations using data from 2006 FIES and official poverty lines

The assumption of a uniform rise of incomes of the poor at the same rate is, of course, unrealistic since growth is often skewed toward the higher income segments of society, and growth is even more rarely continuous. However, this simple simulation of possible poverty trends provides a rather stark assessment that the Philippines is likely not to meet MDG1, especially given the unfolding global crisis that is even more likely to affect poor and vulnerable households.

Since there is some arbitrariness about the determination of a poverty line (Albert, 2008), it is important to look at impacts of aggregate economic growth over the per capita income distribution. Ravallion and Chen (2003) suggest an examination of the Growth Incidence Curve (GIC) which compares the growth rate in (real) per capita incomes[3] of the p^{th} quantile

$$g_t(p) = \frac{y_t(p)}{y_{t-1}(p)} - 1 \qquad (4)$$

in the periods *t -1* and *t*. In particular, at the 50^{th} percentile, the GIC provides the growth rate of the median (real) per capita income. Ravallion and Chen (2003) define growth as absolutely pro-poor if the mean growth rate for the poor is greater than zero. Also, growth is considered to be relatively pro-poor if, in addition, the mean growth rate for the poor is at least as large as the growth rate in the overall mean.

For the period 2000 to 2006, since the GIC in the Philippines (see Figure 3) lies entirely above zero for the bottom 30 percent, growth was pro-poor in absolute terms. Growth was also pro-poor in relative terms since the upper part of the per capita income distribution benefited less than the average growth rate, while those at the lower tail of the income distribution benefited more from growth. However, this pro-poor growth was very modest.

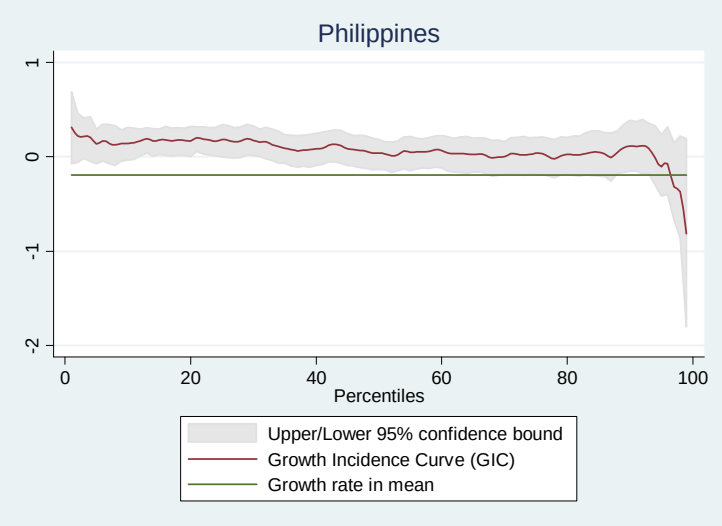

Figure 3: Growth Incidence Curve of the Philippines (2000-2006 Per capita Income)
(Note: Calculations involved adjusting per capita income data from 2000 and 2006 FIES by official poverty lines)

[3] Calculations here involved adjusting the nominal per capita income to the per capita income of the city of Manila, in order to make the welfare indicator comparable across space. For 2006, in addition to the spatial price adjustment, the resulting figures were also deflated to 2000 with the use of the city of Manila's poverty lines.

When the GIC is derived separately for urban and rural areas (see Figure 4), we observe that growth was not pro-poor in absolute terms for the urban areas. For rural areas, however, the growth was pro-poor in absolute terms, but not in relative terms, with those at the lower end and middle of the income distribution benefiting less than the average growth rate, and those at the upper benefiting more from growth.

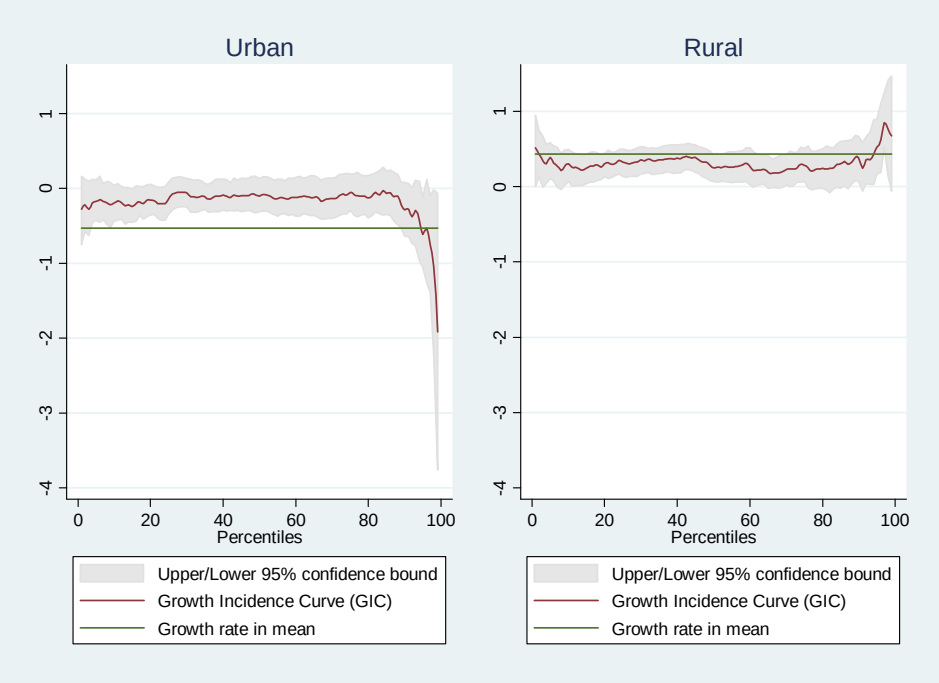

Figure 4: Growth Incidence Curves in Urban and Rural Areas (2000-2006 Per capita Income)
(Note: Calculations involved adjusting per capita income data from 2000 and 2006 FIES by official poverty lines)

We also observe from Table 2 that the average per capita income fell in real terms by 0.2 percent, and that the fall was slighter higher in urban areas. In rural areas, there was some growth in average incomes in real terms. These results on poverty trends and the GICs suggest that income inequality rose in rural areas.

