The Link between Extreme Poverty and Young Dependents in the Philippines:Evidence from Household Surveys

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The Link between Extreme Poverty and Young Dependents in the Philippines: Evidence from Household Surveys[1]

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ABSTRACT

The high level of extreme poverty or those experiencing hunger in the country is the most pressing issue that needs to be addressed by our policymakers. Official government statistics and data from self-rated hunger surveys show an increasing trend in hunger incidence among households. On the one hand, latest data from the National Statistical Coordination Board (NSCB) show that the percentage of population experiencing hunger almost remained the same from 11.1 percent in 2003 to 10.8 percent in 2009. On the other hand, the Social Weather Stations (SWS) quarterly surveys on hunger incidence show an increasing trend in the percentage of families that experienced hunger, reaching 18.4 percent (about 3.8 million households) in the 2nd Quarter of 2012. This study looks at the determinants of extreme poverty among households using the data from the Family Income and Expenditures Survey (FIES) and the household surveys of SWS. Using a *logit* model on the pooled data, the results show that presence of a young dependent in the household increases the probability that the household will be *extremely poor*, controlling for other factors. Other variables that influence the probability of the household being *extremely poor* are the education of the household head and percentage of cash transfer from abroad. Moreover, regional characteristics such as varying food prices and underemployment rate (quality of jobs) explain a lot about the probability of the household being *extremely poor*. The study shows that we cannot ignore the evidence linking population growth and poverty. Development policies aimed at addressing poverty incidence in the country must include measures that will manage the country's bourgeoning population.

Key Phrases: Extreme Poverty, Young Dependents, *Logit* Model, Population Management

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I. INTRODUCTION

The high poverty incidence in the country continues to be a major concern for policy makers. The official statistics on extreme poverty compiled by the National Statistical Coordination Board (NSCB), in Table 1 below, showed that while the percentage of subsistence poor (or food poor)[5] did not change much in recent years, only slightly decreasing from 11.1 percent in 2003 to 10.8 percent in 2009, the number of food poor in the population has increased to about 9.44 million in 2009 from 8.8 million in 2003. This is primarily because of the relatively high population growth during the period.[6] Moreover, the figures from the same table show the actual number of subsistence poor increased in the three major geographical areas, in Luzon (about 215,000 individuals), in the Visayas (about 158,000) and in Mindanao (about 264,000) for the same period.

The results of the 7th National Nutrition Survey (NNS) of 2008 conducted by the Food Nutrition and Research Institute (FNRI) show a significant increase in the proportion of children aged 0-5 years who were underweight (an indirect measure of hunger) from 24.6 percent in 2003 to 26.2 percent in 2008. Moreover, the same report shows that the proportion of children who were under height for age (stunted) also increased significantly to 27.9 percent in 2008 from 26.3 percent in 2003. The FNRI study also shows the same results in children between 6 to 10 years old: a significant increase in the prevalence of underweight from 22.8 percent in 2003 to 25.6 percent in 2008 and increase in the proportion of under height from 32.0 percent to 33.1 percent.

[5] The prevalence of subsistence poor refers to the proportion of families or individuals with per capita income less than the per capita food threshold. The food threshold is determined using regional one-day menus priced at the provincial level. These menus are determined using low-cost nutritionally adequate food items satisfying basic food requirements of 2,000 calories which are 100% adequate for the recommended energy and nutrient intake (RENI) for energy and protein and 80% adequate for the RENI for vitamins, minerals and other nutrients (NSCB, 2010).

[6] The annual population growth from 2000 to 2010 is 1.90% based on the results of the 2010 Census of Population. In May 1, 2010 the population of the Philippines is at 92.34 million. Moreover, data shows that the total fertility rate (TFR) is highest among the poorest households, where the TFR is 5.20 for the poorest 20 percent of households against the national average of 3.30 (as of 2008).

Table 1. Subsistence Incidence and Magnitude of Poor among the Population

Major Island Group	Subsistence Incidence among Population (%)			Magnitude of Poor Population		
	2003	2006	2009	2003	2006	2009
PHILIPPINES	11.1	11.7	10.8	8,802,918	9,851,362	9,440,397
Luzon	6.2	7.2	6.1	2,818,041	3,437,824	3,033,052
Visayas	16.2	16.8	15.3	2,540,826	2,806,891	2,699,031
Mindanao	18.7	18.2	18.2	3,444,051	3,606,647	3,708,314

Source: National Statistical Coordination Board (NSCB)

