ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Bayudan-Dacuycuy, Connie; Baje, Lora Kryz

Working Paper

Chronic food poverty in the Philippines

PIDS Discussion Paper Series, No. 2017-25

Provided in Cooperation with:
Philippine Institute for Development Studies (PIDS), Philippines

Suggested Citation: Bayudan-Dacuycuy, Connie; Baje, Lora Kryz (2017) : Chronic food poverty in the Philippines, PIDS Discussion Paper Series, No. 2017-25, Philippine Institute for Development Studies (PIDS), Quezon City

This Version is available at:
https://hdl.handle.net/10419/173602

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Chronic Food Poverty in the Philippines

Connie Bayudan-Dacuycuy and Lora Kryz Baje

DISCUSSION PAPER SERIES NO. 2017-25

The *PIDS Discussion Paper Series* constitutes studies that are preliminary and subject to further revisions. They are being circulated in a limited number of copies only for purposes of soliciting comments and suggestions for further refinements. The studies under the *Series* are unedited and unreviewed.

The views and opinions expressed are those of the author(s) and do not necessarily reflect those of the Institute.

Not for quotation without permission from the author(s) and the Institute.

August 2017

For comments, suggestions or further inquiries please contact:
The **Research Information Department,** Philippine Institute for Development Studies
18th Floor, Three Cyberpod Centris – North Tower, EDSA corner Quezon Avenue, 1100 Quezon City, Philippines
Tel Nos: (63-2) 3721291 and 3721292; E-mail: publications@mail.pids.gov.ph
Or visit our website at https://www.pids.gov.ph

Chronic food poverty in the Philippines

Connie Bayudan-Dacuycuy and Lora Kryz Baje[1]

There are few studies in the Philippines that analyze poverty dynamics and studies that analyze the effects of weather variability on food poverty dynamics are even fewer. Given that there are some sectors that are more adversely affected by the changing weather patterns, a study analyzing the effects of weather variability on poverty is essential. Using a simple spells approach to understand the food poverty dynamics in the Philippines, this paper finds that deviation of rainfall from its normal values and other key variables such as education, employment, assets, and armed conflict affect chronic food poverty. A discussion of some inputs to policies is provided.

Keywords: chronic food poverty, rainfall, spells approach, Philippines

I. Introduction

The Philippines has a long history of battle against poverty through the government's various anti-poverty and social protection programs. Despite efforts of various leaders, from President Estrada to the current administration, the country has missed its Millennium Development Goal (MDG) target of halving its 1990 poverty level by 2015. As of May 2016, the proportion of population below national poverty threshold is at 25.2%, 8 percentage points higher than the MDG target.

Poverty studies in the Philippines abound but most of these use cross-section data (see for example, Balisacan, 2003a, 2003b; Balisacan and Pernia, 2002; Intal, 1994). As such, they only identify the poor at a given point in time and provide inadequate insights on the dynamics of poverty. Some of the studies that have analyzed poverty dynamics in the country include Reyes et al (2010), Bayudan-Dacuycuy and Lim (2013, 2014), and Mina and Imai (2016).

Our paper aims to contribute to poverty studies in the Philippines by analyzing the effects of geographic attributes like weather variability on food poverty. This paper is relevant in several ways. *One*, World Development Indicators data show that around 29% (of total employment) in the county is still employed in agriculture, a sector that is most vulnerable to the vagaries of weather. People in rural areas can easily slip in and out of poverty since their livelihood depends on stable environments such as stable temperature and steady supply of water.

Two, weather is an integral part of our life and weather shocks can have severe implications on income (see for example, Schlenker, Hanemann and Fisher, 2006; Deschenes and Greenstone, 2007). It can also have an impact on household consumption. For example,

[1] PIDS senior research fellow and research specialist II, respectively.

Bayudan-Dacuycuy (2017) specifically relates energy use and heat index variability and finds that heat index fluctuation has the highest effects on the electricity consumption of balanced and female-majority households that are female headed and in rural areas. Weather variability can also be considered as a shock. As such this paper is closely related with Bayudan-Dacuycuy and Lim (2014) who use the simple spells approach to analyze the effects of shocks on chronic and transient poverty in the Philippines.

Three, climate change and its adverse effects have received significant attention from local and international communities. This is in the light of evidence that points to altered patterns of weather parameters such as wild swings in rain and snow, melting glaciers, and rising temperatures resulting in drying out of some areas and in increased precipitation in others. There are several studies that analyze the effects of weather events on agricultural profit or output (Schlenker, Hanemann and Fisher, 2006; Deschenes and Greenstone, 2007), migration (Yang and Choi, 2007), growth (Dell, Jones and Olken, 2009); Skidmore and Toya, 2002; Noy and Vu, 2010) and health (Murray et al, 2000; Thai and Falaris, 2014). None to our knowledge has analyzed the effects of weather events on food poverty and this is a gap that the paper attempts to address.