Table 2. Pro-poor Growth Statistics in Philippines, by Urban and Rural Areas

	Urban	Rural	Philippines
Growth rate in mean	-0.53	0.44	-0.19
Growth rate at median	-0.10	0.25	0.04
Mean percentile growth rate	-0.18	0.32	0.07
Rate of pro-poor growth for			
10^{th} percentile	-0.21	0.34	0.18
15^{th} percentile	-0.21	0.30	0.18
20^{th} percentile	-0.20	0.30	0.18
25^{th} percentile	-0.20	0.30	0.18
30^{th} percentile	-0.17	0.31	0.18

Note: Authors' calculations using FIES per capita income data adjusted for cost of living and inflation using the official poverty lines for 2000 and 2006 (with 2000 prices in Manila as base).

To consider whether the observation of rising inequality in rural areas is valid, we measure income inequality. The most common measure of inequality, the Gini coefficient, is given by

$$Gini = \frac{1}{2\ n^2\ \bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j| = 1 + \left(\frac{1}{n}\right) - \frac{1}{2\ n^2\ \bar{y}} \sum_{i=1}^{n} (n - i + 1) y_i \qquad (5)$$

where persons are ranked in ascending order of per capita income y_i. The Gini coefficient varies between 0, which reflects complete equality (all persons have exactly the same income) and 1, which indicates complete inequality (where one person has all the income while all others have none).

An alternative set of inequality measures is given by the family of generalized Entropy (GE) measures

$$GE(\alpha) = \frac{1}{\alpha(\alpha - 1)} \left[\frac{1}{N} \sum_{i=1}^{N} \left(\frac{y_i}{\bar{y}} \right)^{\alpha} - 1 \right] \qquad (6)$$

whose values vary between 0 and ∞, with zero representing an equal distribution and a higher value representing a higher level of inequality. The GE (α) measures differ in their sensitivities to income differences in different parts of the distribution. The parameter α represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value. The typical values of α used are 0, 1 and 2: GE(0), which is defined as:

$$GE(0) = \frac{1}{N} \sum_{i=1}^{N} \frac{y_i}{\bar{y}} \ln\left(\frac{y_i}{\bar{y}}\right) \qquad (7)$$

and called the mean logarithmic deviation, is more sensitive to differences in incomes at the lower tail of the distribution; GE(1), called the Theil index,

$$GE(1) = \frac{1}{N} \sum_{i=1}^{N} \ln\left(\frac{\bar{y}}{y_i}\right) \qquad (8)$$

is sensitive to differences uniformly across the distribution; while GE(2), half the square of the coefficient of variation, is more sensitive GE(α) is to income differences at the top of the distribution.

Table 3 confirms the suspicion from the analysis of the GICs that inequality increased in rural areas. Inequality is observed to have gone down slightly across the country, and particularly in urban areas. It appears though from an inspection of the GE measures that the changes were happening more not at the lower part of the distribution.

Table 3. Selected Inequality Statistics for Per capita Income* in 2000 and 2006, by Urban and Rural Areas

	Urban		Rural		Philippines	
	2000	**2006**	**2000**	**2006**	**2000**	**2006**
Gini	0.46462	0.44132	0.41577	0.42425	0.47422	0.45811
GE (0)	0.36589	0.32888	0.28296	0.29546	0.37833	0.35052
GE (1)	0.44055	0.36444	0.33442	0.35837	0.45655	0.39989
GE (2)	1.03343	0.64924	0.62249	0.71443	1.09568	0.75268

* adjusted for cost of living differences and inflation using the official poverty lines as a deflator with the city of Manila in 2000 as the base area and base period, respectively.

Table 4 provides a decomposition of the changes in the poverty statistics (found in Table 1) during the period 2000 to 2006 into growth and redistribution effects (Datt and Ravallion, 1991). These decompositions show the extent to which the change in poverty across the six year period can be attributed to a rise in average income (in the absence of changes in the distribution), and the extent to which the change is due to changes in income inequality (in the absence of growth, i.e. changes in average income). The residual of the decomposition may be viewed as the interaction between the two growth and redistribution effects.

Table 4. Growth in Income and Changes in Inequality Effects on Poverty.

	2000-2006		
	Urban	Rural	**National**
Headcount Poverty Rate			
Initial (Baseline) Year	18.45	48.41	**33.62**
Succeeding Year	19.17	46.23	**32.89**
Change in Headcount Poverty Rate	0.72	-2.19	**-0.73**
Growth Component	-6.91	-19.24	**-11.43**
Redistribution Component	9.23	15.47	**11.42**
Residual	-1.60	1.58	**-0.71**
Poverty Gap			
Initial (Baseline) Year	4.97	15.77	**10.44**
Succeeding Year	5.28	14.60	**10.01**
Change in Poverty Gap	0.31	-1.17	**-0.43**
Growth Component	-2.14	-8.34	**-4.62**
Redistribution Component	3.56	9.58	**5.66**
Residual	-1.12	-2.42	**-1.47**
Poverty Severity			
Initial (Baseline) Year	1.955	6.803	**4.41**
Succeeding Year	2.097	6.206	**4.18**
Change in Poverty Severity	0.142	-0.597	**-0.23**
Growth Component	-0.925	-4.09	**-2.23**
Redistribution Component	1.705	5.807	**3.12**
Residual	-0.637	-2.314	**-1.11**

Note: Authors' calculations using FIES per capita income data and official poverty lines.

As is being illustrated in Table 1, if the distribution of per capita income had not changed, the reduction in poverty headcount, poverty gap, and poverty severity statistics in the period 2000 to

2006 would have been much larger. The growth component (in average incomes) accounts for the bulk of the measured changes in poverty. If the distribution of income had not changed from 2000 to 2006, headcount poverty would have fallen from 33.6% to 22.6% (with poverty rates going down from 18.5% to 11.5% in urban areas, and decreasing from 48.4% to 29.2% in rural areas). From their 2000 baseline levels, poverty gap and poverty squared gap would have also fallen in 2006 by 4.6 percent and 2.2 percent, respectively, if the distribution of income had not changed. Across the country, the changes in distribution (and interaction factors) resulted in a decrease in the head count poverty of only 0.7 percent, in the poverty gap by 0.4 percent, and in the poverty squared gap by 0.2 percent. While there was a modest reduction in poverty rates for the six year period across the country by less than one percent, there was a decrease of 2.2 percent in poverty rates in rural areas, but an increase of 0.7 percent in the urban poverty rate.