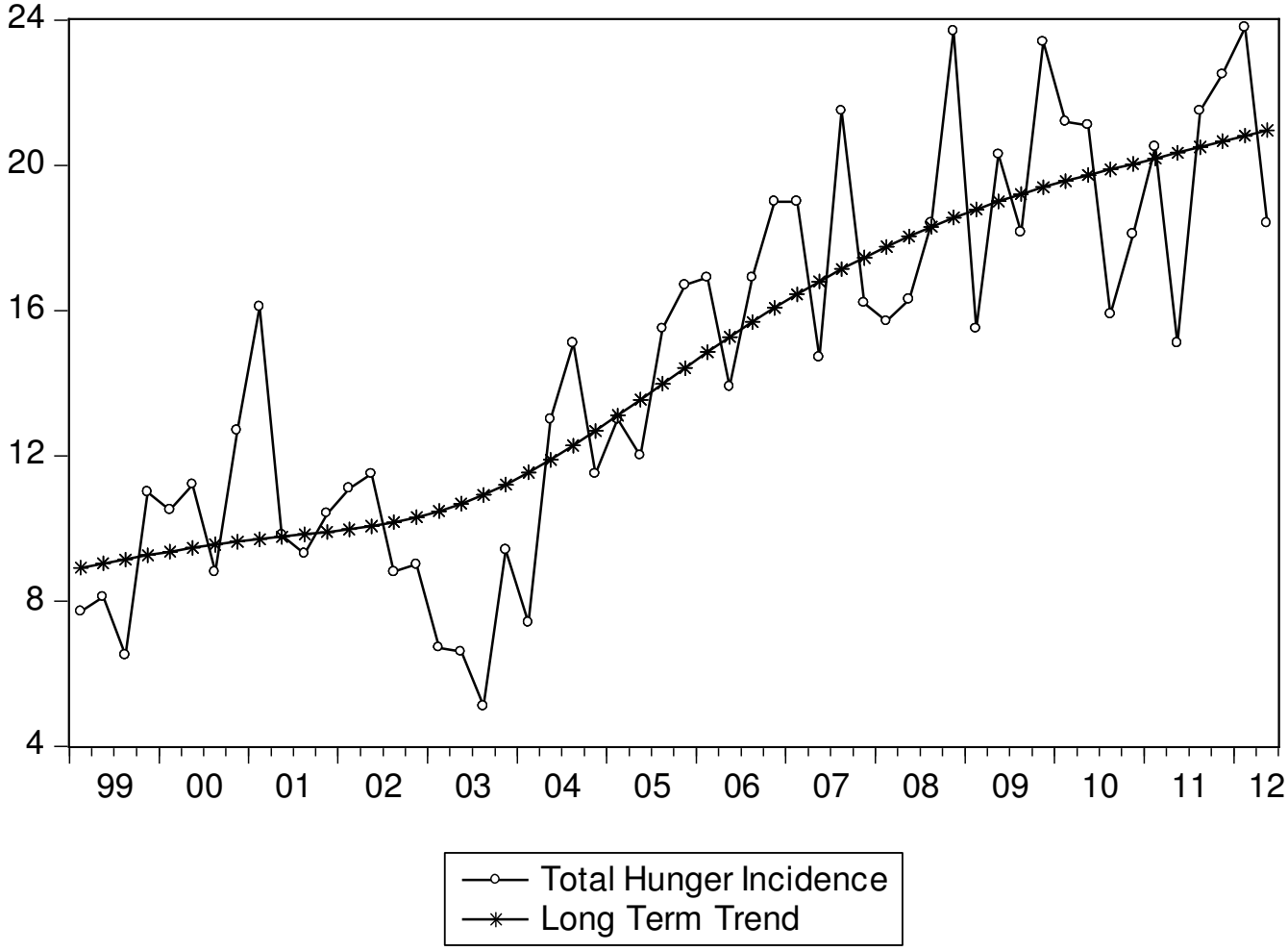
The Social Weather Stations (SWS) national surveys on hunger also show that hunger incidence in the country is still high. The proportion of families experiencing involuntary hunger reached 18.4 percent during the second quarter of 2012, representing about 3.8 million households (SWS, 2012).[7] The time series data on hunger incidence shows that the average hunger incidence from the 3rd quarter of 2010 to the 2nd quarter of 2012 (current Aquino administration) is 19.50 percent. What is noticeable from the SWS time series data is that the long-term trend of the percentage of hunger incidence, computed using the Hodrick-Prescott (HP) filter and shown in Figure 1 below, shifted and increased beginning the second quarter of 2004.[8] In other words, the proportion of hunger incidence rapidly

[7] The SWS quarterly survey has 1,200 respondents from various parts of the country. The respondents are asked if they have experienced hunger in the past three months. If the respondent answers yes, a second question is then asked regarding the frequency of the experience. The SWS further classifies hunger into moderate if it happened "only once" or "a few times" and severe if it happened "often" or "always". While the SWS hunger indicator reports the total hunger incidence as well as the moderate and severe hunger incidence, this paper focus only on the total hunger incidence for its analysis.

[8] The HP filter, first proposed by Hodrick and Prescott (1997) uses a smooting method to obtain an estimate of the long-term trend component of a time series. The HP filter computes the permanent component (TR_t) of a time series y_t by minimizing the variance of y_t around TR_t, subject to a penalty that constrains the second difference of TR_t.

increased starting the second quarter of 2004. The data from the official statistics on hunger incidence (subsistence poor from NSCB), as well as other measures of hunger incidence from the FNRI and SWS, consistently show the same results: that hunger has worsened in the past years.

Figure 1. Total Hunger Incidence and Long Term Trend of Total Hunger Incidence from 1st Quarter of 1999 to 2nd Quarter of 2012



This paper looks at the determinants of extreme poverty in the Philippines, particularly its link with the presence of young dependents in the household, using data from the Family Income and Expenditures Survey (FIES), where the official statistics on subsistence poor (or extreme poverty) is

generated, and the hunger incidence survey from the Social Weather Stations (SWS), an alternative and popular measure of extreme poverty in the country. An important feature of this paper is the mainstreaming of the household data on hunger incidence from the SWS into the econometric models explaining the determinants of hunger in the country. The paper is organized as follows: section 2 presents some the results of the studies on poverty and hunger in the Philippines. Section 3 presents the econometric models and results of the study using the FIES and SWS data and section 4 concludes.

II. STUDIES ON EXTREME POVERTY IN THE PHILIPPINES

Mapa, Han and Estrada (2011) examined the dynamic patterns of hunger incidence and the effects of the determinants of hunger using the quarterly time series data from the SWS national surveys on hunger incidence. The authors used a vector autoregressive (VAR) model to analyze the impact of shocks in food prices and underemployment on the current and future hunger incidence. The authors found that food inflation and underemployment are important determinants of hunger incidence in the Philippines. In particular, a one-time increase in food prices leads to increases in hunger incidence that lasted for the next five quarters. A one-time increase in underemployment, on the other hand, leads to increases in hunger incidence in the next two quarters.

Son (2008) also analyzed the impact of higher food prices on poverty in the country. The study showed the dominating effect of rising food prices on poverty over the period 2003-2006 where higher food process affected the poor harder. The study showed that the poor are highly sensitive to price changes in food, particularly staple food items such as rice. In particular, a 10% increase in food prices can create an additional 2.3 million poor people in country. Moreover, the simulation results from the study showed that a 10% increase in the price of rice will force an additional 0.66 million people into poverty.