Using a simple spells approach to analyze the poverty dynamics in the Philippines, this paper finds that rural areas have substantially higher percentage of always food poor households than urban areas. National Capital Region (NCR) has the highest percentage of never food poor households. Most Luzon and Visayas regions have very high percentage of never food poor households. Most regions in Mindanao have high food poverty, the highest of which is the Autonomous Region of Muslim Mindanao. This paper analyzes the effects of key variables on food poverty using probit and multinomial logit regressions. Results show that education, employment, assets, conflict, and rainfall deviation affect food poverty. A discussion of some inputs to policies is provided.

This paper is organized as follows: section II discusses data sources and definition of key variables, section III discusses food poverty in the Philippines, section IV outlines the empirical strategy, section V discusses the results, and section VI summarizes and concludes.

II. Data and sources

Annual Poverty Indicator Survey (APIS) and Family Income and Expenditure Survey (FIES)

The main datasets to be used are the Annual Poverty Indicator Survey (APIS) in 2004, 2007, and 2008 and the Family Income and Expenditure Survey (FIES) in 2003, 2006, and 2009 collected by the Philippine Statistics Authority (PSA). APIS and FIES can be merged to form a panel dataset since there is a master sample based on the results of the Census of Population and Housing and a portion of the master sample is retained that the PSA re-surveys for some period. These samples are replaced by another set of samples to be tracked again after some period. PSA has four replicates and each replicate possesses the properties of the master sample.

For the purpose of this research, PSA has provided us the second rotation of replicate four of the datasets. Merging of these datasets is done by creating a household identification number through the concatenation of geographical variables such as region, province,

municipality, *barangay*[2], enumeration area, sample housing unit serial number and household control number. There are 6517 samples that are common to the five datasets.

An issue that needs to be addressed in using this panel data is that households are the units of observation. Therefore, it is possible that household members in one year are not the same household members in the following year. This is the case when families migrate or when the household surveyed is composed of non-related members (e.g. the house is for rent). To ensure that the samples are the same households tracked down from 2003 to 2009, samples are further limited to households that satisfy two criteria: the sex of the household head should be the same throughout the period and the age of the household head should be consistent as well. For example, the age difference of the household head in 2003 FIES and 2004 APIS should be either zero or one while the age difference of the household head between 2004 APIS and 2006 FIES should be either two or three. There are 1954 samples left when these additional restrictions have been imposed.

APIS and FIES follow a multi-stage sampling design to make the sample representative of the population. However, the panel data constructed for the current research do not make use of the sampling weights since the weights differ across the survey data. This is a limitation that we acknowledge at the outset. However, this research is a step towards a deeper understanding of poverty in the Philippines while PSA still has to collect genuine longitudinal survey data.

Poverty Thresholds for non-FIES years

The PSA releases official poverty thresholds for the FIES years, which is made up of the food and the non-food thresholds. Since no thresholds have been released for 2004, 2007, and 2008, the poverty thresholds for these years are therefore projected using the poverty threshold in 2003 and the provincial consumer price index in that year. Similar projection is done for the food thresholds. All the relevant APIS incomes and expenditures are multiplied by two since the reference period of APIS is past six months while the reference period of FIES is one year.

Rainfall data

Rainfall data (in millimeters) are collected by the Philippine Atmospheric and Geophysical Astronomical Services Administration (PAGASA) weather stations spread across the Philippines. The data have been measured, compiled, and disseminated through a public use file containing 50 PAGASA weather stations. To map the weather information with the APIS-FIES dataset, we use the province of residence as the merging variable. There are 83 provinces in the APIS-FIES dataset.

The PAGASA datasets have the following features: First, there are several provinces that host multiple weather stations. Second, there are several provinces that have no weather station. However, these provinces are possible to be assigned weather stations based on the relative distance between the province and the location of the weather station. In merging the PAGASA dataset with the APIS-FIES dataset, we address the first feature by selecting the weather station that is located in or in close proximity to the provincial capital. As an illustration, Palawan

[2] This is the basic political unit in the Philippines, equivalent to a village.

Province, located in Luzon's Region 4A, has three stations, namely, Coron, Cuyo and Puerto Princesa. In this case, Puerto Princesa is chosen.

Second, in view of the importance of accounting for similar weather patterns and enhancing data variability, we do not automatically remove households in provinces without weather stations. For example, Mountain Province and the provinces of La Union and Ifugao are assigned the weather station in Baguio City, Benguet while Tarlac is assigned the weather station in Cabanatuan, Nueva Ecija. Assigning adjacent weather stations to provinces without one maximizes the number of households included in the estimation sample. Without this assignment, 28 provinces will be dropped out of the sample. This translates to a reduction of 658 households. Table 1A provides the mapping of the respective weather stations to provinces and cities. The first column lists the provinces in APIS-FIES while the second column lists the PAGASA weather station assigned to it. For provinces without weather stations, the air/straight distance between their capital and the nearby weather stations is computed using the following website: *http://distancecalculator.globefeed.com/Philippines_Distance_Calculator.asp*. The fourth column shows the distance corresponding to the third column. Out of the 83 provinces, there are 24 that have weather stations, 57 that are assigned nearby weather stations, and 2 that could not be reasonably mapped. Guimaras and Batanes are two provinces where a match could not be found in the PAGASA weather data.