3. Measuring and Analyzing Vulnerability

While the description of income poverty, growth and inequality in the previous section allows us not only to link these three different concepts, but also to see the extent of work that needs to be performed for poverty to be reduced effectively, this poverty assessment cannot provide a full picture of the likely future conditions of poverty. In particular, it is important to be forward-looking as welfare is not only about present (and past) conditions, but also about future welfare, which is often dependent on the risks that households face.

Households often experience shocks whether as part of their specific conditions, the areas where they reside, and the like, that result in volatility, particularly downward movements, in their incomes. Without sufficient assets or mechanisms to help them mitigate the impact of income shocks, there may be irreversible losses to their welfare that may possibly lead the households into a state of perpetual poverty. Because of such risks, volatility and uncertainty in their incomes, some households even engage in risk mitigating strategies to reduce the chance of substantial income losses. However, these strategies typically yield low average returns, further locking them into poverty. Interventions meant at reducing vulnerability to income poverty are thus important as part of a poverty reduction plan. It is after all, not enough to cure the poverty problem, but also to make efforts to prevent it as well.

Income and consumption dynamics and variability can be proxy indicators for vulnerability. Dynamics of income and consumption at the household level can only be studied if panel data are available. Chaudhuri (2000) develops a methodology for measuring household vulnerability with cross section data using a modified probit model. Albert et al (2008) adapts this methodology with per capita income data for identifying vulnerable households in the Philippines; this was undertaken for the 1997 FIES (and validated with panel data of a subset of this round of the FIES for the 1998 Annual Poverty Indicator Survey). The vulnerability estimation methodology consists essentially of estimating the vulnerability to income poverty of household *i* at time *t* by the probability that household *i* will be income poor at time *t+1*:

$$v_{it} = \Pr\{Y_{i,t+1} < Z_i\} \qquad (9)$$

where

$Y_{i,t+1}$ is the i^{th} household's per capita income at time t+1, and

Z_i is the poverty line (for the area where the i^{th} household resides)

Although the income per capita of a household at time $t+1$is not observed at time t, a reasonable estimate of this may be obtained by way of a model of the determinants of the current income per capita :

$$\ln Y_i = \boldsymbol{X_i\beta} + \varepsilon_i \quad (10)$$

where

Y_i is the i^{th} household's per capita,
$\boldsymbol{X_i}$ is a set of observable characteristics of the household (that explains per capita income)
$\boldsymbol{\beta}$ is a vector of parameters, and
ε_i is a disturbance term that captures idiosyncratic factors which explains varying per capita levels for households that are otherwise observationally equivalent.

The income model in (10) assumes that the disturbance terms has a mean zero, but varies across households, and this variation itself can be modeled from an underlying regression on the covariates of income, i.e.,

$$\sigma_i^2 = \boldsymbol{X_i\theta} \quad (11)$$

The estimates of the parameters $\boldsymbol{\beta}$ and $\boldsymbol{\theta}$ from (10) and (11) can be obtained through a three step methodology due to Amemiya (1977):

- Firstly, the regression model in (10) is estimated by ordinary least squares, thus yielding residuals

$$e_i = \ln Y_i - \boldsymbol{X_i\hat{\beta}_{OLS}} \quad (12)$$

A model of the squared residuals

$$e_i^2 = \boldsymbol{X_i\theta} + \eta_i \quad (13)$$

is formulated to allow the measurement of the idiosyncratic variance for each household. Initial estimates $\widehat{\boldsymbol{\theta}}_{LS}$ of the parameter $\boldsymbol{\theta}$ for (13) are obtained through ordinary least squares.

- The predictions from (13) are then used to yield a transformed equation:

$$\frac{e_i^2}{\boldsymbol{X_i\hat{\theta}_{LS}}} = \frac{\boldsymbol{X_i\theta}}{\boldsymbol{X_i\hat{\theta}_{LS}}} + \frac{\eta_i}{\boldsymbol{X_i\hat{\theta}_{LS}}} \quad (14)$$

which, is once again estimated by ordinary least squares to obtain a consistent set of estimates $\widehat{\boldsymbol{\theta}}_{FGLS}$ of the parameter $\boldsymbol{\theta}$. Estimates of the standard deviation

$$\hat{\sigma}_i = \sqrt{\boldsymbol{X_i}\,\widehat{\boldsymbol{\theta}}_{FGLS}} \tag{15}$$

are then used to transform the regression in equation (10) into:

$$\frac{\ln Y_i}{\sqrt{\boldsymbol{X_i}\,\widehat{\boldsymbol{\theta}}_{FGLS}}} = \frac{\boldsymbol{X_i}}{\sqrt{\boldsymbol{X_i}\,\widehat{\boldsymbol{\theta}}_{FGLS}}}\boldsymbol{\beta} + \frac{\varepsilon_i}{\sqrt{\boldsymbol{X_i}\,\widehat{\boldsymbol{\theta}}_{FGLS}}} \tag{16}$$

- Estimation of equation (16) through least squares yields an estimate $\widehat{\boldsymbol{\beta}}_{\boldsymbol{FGLS}}$ of $\boldsymbol{\beta}$, which provides an estimate of the expected log income (per capita):

$$\ln \hat{Y}_i = \boldsymbol{X_i}\widehat{\boldsymbol{\beta}}_{\boldsymbol{FGLS}} \tag{17}$$

This, in turn can be used to estimate the household vulnerability levels under the assumption that income per capita has a log normal distribution:

$$\hat{v}_i = \Pr\{\hat{Y}_i < Z_i \mid \boldsymbol{X_i}\} = \Pr\{\ln \hat{Y}_i < \ln Z_i \mid \boldsymbol{X_i}\}$$

$$= \Pr\{\ln \boldsymbol{X_i}\widehat{\boldsymbol{\beta}}_{\boldsymbol{FGLS}} < \ln Z_i \mid \boldsymbol{X_i}\} = \Phi\left[\frac{\ln Z_i - \boldsymbol{X_i}\widehat{\boldsymbol{\beta}}_{\boldsymbol{FGLS}}}{\sqrt{\boldsymbol{X_i}\,\widehat{\boldsymbol{\theta}}_{FGLS}}}\right] \tag{18}$$

where $\Phi(.)$ denotes the cumulative distribution function of the standard normal distribution.