Reyes, Sobrevinas, Bancolita and de Jesus (2009) examined the impact of the simultaneous increase in the prices of rice and fuel experienced in 2008 on poverty incidence. The study showed that such increases also increased poverty incidence by about 2 to 2.5 percentage points or about 1.8 to 2.2 million people falling below the poverty threshold.

The global financial crisis (GFC) that started in 2008 also affected poverty reduction efforts in the country. Balisacan, Piza, Mapa, Abad Santos and Odra (2010) showed the impact of the GFC on the country's economic growth and poverty incidence. The study showed that the GFC pushed down the GDP growth rate from its long-term trend (of about 4.7%) by 1.0 percentage point in 2008 and 3.8 percentage points in 2009. Simulations done by the authors showed that if there was no GFC and the economy moved along its long-term growth path, average household income would have increased by 1.8% between 2008 and 2009, causing poverty to fall, rather than increase (from 2006 to 2009), by about 0.4 percentage points during the same period. The authors estimated that about 2 million Filipinos were pushed to poverty due to the GFC.

Reyes, Sobrevina and de Jesus (2010) looked at the impact of the GFC on poverty incidence at the household and community level. The authors used the different dimensions of poverty obtained from the community-based monitoring systems (CBMS) being implemented in the Philippines. The study established the channels through which the GFC could affect households – through overseas employment and remittances. Using 10 selected sites distributed all over the Philippines with a total of 3499 households, the study showed that about 12.9 percent of all households interviewed were retrenched during the period November 2008 to April 2009. Moreover, about 71 percent of the Overseas Filipino Workers (OFWs) working in Asian countries experienced wage reduction. An estimated 7.1 percent of all households experienced a decline in the frequency of receipt of remittances while majority of the households (79.1 percent) reported a decline in their monthly income from the business. The study

showed that poverty incidence in most of the sites increased in 2009 as compared to their previous CBMS round. The study established that the GFC affected the households in terms of OFW remittances and local employment and resulted in an increase in poverty incidence, albeit modestly. In response to the crisis, households adopted various coping strategies which may be damaging and counter-productive in the long run (such as withdrawal of children from school).

The link between population and family size on the one hand and poverty incidence on the other hand in the Philippines has been established using both macro and micro data. Mapa, Balisacan and Briones (2006) used econometric models to established the causality between presence of young dependents in the household (household members below 15 years old) and income growth. The authors made use of provincial data from 1985 to 2003. The results from the study showed that a one-percentage point decrease in the proportion of young dependents in 1985 increases the estimated mean provincial per capita income from 1985 to 2003 by about 7.5 basis points, all things being equal. Using simulation exercises, the authors established that had the country's provinces reduced the proportion of young dependent to an average of about 36 percent in 1985 (instead of the actual 41.50 percent), the estimated national average per capita income in year 2003 (18 years later) would have been higher by about 7.12 percent (the population factor effects). The increase in per capita income (due to the population factor) could have resulted in a lower poverty incidence, estimated to be lower by about 3.60 percentage points or about 2.8 million individuals taken out of poverty.

At the micro level, Orbeta (2006)) have shown that family size is closely associated with poverty incidence, as shown by household survey data over time. Pernia et.al. (2009) showed that official data from the Family Income and Expenditures Survey (FIES) since 1985 unambiguously show that poverty incidence is lower for families with fewer children but rises consistently with the number of children.

Moreover, the authors showed that the latest data from the 2009 FIES reveal that 2.9 percent and 46.4 percent poverty rates, respectively, for families with one child and those with nine or more children.

III. ECONOMETRIC MODELS ON THE DETERMINANTS OF EXTREME POVERTY

The paper looks at the determinants of extreme poverty or those experiencing hunger using household data from two commonly used surveys in the Philippines when estimating extreme poverty: the Family Income and Expenditures Survey (FIES) and the Social Weather Stations (SWS) Hunger Incidence Survey. The paper made use of the logistic regression models to establish the determinants of extreme poverty using the two different data sets.

3.1. Logistic Regression Model (Determinants Extreme Poverty in Households)

The econometric model used in analyzing the determinants of extreme poverty is the *logit model*. Consider the linear model,

$$y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + ... + \beta_k X_{ki} + \varepsilon_i \qquad i = 1,2,...,n \qquad (1)$$

where the variable of interest, y_i, takes on the value 1 if the household is experiencing "extreme poverty" and value 0, otherwise. The X_1, X_2,…, X_k represent the determinants of the extreme poverty in households.

Note that y_i is a Bernoulli random variable with probability of success,π, or $y_i \sim Be(\pi)$. The problem in economics is that most likely π is unknown and not constant across the observations. The solution is to make π dependent on X_i. Thus, we have,

$$y_i \sim Be\left(F\left(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + ... + \beta_k X_{ki}\right)\right) \qquad (2)$$

where the function F(·) has the property that maps $\beta_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_kX_k$ onto the interval [0,1]. Thus, instead of considering the precise value of y, we are now interested on the probability that y = 1, given the outcome of $\beta_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_kX_k$, or,

$$\Pr\left(y_i = 1 \mid \underline{\beta}, \underline{x_i}\right) = F(\underline{x_i}\,\underline{\beta}) \tag{3}$$

where F is a continuous, strictly increasing function and returns a value ranging from 0 to 1. The choice of F determines the type of binary model. Given such a specification, the parameters of this model (the betas) can be estimated using the method of maximum likelihood. Once the identifiable parameters are established, the likelihood function is written as,

$$L(y;\beta) = \prod_{i=1}^{n} \left\{ \left[F(x_i\beta)\right]^{y_i} \left[1 - F(x_i\beta)\right]^{1-y_i} \right\} \tag{4}$$

In the case of the LOGIT model with a single explanatory variable the probability of success is given by,

$$\Pr(y_i = 1 \mid x_i) = \frac{\exp(\beta_0 + \beta_1 x_i)}{1 + \exp(\beta_0 + \beta_1 x_i)} \tag{5}$$

The parameters of the model are estimated using Maximum Likelihood (ML). Using the likelihood function,

$$L(y;\beta) = \prod_{i=1}^{n} \left\{ \left[F(x_i\beta)\right]^{y_i} \left[1 - F(x_i\beta)\right]^{1-y_i} \right\} \tag{6}$$

We can obtain an expression for the log-likelihood,

$$\begin{aligned} \log(L) &= \sum_{i=1}^{n} y_i \log[F(x_i'\beta] + (1 - y_i)\log[1 - F(x_i'\beta)] \\ &= \sum_{i:y_i=1}^{n} \log[F(x_i\beta] + \sum_{i:y_i=0}^{n} \log[1 - F(x_i\beta)] \end{aligned} \tag{7}$$

Differentiating the log-likelihood function with respect to the parameter vector β and set the vector of derivatives equal to zero:

$$\frac{\partial \log L}{\partial \beta} = \sum_{i:y_i=1} \frac{f(x_i\beta)}{F(x_i\beta)} x_i' - \sum_{i:y_i=0} \frac{f(x_i\beta)}{1-F(x_i)} x_i' = 0 \qquad (8)$$

where f(.) is the probability density function associated with the F(.). Simplifying, we have,

$$0 = \sum_{i=1}^{n} \left[\frac{y_i}{F(x_i\beta)} - \frac{1-y_i}{1-F(x_i\beta)} \right] f(x_i\beta) x_i' \qquad (9)$$

Combining the two terms inside the brackets, we have,

$$0 = \sum_{i=1}^{n} \frac{y_i - F(x_i\beta)}{F(x_i\beta) - [1-F(x_i\beta)]} f(x_i\beta) x_i' \qquad (10)$$

In the *logit* model we can simplify the last equation using the fact that,

$$f(x) = F(x)[1-F(x)] = \frac{\exp(-x)}{(1+\exp(-x))^2} \qquad (11)$$

The simplification yields:

$$0 = \sum_{i=1}^{n} [y_i - F(x_i\beta)] x_i' \quad or \quad \sum_{i=1}^{n} y_i x_i' = \sum_{i=1}^{n} F(x_i\beta) x_i' \qquad (12)$$

The likelihood equations associated with the *logit* models are non-linear in the parameters. Simple closed-form expressions for the ML estimators are not available, so they must be solved using numerical algorithms.

Marginal Effects

Interpretation of the coefficient values is complicated by the fact that estimated coefficients from a binary model cannot be interpreted as marginal effect on the dependent variable. The marginal effect of X_j on the conditional probability is given by,

$$\frac{\partial E(y \mid \underline{X}, \underline{\beta})}{\partial X_j} = f(\underline{x}_i' \underline{\beta})\beta_j \qquad (13)$$

where $f(\cdot)$ is the density function corresponding to $F(\cdot)$. In here, β_j is weighted by a factor $f(\cdot)$ that depends on the values of all the regressors in $\underline{X}$. The direction of the effect of a change in X_j depends only on the sign of the β_j coefficient. Positive values of β_j imply that increasing X_j will increase the probability of the response, while negative values of β_j will decrease the probability of the response. The marginal effect is usually estimated using the average of all the values of the explanatory variables ($\underline{\mathbf{X}}$) as the representative values in the estimation.

Average Marginal Effect

Some researchers (particularly Bartus (2005)) argue that it would be more preferable to compute the *average marginal effect*, that is, the average of each individual's marginal effect. The marginal effect computed at the *average X* is different from the average of the marginal effect computed at the individual X.

3.2. Empirical Results from FIES Pooled Data (2003, 2006 and 2009)

To determine the effects of the number of young dependents on the probability of a household being extremely poor (subsistence poor), an econometric (*logit*) model is estimated using the pooled data on the households from the 2003, 2006 and 2009 Family Income and Expenditure Surveys (FIES).[9] To control for factors that may influence the probability of a household being extremely poor (or not extremely poor) such as income, the households included in the study are only those with per capita income in the vicinity of the *per capita food threshold* as computed by the NSCB. This was computed by the authors to be within 20 percent of the threshold. In other words, the households are categorized as (a*) extremely poor households*, with per capita income lower (maximum of 20 percent) than the per capita food threshold and (b) *poor households*, with per capita income higher (maximum of 20 percent) than the per capita food threshold (but lower than the per capita poverty threshold). The reason behind selecting the household with income "near" the food threshold is make sure that the two groups (extremely poor and poor households) are comparable.[10]

The explanatory variables ($\underline{\mathbf{X}}$) used to explain the probability of being "extremely poor" household include: (a) the number of young dependents in the household (aged less that 15 years), (b) education of the household head, (c) gender of the household head (indicator variable with values 1 if Male and 0 if Female), (d) age of the household head, (e) income transfer from abroad (as a percentage of total income), (f) indicator variable for extended family (1 if the household has an extended family and 0 otherwise), (g) time indicator variables (for the years 2003, 2006 and 2009), and (h) regional indicator variables to account for regional differences (17 regions).

[9] Only the data from the 2003, 2006 and 2009 FIES are used in building the econometric model to maintain the consistency in the definition of "subsistence poor" and "poor" households.

[10] The concept is similar to the regression discontinuity design (Thistlewaite and Campbell (1960)) in identifying the "experimental" and "control" groups.

The figures in Table 2 show the 12,876 households included in the study, of which 5,848 or about 45 percent are classified as "extremely poor" households, while 7,028 or about 55 percent are classified as "poor" households. Across the survey years (2003, 2006 and 2009), the percentage of extremely poor in the sample remained the same, which is the objective of taking a sample of "extremely poor" and "poor" households with per capita income near the per capita food threshold. The two groups are comparable, similar to the control and treatment groups.