The procedure outlined above was carried out on the three latest rounds of the FIES for the years 2000, 2003, and 2006, using the following household characteristics as the covariates[4] of the underlying regression models:

- number of dependents (aged less than 15);
- number of adults (aged 15 and older);
- sex of the household head;
- educational attainment of the household head;
- age of the household head;
- major sector of employment of head (together with whether or not the employment is self employment);
- ownership of land;
- use of electricity;
- whether the household can be classified as agricultural; and,
- region where household resides.

Using vulnerability estimates, households are then said to be:

[4] For a more detailed set of descriptions of the variables used, refer to Table A-2 in the Appendix.

- **non-vulnerable** if

$$\hat{v}_i \leq \ National\ poverty\ rate$$

- **vulnerable** if

$$\hat{v}_i > \ National\ poverty\ rate$$

The vulnerable can be further categorized into:

- **highly vulnerable** if

$$\hat{v}_i > 50\%$$

- **relatively vulnerable** if

$$50\% > \hat{v}_i > \ National\ poverty\ rate$$

The incidence of vulnerability across the population for the years 2000, 2003 and 2006, by poverty status, is shown in Table 1. In 2000 and 2003, about nineteen out of twenty poor persons belong to vulnerable households, and about sixty percent of the non-poor belong also to vulnerable households. Thus, poverty is not equivalent to vulnerability. It is interesting to note that the drop in headcount poverty rates in 2000 to 2003 (reported in Table 1) was accompanied by a drop in the proportion of people belonging to vulnerable households. The rise in headcount poverty rates from 2003 to 2006 (also reported in Table 1) was similarly accompanied by a rise in the percentage of the population belonging to households vulnerable to income poverty.

Table 5. Percentage of the Population belonging to Highly Vulnerable, Relatively Vulnerable, and Not Vulnerable Households, by Poverty Status (2000, 2003, and 2006).

Poverty Status	Vulnerability Level	2000	2003	2006
Poor				
	Highly Vulnerable	77.62	74.66	86.52
	Relatively Vulnerable	17.97	21.07	11.99
	Not Vulnerable	4.41	4.27	1.49
Non Poor				
	Highly Vulnerable	23.62	19.68	33.15
	Relatively Vulnerable	34.04	37.21	39.29
	Not Vulnerable	42.34	43.11	27.57
Total				
	Highly Vulnerable	41.76	36.21	50.70
	Relatively Vulnerable	28.64	32.36	30.31
	Not Vulnerable	29.60	31.44	18.99

Average family size among the non-vulnerable households is much smaller than those of vulnerable households, especially highly-vulnerable ones. As Figure 5 illustrates, the disparity is largely on account of the number of young members in the household.

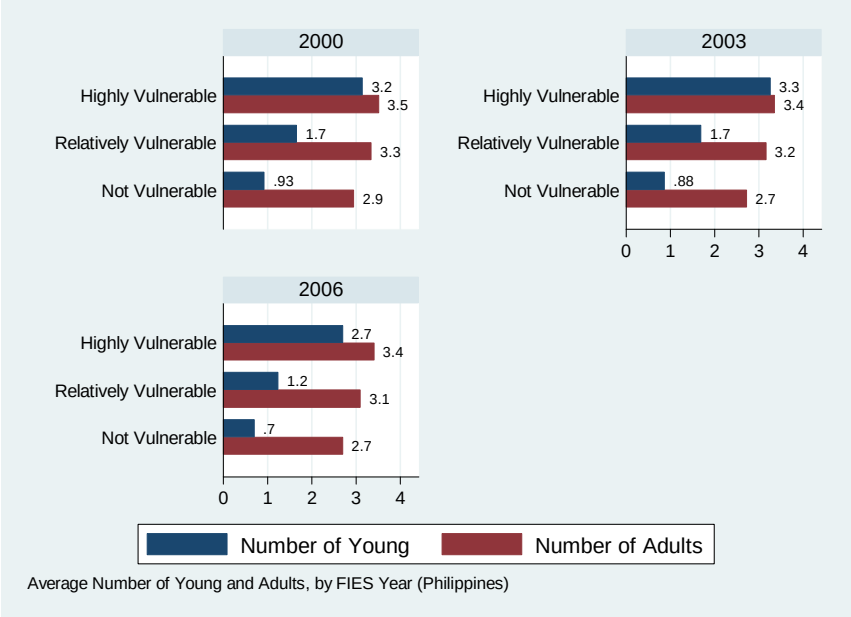

Figure 5. Average Number of Young Members in the Household and Average Number of Adult Members in the Household by Highly Vulnerable, Relatively Vulnerable, and Not Vulnerable Households in the Philippines (for the years 2000, 2003, and 2006)

Figures 6 and 7, which show the number of young and adult members by vulnerability status across the urban and rural population, show that the national picture is not different for the urban and rural areas. There does not seem to be any large disparity between the urban and rural profile of vulnerable households as far as family size structure is concerned.

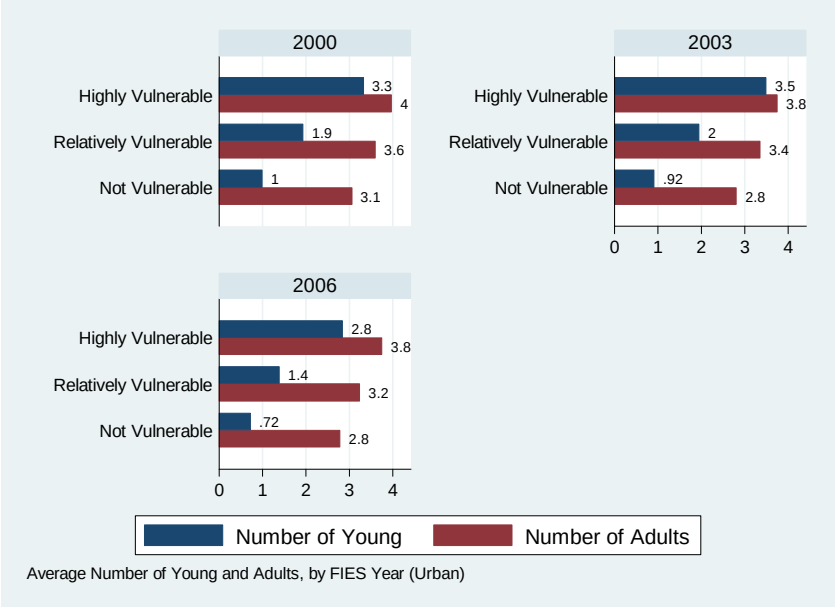

Figure 6. Average Number of Young Members in the Household and Average Number of Adult Members in the Household by Highly Vulnerable, Relatively Vulnerable, and Not Vulnerable Households in urban areas (for the years 2000, 2003, and 2006)