Table 2. Number of Households in the Sample (FIES 2003, 2006 and 2009)

Year	Extremely/Subsistence Poor		Poor		Total	
	Number of HHs	%	Number of HHs	%	Number of HHs	%
2003	2,044	46.07	2,393	53.93	4,437	100.00
2006	1,946	45.64	2,318	54.36	4,264	100.00
2009	1,858	44.50	2,317	55.50	4,175	100.00
Total	5,848	45.42	7,028	54.58	12,876	100.00

Source: FIES, National Statistics Office (2003, 2006, 2009) and NSCB (2003, 2006, 2009)

The numbers in Table 3 are the summary statistics for the variable of interest and the explanatory variables. Some striking results from the table include the relatively higher average number of young dependents – close to 3 for the households. Moreover, the average income transfer from abroad (as percentage of total income) is less than 1 percent, indicating presence of few overseas workers as members of the households, although there were a few households with relatively very high income transfer from abroad as indicated by the maximum value of about 93 percent. About 90 percent of these households are headed by males and 21 percent of the households are considered as "extended family" households consisting of two or more families.

The figures in Table 4 show the frequency distribution of the highest educational attainment of the household head. The results show that about 85 percent of the household heads did not finish high school education, while only 12 percent of the household heads can show a high school diploma as their

highest educational attainment. Only 2.71 percent of the household heads were able to reached college and less than one percent did finished college. This result is important since supports the common knowledge that good education is one of the important pathways to get out of poverty.

Table 3. Summary Statistics of the Dependent and Explanatory Variables

Variable	Mean	Std. Dev.	Min	Max
Household Classification (1 if Subsistence Poor, 0 if otherwise)	0.45	0.50	0.00	1.00
Age of Household Head	45.65	13.09	15.00	99.00
Number of Young Dependents (< 15 years old)	2.89	1.74	0.00	11.00
Income from Abroad (as percentage of household income)	0.93	5.04	0.00	92.84
Type of Family (1 if Extended Family, 0 if Single Family)	0.21	0.41	0.00	1.00
Gender of the Household Head (1 if Male, 0 if Female)	0.90	0.30	0.00	1.00

Table 4. Frequency Distribution of the Highest Educational Attainment of the Household Head

Level of Education	N	Percent
No Education	836	6.49
Elementary Undergraduate	5070	39.38
Elementary Graduate	3308	25.69
High School Undergraduate	1680	13.05
High School Graduate	1574	12.22
College Undergraduate	349	2.71
College Graduate/Post Graduate	59	0.46
Total	12876	100.00

A cross-tabulation of the gender of the household head and household classification (extremely poor or poor) is shown in Table 5. The results show that among male-headed households, about 46 percent are classified as extremely poor households and about 54 percent are poor households. The percentages are not significantly different for female-headed households, where about 44 percent are considered as extremely poor households and the remaining 56 percent are classified as poor households. The chi-square test shows no significant difference in the percentages of extremely poor households between male- and female-headed households.

Table 5. Household Classification (Extremely Poor or Poor) by Gender of the Household Head

Gender of Household Head	Extremely/Subsistence Poor		Poor		Total
	n	%	N	%	
Male	5,276	45.57	6,303	54.43	11,579
Female	572	44.10	725	55.90	1,297
Total	5,848	45.42	7,028	54.58	12,876
Pearson Chi-Square Statistic		1.0077	p-value		0.315

A similar cross-tabulation is reported in Table 6, this time for the type of family (single or extended family) against household classification (extremely poor or poor). The results show that among extended-family households, about 44 percent are classified as extremely poor households and about 56 percent are considered as poor households. The percentages are not significantly different for the single-family households, where about 46 percent are considered as extremely poor households and the remaining 54 percent are classified as poor households. The chi-square test shows no significant difference in the percentages of extremely poor households between extended and single family-type of households.

Table 6. Household Classification (Extremely Poor or Poor) by Family Type

Type of Family	Extremely/Subsistence Poor		Poor		Total
	n	%	N	%	
Extended	1,197	44.22	1,510	55.78	2,707
Single	4,651	45.74	5,518	54.26	10,169
Overall	5,848	45.42	7,028	54.58	12,876
Pearson Chi-Square Statistic		1.9882	p-value		0.159

The comparison of the sample averages for of the two groups of households, extremely poor and poor, for the covariates (1) number of young dependents, (2) age of the household age and (3) income transfer from abroad (as percent of total income) are shown in Table 7. The results show that the average number of young dependents in extremely poor households is significantly higher at 3.11, compared to the average number of young dependents in poor households at 2.72. The average percentage of income

from abroad (of total income) is significantly lower for the extremely poor households than the poor households (0.78 percent vs. 1.05 percent). Moreover, the average age of the household heads for the extremely poor is significantly lower at 45.32 years when compared to the average age of the household heads in poor households, at 45.91 years.

Table 7. Comparison of the Means for the Quantitative Explanatory Variables

Variable	Extremely/Subsistence Poor		Poor		t-test p-value
	Mean	Std. dev.	Mean	Std. dev.	
Number of Young Dependents	3.106	1.763	2.719	1.708	0.0000**
Age of the Household Head	45.323	12.835	45.914	13.285	0.0104*
Income from Abroad (as % of total income)	0.777	4.788	1.053	5.231	0.0018**

** the two groups are significantly different at the 1 percent level; * significantly different at the 5 percent level

The logistic regression model used to identify the determinants of the probability of an extremely poor household is given in Table 8.[11] The results show that presence of young dependents in the household increases the probability of the household becoming extremely poor by about 4 percentage points, the estimated marginal effect, controlling for other factors. In effect, a household with an average number of young dependents of about 5 will have a probability of about 20 percentage of becoming extremely poor, all things being the same.

The table also shows that education is a very important factor that influences the household of becoming/not becoming extremely poor. In particular, if the household head finished college education, the probability of the household becoming extremely poor decreases by about 17 percentage points (relative to a household head with no education or not having finished elementary school). If the

[11] Only the final model is presented here. The full model (initial) is provided in Appendix 1.

household head has an elementary diploma, the probability of becoming extremely poor decreases by only 5 percentage points, all thing being the same.

Another deterrent of a household becoming extremely poor is the presence of an Overseas Filipino Worker (OFW) member in the household. The result shows that higher percentage of income transfer from abroad lowers the probability that the household will become extremely poor.

Table 8. Logistic Regression Explaining the Determinants of the Extremely Poor Household (FIES)

Explanatory Variables	Coefficient	Robust S.E.	P-value	Marginal Effects
Number of Young Dependents (< 15 years old)	0.1667	0.0109	0.0000	0.0401
Percentage of Income from Abroad	-0.0108	0.0040	0.0070	-0.0026
Elementary Graduate	-0.2284	0.0814	0.0050	-0.0549
High School Undergraduate	-0.3896	0.0886	0.0000	-0.0936
High School Graduate	-0.4140	0.0907	0.0000	-0.0995
College Undergraduate	-0.6696	0.1338	0.0000	-0.1609
College Graduated/Post Graduate	-0.7489	0.2903	0.0100	-0.1799
Region 1	0.9144	0.2098	0.0000	0.2197
Region 2	0.6822	0.2180	0.0020	0.1639
Region 3	0.6294	0.2137	0.0030	0.1512
Region 4A	0.5481	0.2131	0.0100	0.1317
Region 4B	0.7364	0.2063	0.0000	0.1769
Region 5	0.8463	0.2015	0.0000	0.2034
Region 6	0.8784	0.2038	0.0000	0.2111
Region 7	1.1440	0.2035	0.0000	0.2749
Region 8	0.8461	0.2043	0.0000	0.2033
Region 9	1.3381	0.2065	0.0000	0.3215
Region 10	1.1139	0.2055	0.0000	0.2676
Region 11	1.0803	0.2063	0.0000	0.2596
Region 12	0.8889	0.2055	0.0000	0.2136
CAR	1.0230	0.2150	0.0000	0.2458
ARMM	0.5821	0.2068	0.0050	0.1399
CARAGA	1.1300	0.2052	0.0000	0.2715
Constant	-1.3431	0.2097	0.0000	

Chi-Square statistic (Wald) = 374.67; p-value = 0.000; McFadden R-Squared = 0.02; Base category for the education of household head is Not Completed Elementary Diploma; Base category for the Regions is the National Capital Region.

The regional indicator variables are also statistically significant (and positive for all regions). The base region is the National Capital Region (NCR) and the results show that the probability of being extremely poor is higher for households living outside the NCR, controlling for other factors. The regional differences can be explained by the availability of jobs in the regions, the quality of jobs and differences in food prices.[12]

3.3. Empirical Results from the SWS

This section discusses the results of the econometric model explaining the determinants of hunger incidence using the SWS survey on hunger. The data set is a pooled data consisting of four (4) quarters, from 3rd quarter of 2010 to the 2nd quarter of 2011 (coinciding the first year of the administration of President Benigno C. Aquino III). The total sample size is 4800 households or 1200 households per quarter.

The figures in Table 9 show the cross tabulation of the household classification (those experiencing hunger or not) against the number of young dependents.[13] The results show that the percentage of households experiencing hunger increases as the number of young dependents increases. On the one hand, for households with two young dependents the percentage of households experiencing hunger is only 17.21 percent. On the other hand, the percentage of households experiencing hunger is 31.41 percent for households with at least five young dependents. The chi-square statistic (87.71) and the corresponding p-value (almost zero) suggest that the percentage of households experiencing hunger is related to the number of young dependents.

[12] This is mainly from the Vector AutoRegressive (VAR) model of Mapa, Han and Estrada (2011) showing underemployment and food prices are primary determinants of hunger incidence.

[13] For the SWS data, we use a slightly different definition of young dependents, members of the households whose age are below 18 years old (instead of the usual definition of less than 15 years old). SWS survey only classify household member as either below 18 years old or at least 18 years old.

The relationship between the number of young dependents and the percentage of households experiencing hunger is further enhanced from the results in Table 10, where the means of the number of young dependents for the two groups of households (experiencing hunger and not experiencing hunger) are compared. The results show that the average number of young dependents for households experiencing hunger is 2.30 and is significantly higher than the average number of young dependents for households that did not experience hunger, at 1.77. The test is significant at the 1 percent level. The results from the SWS is consistent with the results from the FIES, showing the relationship between the number of young dependents in the household and the probability of the household being extremely poor (or those experiencing hunger).

Table 9. Household Classification by Number of Young Dependents

Number of Young Dependents	Experiencing Hunger		Total
	No	Yes	
None	1,004	166	1,170
Percentage	85.81	14.19	100
One	994	157	1,151
Percentage	86.36	13.64	100
Two	866	180	1,046
Percentage	82.79	17.21	100
Three	503	144	647
Percentage	77.74	22.26	100
Four	348	91	439
Percentage	79.27	20.73	100
Five and above	238	109	347
Percentage	68.59	31.41	100.00
Total	3,953	847	4,800
Percentage	82.35	17.65	100

Chi-square Statistic = 87.71; p – value = 0.000

The other interesting result in Table 10 is the comparison of the average age of the household heads for the two groups. It shows that the average age of the heads of households experiencing hunger is significantly lower compared to the age of the heads of households not experiencing hunger (45.82 years vs. 47.56 years).

Table 10. Comparison of the Means for the Quantitative Explanatory Variables

Variable	Extremely Poor		Non-Poor		t-test p-value
	Mean	Std. Error.	Mean	Std. Error	
Number of Young Dependents (< 18 years old)	2.30	0.06	1.77	0.03	0.0000**
Age of the Household Head	45.82	0.42	47.56	0.20	0.0000**

** the two groups are significantly different at the 1 percent level;

Presence of an OFW member in the household is negatively related to the probability of the household being extremely poor as shown in Table 11. The percentage of household experiencing hunger for those without an OFW member in the household is about 19 percent. This percentage is almost twice when compared to the percentage of households experiencing hunger with OFW member at 10.26 percent.