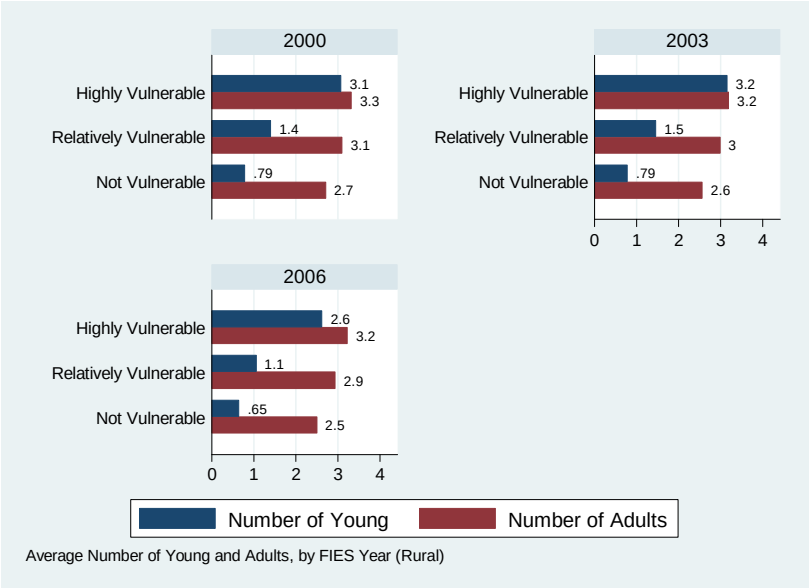

Figure 7. Average Number of Young Members in the Household and Average Number of Adult Members in the Household by Highly Vulnerable, Relatively Vulnerable, and Not Vulnerable Households in rural areas (for the years 2000, 2003, and 2006)

Estimates of the proportion of households among urban and rural areas across all the regions in the country are given in Table A-1, illustrating the vulnerability to income poverty, just like poverty itself, is more of a rural phenomenon. In addition, there are disparities in vulnerability levels, just like poverty rates, across the regions. For the period 2000 to 2006, between one to three in twenty households residing in Metro Manila were highly vulnerable; in ARMM, between three to four out of five households are highly vulnerable. About half to three fourths of Metro Manila households are non-vulnerable in the six year period, but the corresponding incidence among ARMM households is about one to three in twenty.

Breaking down households by employment of their heads in the major sectors, the most vulnerable households are those with heads that work in agriculture, while households with heads who employed in services are the least vulnerable (Figure 8).

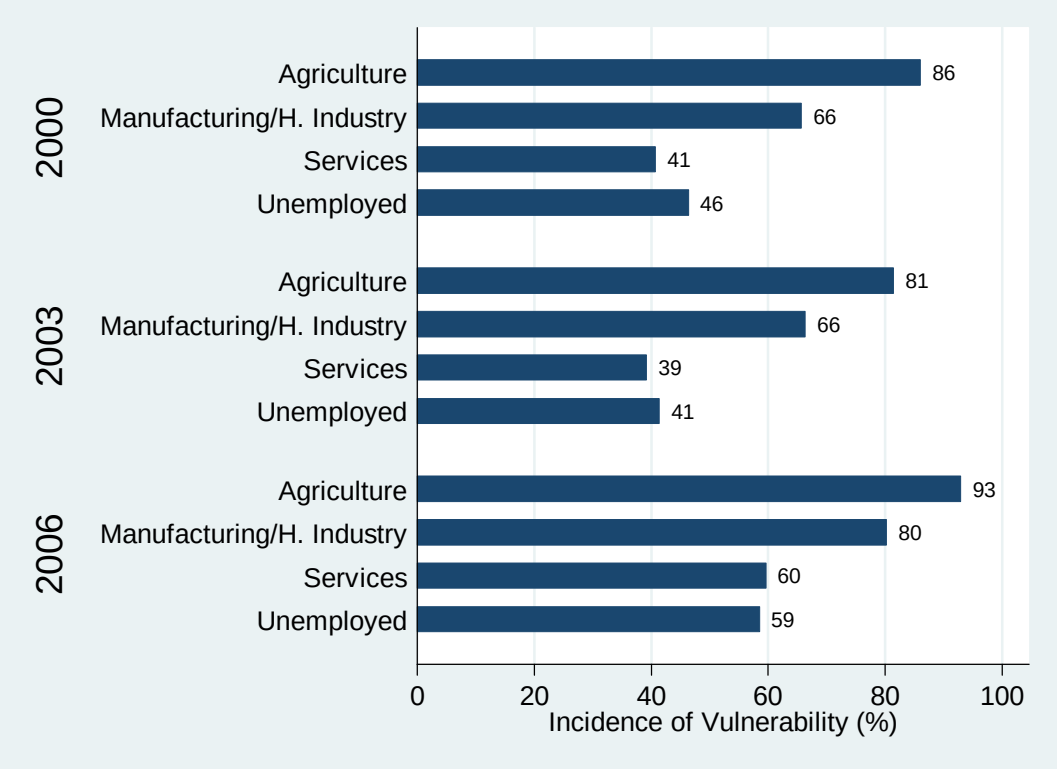

Figure 8. Incidence of Household Vulnerability to Income Poverty by Major Sector of Employment of the Household Head (for the years 2000, 2003, and 2006)

As in the case of poverty (see, e.g., Reyes 2002, and Reyes, 2004), for vulnerability to income poverty, the returns to education are rather high. Table 6 indicates that the proportion of households that are not vulnerable rising with increasing educational attainments of the household head.

Table 6. Incidence of Vulnerability Status Among Households in Urban and Rural Areas, by Highest Educational Attainment of the Head of the Household (2000, 2003, and 2006)

Area	Educational Attainment of Household Head	Vulnerability Status	2000	2003	2006
Philippines	None	Highly Vulnerable	62.79	51.42	74.45
		Relatively Vulnerable	26.76	33.58	22.26
		Not Vulnerable	10.44	15	3.3
	Some elementary to elementary graduate	Highly Vulnerable	49.4	46.11	62.16
		Relatively Vulnerable	31.89	35.78	30.27
		Not Vulnerable	18.7	18.11	7.57

	Some high school to high school graduate	Highly Vulnerable	25.05	16.92	35.72
		Relatively Vulnerable	37.68	39.69	46.03
		Not Vulnerable	37.27	43.39	18.25
	Some college and beyond	Highly Vulnerable	2.43	1.42	3.26
		Relatively Vulnerable	11.35	12.77	20.91
		Not Vulnerable	86.22	85.81	75.83
Urban	None	Highly Vulnerable	48.52	35.27	54.17
		Relatively Vulnerable	32.7	40.99	39.78
		Not Vulnerable	18.78	23.74	6.05
	Some elementary to elementary graduate	Highly Vulnerable	38.49	36.36	54.45
		Relatively Vulnerable	36.6	39.62	36.03
		Not Vulnerable	24.92	24.02	9.52
	Some high school to high school graduate	Highly Vulnerable	17.44	12.18	29.7
		Relatively Vulnerable	36.89	38.75	49.42
		Not Vulnerable	45.68	49.07	20.88
	Some college and beyond	Highly Vulnerable	1.61	1.03	2.45
		Relatively Vulnerable	9.82	11.93	19.64
		Not Vulnerable	88.57	87.03	77.9
Rural	None	Highly Vulnerable	66.82	54.65	78.54
		Relatively Vulnerable	25.09	32.1	18.72
		Not Vulnerable	8.09	13.25	2.74
	Some elementary to elementary graduate	Highly Vulnerable	55.09	51.02	2.74
		Relatively Vulnerable	29.44	33.84	27.4
		Not Vulnerable	15.47	15.14	6.6
	Some high school to high school graduate	Highly Vulnerable	35.19	23.34	43.69
		Relatively Vulnerable	38.73	40.95	41.55
		Not Vulnerable	26.08	35.7	14.76
	Some college and beyond	Highly Vulnerable	4.82	2.45	5.39
		Relatively Vulnerable	15.83	15	24.22
		Not Vulnerable	79.34	82.55	70.39

4. Policy Thrusts

The previous section highlighted the profile of (highly and relatively) vulnerable households (as compared with non-vulnerable households). The relatively vulnerable households may be viewed as households who may be exposed to shocks because of their idiosyncratic characteristics, while the extremely vulnerable are both likely to be exposed to shocks as well as have limited income-generating capacities. Intervention for the vulnerable ultimately takes two sets of courses of action: protection from likely exposure to shocks and assistance for households to increase their incomes and assets.

The assessment of vulnerability to income poverty confirms the importance of addressing inequality in welfare among various subgroups of the population, e.g., the urban versus rural population, across regions, and across sectors of employment. Despite the many public actions over the past several decades in the agricultural sector, e.g., agrarian reform, agricultural infrastructure (including farm to market roads), investments on inputs such as fertilizers and irrigation systems, we still find that households with heads engaged in agriculture are not only to be poorer segments of the population, but also the more vulnerable to income poverty. This suggests that there is hardly any impact of such public actions on agriculture in reducing poverty (and vulnerability).

Linkages between policies and data such as those generated from this study on vulnerability to income poverty should be developed. Poverty and vulnerability, for instance, cannot be divorced from population management: average family sizes among vulnerable households are higher than those of non-vulnerable households. The highly vulnerable have too many dependents (more than those of the relatively vulnerable households, and more so, of the non-vulnerable households). Family size appears to be exacerbating disparities in opportunities, assets and resources.

In the midst of a crisis, households with large family sizes are at a higher risk of becoming poor, and these households decide not to send their children to school to meet their critical short-term needs for income (Tabunda and Albert, 2002). These mitigating measures of households have long term costs in terms of the future income earning capacities of household members, and ultimately the well-being of the household. A household is more likely to be exposed to adverse shocks and have limited earnings prospects and income-generating capacity if it has low levels of human capital.

The nexus between poverty (and vulnerability) with education has been observed in a number of studies. Using data from the 2004 Annual Poverty Indicator Survey (APIS), conducted by the NSO, Maligalig and Albert (2008) estimated that children who belong to families in the bottom 30% of the income distribution are 2.82 times more likely to be out of school compared to their counterparts in the upper 70% of the income distribution ceteris paribus. Most students who stay out of school identify cost, lack of interest and other reasons as the major reasons for not staying in school. Maligalig *et al* (2009) obtained a number of interesting findings about working children and poverty: practically three out of every twenty children belonging to secondary education-age group are already working, with boys almost twice as likely to be working as girls; more than half of the working children are in the bottom 30% of the income distribution; and, all other things being equal, working children are estimated to be nearly ten times more likely not to attend school.

A number of government interventions have been established for improving participation in basic education, especially among the poor and vulnerable. The Pantawid Pamilyang Pilipino Program (4Ps), for instance, provides cash transfers to families participating in the program conditioned on having them send their 3-5 year old children attend daycare or preschool classes, and their children aged 6-14 years old enrolled and regularly attend formal education. Families that are part of the 4Ps are selected by way of a targeting mechanism called a proxy means test that identifies characteristics of poor families based on the results of the FIES, small area

estimates of poverty, among others. Such programs have to be accelerated, but with seriousness in ensuring monitoring systems are in place, financial costs to the program studied carefully, and exit strategies developed (Llanto, 2008).

The Department of Education (DepEd) has developed the Alternative Learning System (ALS) and a host of programs for Alternative Delivery Mode (ADM) that are aimed at giving everyone, especially the poor, equitable access to basic education. Out-of-school youths and adults aged 16 years and over are targeted in the ALS, by the provision of self-learning modules as an alternative to attendance in formal secondary education. These modules are meant to help the ALS participant prepare for the DepEd's Accreditation and Equivalency (A&E) test, which is given every February, and which the participant has to pass to earn a high school diploma. Unlike ALS, participants of ADM, such as working students, are enrolled in formal secondary schools. ADM participants, however, are given their school lessons flexibly, by way of modules, with some minimal teacher-pupil interaction at the start and end of the academic year, and occasionally, as the need arises. The ADM participants are selected from among those who are in school, and who are likely to drop out (given poor attendance or poor performance). While beneficiaries of the ALS and ADM are more likely persons from poor and vulnerable households, given the national trends in education statistics (see Albert and Maligalig, 2007), it appears that such programs are having minimal impact on improving the human resource investments made by the poor. The opportunity costs for children of poor and vulnerable families to stay in (or return to) school appear to be too high, especially during a crisis period. If the country is truly bent on hastening its efforts in reducing poverty, it is important to have a poverty reduction road map based on statistical information of both the poor and the vulnerable. Policies and programs geared toward preventing the transmission of poverty from one generation to the next, especially by way of human resource investments, and population management, must be an essential component of any sustainable reduction strategy of poverty and vulnerability.