Table 11. Household Classification by Presence of an OFW in the Household

With OFW Member in the HH	Experiencing Hunger		Total
	No	Yes	
No	3,297	772	4,069
Percentage	81.03	18.97	100
Yes	656	75	731
Percentage	89.74	10.26	100
Total	3,953	847	4,800
Percentage	82.35	17.65	100

Chi-square statistic = 32.37; p-value = 0.0000

Another strong determinant of extreme poverty is the type of job or the quality of job of the household head. The results from Table 12 show that if the household heads are employed in the informal sector, the more likely for the household to experience hunger. The percentage of households experiencing hunger, given that the head of the household is employed in the informal sector is almost 30 percent (the highest in the different categories), this is followed by the households with household head that are self-employed in the informal sector – about 21 percent of the households are experiencing hunger. Households with heads working in the government sector are those with the lowest percentage experiencing hunger at 9.38 percent. For households where the head is self-employed in the formal sector the percentage of those experiencing hunger is only about 11 percent.

Table 12. Household Classification by Type of Job of the Household Head

Type of Job	Experiencing Hunger		Total
	No	Yes	
Private enterprise (registered: formal)	622	152	774
Percentage	80.36	19.64	100
Private enterprise (not registered: informal)	169	71	240
Percentage	70.42	29.58	100
Self-employed (registered: formal)	680	81	761
Percentage	89.36	10.64	100
Self-employed (not registered: informal)	825	223	1,048
Percentage	78.72	21.28	100
Government	309	32	341
Percentage	90.62	9.38	100
Unpaid family worker	16	3	19
Percentage	84.21	15.79	100
Total	2,621	562	3,183
Percentage	82.34	17.66	100

Chi-square Statistic = 78.86; p – value = 0.000

The figures in Table 13 support the notion that having a good education is way out of poverty. The results show that the percentage of households experiencing hunger is about 25 percent for households where the heads do not have education. This value decreases to just 15 percent for households where the heads completed high school education.

Table 13. Household Classification by Highest Educational Attainment of the Household Head

Educational Attainment of HH Head	Experiencing Hunger		Total
	No	Yes	
No formal education	61	20	81
Percentage	75.31	24.69	100
Some elementary	621	242	863
Percentage	71.96	28.04	100
Completed elementary	778	209	987
Percentage	78.82	21.18	100
Some high school	688	217	905
Percentage	76.02	23.98	100
Completed high school	1,218	218	1,436
Percentage	84.82	15.18	100
Some vocational	77	13	90
Percentage	85.56	14.44	100
Completed vocational	211	26	237
Percentage	89.03	10.97	100
Some college	575	97	672
Percentage	85.57	14.43	100
Completed college	649	43	692
Percentage	93.79	6.21	100
Post college	35	1	36
Percentage	97.22	2.78	100

Chi-square Statistic = 182.46; p – value = 0.000

The results from the table indicate that having at least high school education for the household head is needed to reduce the probability of the household experiencing hunger, controlling for other factors. For the households that experienced hunger in the sample, about 63 percent of their heads did not finish high school diploma. This is almost twice the percentage of households who experienced hunger for households where the heads completed at least high school education, at 37 percent.

The figures in Table 14 show the results of the final logistic model identifying the factors explaining the probability of extremely poor among households (or households experiencing hunger). [14] The results show that presence of young dependents in the household increases the probability of the household being extremely poor by about 2 percentage points, controlling for other factors. The relationship between the number of young dependents and the household being extremely poor is consistent with the logistic regression results using data from the Family Income and Expenditures Surveys (FIES).

The results also show that presence of an OFW member in the household decreases the probability of the household being extremely poor by about 6 percentage points, all things being the same. The geographical indicator variables are also statistically significant and negative, indicating lower probability of being extremely poor outside the National Capital Region (NCR), controlling for other factors.

Another interesting result from the logistic regression relates to the type of job of the household head. The model shows that if the household head is employed in the informal sector, the probability of the household becoming extremely poor increases. In particular, if the household head is self-employed in the informal sector, the probability of the household becoming extremely poor increases by about 9 percentage points compared to the household where the head is employed in the government sector (the

[14] The full model is provided in Appendix 2.

base category). The probability increases to about 13 percentage points if the household head is employed in the informal sector. The results suggest that quality of jobs is an important determinant of extreme poverty in the household.

Table 14. Logistic Regression Explaining the Determinants of an Extremely Poor Household

Variable	Coef.	Std. Err.	p-value	Marginal Effect
Presence of OFW member in the Household	-0.420	0.175	0.017	-0.057
Luzon Indicator Variable	-0.389	0.146	0.008	-0.052
Visayas Indicator Variable	-0.487	0.144	0.001	-0.066
Mindanao Indicator Variable	-0.320	0.136	0.019	-0.043
Employment type: Private enterprise (registered: formal)	0.608	0.143	0.000	0.082
Employment type: Private enterprise (not registered: informal)	0.958	0.179	0.000	0.129
Employment type: Self-employed (not registered: informal)	0.637	0.130	0.000	0.086
Education: some elementary	0.872	0.141	0.000	0.118
Education: completed elementary	0.492	0.144	0.001	0.066
Education: some high school	0.559	0.140	0.000	0.075
Education: completed vocational	-0.572	0.317	0.071	-0.077
Education: completed college	-0.932	0.242	0.000	-0.126
Age	-0.009	0.004	0.038	-0.001
Number of young dependents	0.144	0.027	0.000	0.019
Constant	-1.826	0.256	0.000	-

Likelihood Ratio (LR) statistic = 231; p-value = 0.000; Pseudo R-Squared = 0.08; Number of Obs. = 3164; Base category for the education of household head is High School Graduate ; Base category for the Regions is the National Capital Region; Base category for Employment is employed is Government sector in formal sector.

The education of the household head also plays an important role in explaining the probability of the household being extremely poor. For household heads that completed college education, the

probability of the household being extremely poor reduces by about 13 percentage points, all things being the same. If the head of the household completed a vocational course, the probability of the household being extremely poor decreases by about 8 percentage points, controlling for other factors. If the household head did not complete high school education, the probability of being extremely poor increases from about 7 percentage points (for heads who completed elementary) to 12 percentage points (for heads who did not complete elementary education).

IV. CONCLUSIONS

This study looks at the determinants of extreme poverty (or hunger incidence) among households using data sets from two commonly used sources of hunger statistics in the country, the Family Income and Expenditures Survey (FIES) data and the Social Weather Stations (SWS) survey data. The paper used a logistic regression model to capture the factors that influence the probability of the household experiencing extreme poverty.

The results show that factors increasing the probability of extreme poverty in the households are: (a) the high number of young dependents in the household, (b) the education of the household head, particularly if the head did not finish high school education, (c) the quality of job of the household head, if he/she is employed in the informal sector.

The factors that decrease the probability of the household being extremely poor are: (a) presence of an OFW member in the household, (b) the household head completing college education or a vocational education and (c) if the household head is employed in the government sector or self-employed in the formal sector.

This paper shows an empirical evidence linking high fertility rate (presence of a high number of young dependents in the household) on the one hand and extreme poverty on the other. The results of

the study show the importance of addressing the country's bourgeoning population in order to reduce poverty. Policy makers must address the country's rapid population growth head-on though proactive government policies, such as the Reproductive Health (RH) bill. The failure to address the country's high population growth will bring irreversible damage to this generation of Filipinos and the next. The country simply cannot afford to have millions of Filipinos go through the vicious cycle of high fertility and poverty: high fertility rate that prolongs extreme poverty in households and poor households contributing to high fertility rates.

This paper also showed the relationship between the quality jobs of the household head and the probability of the household being extremely poor. The result of this study highlights the importance of addressing the problem of high underemployment rate in the country. We cannot reduce poverty incidence when almost one-in-five worker is underemployed. Government policies should be aimed in creating high quality jobs, particularly in the manufacturing/industry sector. Managing population growth will also minimize the pressure created by the about one million new workers entering the labor force every year.

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Appendix 1. Logistic Regression Model for the Determinants of Extreme Poverty in Households
(Full Model using FIES data)

Explanatory Variables	Coefficient	Robust Std. Err.	P-value	Marginal Effects
Age of the Household Head	0.0019	0.0017	0.2530	0.0005
Type of Family (1 if Extended Family, 0 If Single Family)	-0.0978	0.0477	0.0400	-0.0235
Number of Young Dependents	0.1725	0.0117	0.0000	0.0414
Percentage of Income from Abroad	-0.0109	0.0040	0.0070	-0.0026
Gender of the Household Head (1 if Male, 0 if Female)	-0.0547	0.0632	0.3870	-0.0131
Elementary Undergraduate	-0.1142	0.0782	0.1440	-0.0274
Elementary Graduate	-0.2142	0.0823	0.0090	-0.0514
High School Undergraduate	-0.3709	0.0902	0.0000	-0.0891
High School Graduate	-0.3967	0.0925	0.0000	-0.0953
College Undergraduate	-0.6499	0.1350	0.0000	-0.1561
College Graduated/Post Graduate	-0.7333	0.2902	0.0110	-0.1761
Indicator for Year 2003	0.0333	0.0440	0.4480	0.0080
Indicator for Year 2006	-0.0045	0.0444	0.9200	-0.0011
Region 1	0.9208	0.2100	0.0000	0.2211
Region 2	0.6896	0.2182	0.0020	0.1656
Region 3	0.6363	0.2139	0.0030	0.1528
Region 4A	0.5524	0.2133	0.0100	0.1327
Region 4B	0.7353	0.2065	0.0000	0.1766
Region 5	0.8523	0.2016	0.0000	0.2047
Region 6	0.8832	0.2040	0.0000	0.2121
Region 7	1.1448	0.2036	0.0000	0.2749
Region 8	0.8530	0.2044	0.0000	0.2049
Region 9	1.3495	0.2068	0.0000	0.3241
Region 10	1.1251	0.2057	0.0000	0.2702
Region 11	1.0872	0.2065	0.0000	0.2611
Region 12	0.8966	0.2058	0.0000	0.2153
CAR	1.0294	0.2152	0.0000	0.2472
ARMM	0.5833	0.2072	0.0050	0.1401
CARAGA	1.1390	0.2054	0.0000	0.2735
Constant	-1.4062	0.2415	0.0000	

Chi-Square statistic (Wald) = 374.67; p-value = 0.000; McFadden R-Squared = 0.02

Appendix 2. Logistic Regression Model for the Determinants of Extreme Poverty in Households (Full Model using SWS data)

Variable	Initial Model			
	Coef.	Std. Err.	z-value	p-value
Sex of Household Head is Female	0.176	0.113	1.560	0.118
Presence of OFW currently working abroad	-0.439	0.178	-2.470	0.014
Luzon Area	-0.356	0.146	-2.430	0.015
Visayas Area	-0.457	0.144	-3.170	0.002
Mindanao Area	-0.279	0.138	-2.010	0.044
Quarter 2 (time indicator)	0.203	0.136	1.490	0.135
Quarter 3 (time indicator)	0.103	0.140	0.740	0.461
Quarter 4 (time indicator)	0.161	0.139	1.160	0.246
Employment type: Private enterprise (registered: formal)	0.448	0.218	2.060	0.040
Employment type: Private enterprise (not registered: informal)	0.762	0.247	3.080	0.002
Employment type: Self-employed (registered: formal)	-0.240	0.230	-1.040	0.296
Employment type: Self-employed (not registered: informal)	0.430	0.212	2.030	0.043
Education: some elementary	0.640	0.343	1.870	0.062
Education: completed elementary	0.217	0.345	0.630	0.529
Education: some high school	0.283	0.344	0.820	0.411
Education: completed high school	-0.235	0.343	-0.680	0.494
Education: some vocational	-0.303	0.512	-0.590	0.555
Education: completed vocational	-0.843	0.448	-1.880	0.060
Education: some college	-0.443	0.369	-1.200	0.229
Education: completed college	-1.273	0.399	-3.190	0.001
Age	-0.011	0.004	-2.460	0.014
Number of young dependents	0.144	0.027	5.250	0.000
Constant	-1.483	0.454	-3.260	0.001

Chi-Square statistic (Wald) = 236.97; p-value = 0.000; McFadden R-Squared = 0.08