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APPENDIX

Table A-1.a. Incidence of Highly Vulnerable Households in Urban and Rural Areas, by Region (2000, 2003, & 2006)

	2000	2003	2006		2000	2003	2006
Philippines	32.39	26.73	40.35	Eastern Visayas	40.97	37.85	53.53
Urban	19.32	15.65	27.83	Urban	22.58	21.37	37.09
Rural	45.17	37.62	52.67	Rural	48.17	42.23	57.63
Ilocos Region	33.86	24.6	41.3	Zamboanga Peninsula	44.54	48.69	54.48
Urban	22.61	19.95	34.92	Urban	27.3	26.69	34.84
Rural	39.11	27.19	45.1	Rural	52.25	55.15	61.07
Cagayan Valley	27.86	20.96	33.91	Northern Mindanao	36.25	30.03	41.96
Urban	20.06	14.93	25.76	Urban	23.8	17.87	31.55
Rural	29.94	23.09	36.72	Rural	44.56	38.17	49.57
Central Luzon	35.15	24.13	32.67	Davao	35.25	33.67	49.53
Urban	31.23	23.46	30.15	Urban	23.55	22.73	40.22
Rural	39.88	25.2	36.75	Rural	42.66	40.98	55.79
CALABARZON	17.87	17.96	30.6	SOCCKSARGEN	42.1	32.13	58.94
Urban	13.53	12.61	24.97	Urban	31.03	18.44	48.66
Rural	26.03	28.08	41.61	Rural	49.49	38.15	63.65
MIMAROPA	45.89	37.82	65.12	NCR	5.38	5.1	14.66
Urban	30.66	30.62	54.12	Urban	5.38	5.1	14.66
Rural	51.68	41.14	70.14	Rural			
Bicol Region	50.7	37.56	53.64	CAR	39.39	29.93	37.32
Urban	38.32	28.11	43.71	Urban	17.07	13.37	17.42
Rural	55.33	41.26	57.04	Rural	51.87	37.84	47.52
Western Visayas	35.77	33.86	41.45	ARMM	66.83	53.34	82.25
Urban	20.38	19.24	25.73	Urban	51.66	34.55	71.36
Rural	45.3	40.46	48.86	Rural	71.45	56.82	84.41
Central Visayas	37.97	26.25	39.97	CARAGA	51.32	43.8	59.59
Urban	32.02	17.82	33.01	Urban	37.91	36.59	52
Rural	42.66	34.49	47.03	Rural	58.8	47.49	63.54

Table A-1.b. Incidence of Relatively Vulnerable Households in Urban and Rural Areas, by Region (2000, 2003, & 2006)

	2000	2003	2006
Philippines	29.22	32.07	33.35
Urban	28.19	30.53	35.99
Rural	30.24	33.58	30.75
Ilocos Region	37.54	37.84	38.38
Urban	34.57	38.49	37.53
Rural	38.92	37.48	38.88
Cagayan Valley	33.28	30.62	37.63
Urban	30.2	24.3	35.36
Rural	34.1	32.85	38.41
Central Luzon	39.31	40.4	39.22
Urban	41.8	39.21	38.34
Rural	36.31	42.32	40.66
CALABARZON	31.76	35.41	40.05
Urban	29.56	35.11	40.32
Rural	35.88	35.97	39.51
MIMAROPA	26.64	31.3	22.87
Urban	25.87	28	27.23
Rural	26.93	32.82	20.88
Bicol Region	27.36	30.54	28.32
Urban	30.63	30.8	33
Rural	26.13	30.44	26.72
Western Visayas	27.13	34.58	32.94
Urban	25.88	31.85	34.63
Rural	27.91	35.82	32.14
Central Visayas	31.35	31.77	36.1
Urban	32.34	30.72	37.09
Rural	30.57	32.8	35.09

	2000	2003	2006
Eastern Visayas	27.91	28.99	27.57
Urban	26.35	28.89	30.71
Rural	28.52	29.01	26.78
Zamboanga Peninsula	27.57	27.7	27.17
Urban	28.05	29.74	34.74
Rural	27.35	27.11	24.63
Northern Mindanao	29.07	31.88	31.87
Urban	29.88	30.1	34.18
Rural	28.54	33.07	30.19
Davao	31	35.18	30.83
Urban	32.04	39.36	35.15
Rural	30.35	32.38	27.93
SOCCKSARGEN	28.66	33.21	27.74
Urban	28.33	32.03	33.15
Rural	28.88	33.73	25.25
NCR	19.91	21.2	34.73
Urban	19.91	21.2	34.73
Rural			
CAR	30.03	29.18	32.39
Urban	32.73	25.12	33.7
Rural	28.53	31.12	31.72
ARMM	19.55	29.83	13.43
Urban	24.78	31.74	20.22
Rural	17.95	29.48	12.08
CARAGA	27.86	34.38	28.35
Urban	32.02	37.66	34.06
Rural	25.54	32.71	25.37

Table A-1.c. Incidence of Non Vulnerable Households in Urban and Rural Areas, by Region (2000, 2003, & 2006)

	2000	2003	2006		2000	2003	2006
Philippines	38.38	41.2	26.3	Eastern Visayas	31.12	33.17	18.9
Urban	52.49	53.82	36.18	Urban	51.07	49.74	32.2
Rural	24.59	28.8	16.58	Rural	23.31	28.76	15.58
Ilocos Region	28.61	37.56	20.32	Zamboanga Peninsula	27.89	23.6	18.35
Urban	42.82	41.56	27.55	Urban	44.65	43.58	30.42
Rural	21.97	35.33	16.02	Rural	20.4	17.74	14.3
Cagayan Valley	38.86	48.42	28.46	Northern Mindanao	34.68	38.09	26.17
Urban	49.74	60.78	38.88	Urban	46.32	52.03	34.27
Rural	35.97	44.06	24.87	Rural	26.9	28.75	20.24
Central Luzon	25.54	35.47	28.11	Davao	33.74	31.15	19.63
Urban	26.97	37.33	31.51	Urban	44.41	37.91	24.64
Rural	23.81	32.48	22.59	Rural	26.99	26.64	16.28
CALABARZON	50.37	46.63	29.35	SOCCKSARGEN	29.24	34.66	13.33
Urban	56.91	52.28	34.71	Urban	40.64	49.53	18.19
Rural	38.1	35.94	18.89	Rural	21.63	28.12	11.1
MIMAROPA	27.46	30.88	12.01	NCR	74.71	73.7	50.61
Urban	43.46	41.38	18.65	Urban	74.71	73.7	50.61
Rural	21.39	26.04	8.98	Rural			
Bicol Region	21.94	31.9	18.04	CAR	30.57	40.89	30.29
Urban	31.05	41.09	23.29	Urban	50.2	61.51	48.88
Rural	18.53	28.3	16.24	Rural	19.61	31.04	20.76
Western Visayas	37.1	31.56	25.62	ARMM	13.62	16.83	4.32
Urban	53.74	48.91	39.64	Urban	23.55	33.71	8.41
Rural	26.8	23.72	19.01	Rural	10.6	13.71	3.51
Central Visayas	30.68	41.97	23.93	CARAGA	20.82	21.82	12.07
Urban	35.64	51.46	29.9	Urban	30.07	25.76	13.94
Rural	26.77	32.71	17.88	Rural	15.65	19.8	11.09

Table A-2. Explanatory Variables Used, Means and Standard Deviations (2000, 2003, and 2006)

Variable	Definition	2000		2003		2006	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
hh_dependent	Number of dependents (age<15) in the Household (HH)	1.862529	1.722071	1.780411	1.636497	1.687915	1.60334
hh_adult	Number of adults (age>=15) in the HH	3.246492	1.55883	3.041086	1.489288	3.119811	1.532336
hoh_age	Age of the Head of Household (HOH)	48.84008	13.84694	46.2037	14.2399	48.43659	14.03204
hoh_hgc_1	Highest grade completed of HOH: none	0.040711	0.197621	0.03193	0.175814	0.027476	0.163465
hoh_hgc_2	Highest grade completed of HOH: some elementary to elementary graduate	0.4327	0.49545	0.413061	0.492384	0.408236	0.491507
hoh_hgc_3	Highest grade completed of HOH: some high school to high school graduate	0.317422	0.465473	0.33918	0.473431	0.341626	0.474255
hoh_hgc_4	Highest grade completed of HOH: some college and beyond	0.209166	0.406713	0.215829	0.411397	0.222662	0.416034
hoh_male	Indicator Variable if the HOH is male (hoh_male=1 if male; hoh_male=0 if female)	0.825037	0.379936	0.832889	0.373075	0.813265	0.389699
hoh_employ1	Employment of HOH: Agriculture, Self-employed	0.279854	0.448927	0.275648	0.44684	0.261469	0.439435
hoh_employ2	Employment of HOH: Agriculture, Employed by others	0.07509	0.263537	0.081667	0.273857	0.078836	0.269482
hoh_employ3	Employment of HOH: Manufacturying/Heavy Industry, Self-Employed	0.03449	0.182483	0.027922	0.164748	0.025301	0.157037
hoh_employ4	Employment of HOH: Manufacturing/Heavy Industry, Employed by others	0.117941	0.322538	0.124501	0.330152	0.112351	0.315798
hoh_employ5	Employment of HOH: Service Industry, Self-employed	0.137394	0.344263	0.141166	0.348192	0.152424	0.359431
hoh_employ6	Employment of HOH: Service Industry, Employed by others	0.191434	0.393429	0.207975	0.405859	0.204634	0.403434
hoh_employ7	Employment of HOH: Unemployed	0.16379	0.370085	0.141122	0.348147	0.164986	0.371168

own_hl	Indicator Variable if HH owns or has owner-like possession of its residential house and lot (own_hl=1 if yes, own_hl=0 if no)	0.68523 0.759596	0.464424 0.427329	0.681306 0.770625	0.46597 0.420431	0.706955 0.821108	0.455159 0.383262
electricity	Indicator Variable if the HH has electricity (electricity=1 if yes; electricity=0 if no)	0.259868	0.438562	0.253089	0.434782	0.242288	0.428468
agri	Indicator Variable if the HH is an agricultural HH (agri=1 if yes; agri=0 if no)	0.053578	0.225183	0.05316	0.224353	0.054394	0.226793
region1	Ilocos Region	0.037599	0.190225	0.035632	0.18537	0.035597	0.185283
region2	Cagayan Valley	0.103035	0.304005	0.109858	0.312712	0.109717	0.312537
region3	Central Luzon	0.118868	0.323634	0.132601	0.339143	0.129313	0.335547
region16	CALABARZON	0.029672	0.169681	0.030348	0.171542	0.031343	0.174242
region17	MIMAROPA	0.059661	0.236858	0.057381	0.232569	0.058028	0.233796
region4	Bicol Region	0.080397	0.271906	0.076844	0.266343	0.078718	0.269298
region5	Western Visayas	0.073314	0.260652	0.073794	0.261435	0.074321	0.262292
region6	Central Visayas	0.048886	0.21563	0.045754	0.20895	0.046782	0.211171
region7	Eastern Visayas	0.036037	0.186382	0.035612	0.18532	0.03582	0.18584
region8	Zamboanga Peninsula	0.045681	0.208791	0.044857	0.206989	0.04531	0.207984
region9	Northern Mindanao	0.047994	0.213754	0.049237	0.216362	0.048338	0.21448
region10	Davao	0.044511	0.206227	0.04299	0.202834	0.043016	0.202894
region11	SOCCKSARGEN	0.145215	0.352318	0.139145	0.346098	0.135712	0.342483
region12	NCR	0.018251	0.133857	0.016959	0.129118	0.017382	0.130691
region13	CAR	0.030178	0.171076	0.030616	0.172276	0.03068	0.172449
region14	ARMM	0.027123	0.162441	0.025215	0.156776	0.025529	0.157724
region15	CARAGA	1.862529	1.722071	1.780411	1.636497	1.687915	1.60334