Increased precipitation results to floods that aid the proliferation of vector-borne or water-borne diseases while extreme hot or cold temperature increases mortality. Both affects food security by altering the production patterns involving agriculture and environment, fisheries, and resources sectors. To come up with proxies for weather variabilities/fluctuations, rainfall data are compared to their normal values, which are defined as the 30-year average and are compiled by PAGASA for the period 1971-2000. Rainfall is highly localized and matching the rainfall data with the provinces can introduce substantial measurement error. To mitigate measurement error, we use three samples: households in provinces that are at most 40, 20, and 10 kilometers away from the assigned weather station.

III. Food poverty in the Philippines

Dynamics of food poverty between 2003 and 2009 is analyzed using the APIS-FIES data and the simple spells approach. This approach compares the per capita food expenditure against the food threshold. A household in a given year is assigned 1 if the per capita food expenditure is lower than the food threshold and 0 otherwise. The number of times a household fall below the threshold is counted. A count of 0 means that the household is never food poor and a count of 6 means that the household is always food poor.

From figure 1, a large percentage of the sample is always food poor at around 40% and the rest are either never poor or are moving in and out of poverty. In rural areas, 50% of the households are always food poor and around 2% are never food poor. While the rest of rural households are moving in and out of food poverty, a larger percentage experiences high frequency of food poverty. The percentage of never food poor and always food poor in urban households are relatively similar at 20% and 22%, respectively. The rest of urban households are

moving in and out of food poverty and those that are once food poor have the highest percentage at around 15% and the five times food poor at around 10%.

Food poverty among regions in Luzon is presented in figure 2. NCR has the highest percentage of never food poor households at 35% followed by Calabarzon[3] at around 20%, Cagayan Valley and Central Luzon at around 15%, Ilocos region at around 12%, and Cordillera Administrative Region[4] at around 2%. The percentage of always food poor households is highest in MIMAROPA[5] at 60%, followed by Bicol region[6] at 48%, and Ilocos Region[7] at 38%. There are around 28% that are always food poor households in Cagayan Valley and Calabarzon. There are around 25% that are always food poor households in Cordillera Administrative Region and around 45% that are four and five times food poor.

Food poverty among regions in Visayas is presented in figure 3. There are around 11% that are never food poor households in Western[8] and Eastern[9] Visayas and around 8% in Central[10] Visayas. The percentage of always poor households in Central Visayas is around 48% while Western and Eastern Visayas have around 35%.

From figure 4, most regions in Mindanao have high food poverty, the highest of which is the Autonomous Region of Muslim Mindanao (ARMM)[11] at 70%. The percentage of food poverty in Davao[12] and CARAGA[13] is around 60% while in Zamboanga Peninsula and Northern Mindanao is around 51%.

To summarize, NCR has the highest percentage of never food poor households. Calabarzon, Central Luzon, and Cagayan Valley, regions that are close to NCR, have higher percentages of never food poor households. In Luzon, always food poor households are highest in MIMAROPA and Bicol, regions that are beleaguered by the presence of the New People's Army. Mindanao regions have higher percentage of always food poor households than Luzon and Visayas regions. Among Mindanao regions, ARMM, where armed conflict often occurs, has the highest percentage of always food poor households. Some provinces, like Camarines Norte, Camarines Sur, Sorsogon, Masbate, and Albay in Bicol Region and Western and Northern Samar in Eastern Visayas, are prone to the occurrence of typhoons and are at risk to rainfall change as well. The differences in the food poverty statistics across regions are likely results not only of armed conflict and natural disasters but disparities in the quality of local governance and infrastructure as well.

[3] Includes the provinces of Cavite, Laguna, Batangas, Rizal, and Quezon,
[4] Includes the provinces of Abra, Apayao, Benguet, Ifugao, Kalinga, Mountain Province
[5] Includes the provinces of Mindoro,Marinduque, Romblon and Palawan.
[6]Includes the provinces of Albay, Camarines Norte, Camarines Sur, Catanduanes, Masbate, Sorsogon
[7] Includes the provinces of Ilocos Norte, Ilocos Sur, La Union, Pangasinan
[8] Includes the provinces of Aklan, Antique, Capiz, Guimaras, Iloilo
[9] Includes the provinces of Biliran, Eastern Samar, Leyte, Northern Samar, Samar, Southern Leyte
[10] Includes the provinces of Bohol, Cebu, Negros Oriental, Siquijor
[11] Includes the provinces of Basilan, Lanao del Sur, Maguindanao, Sulu, Tawi-Tawi
[12] Includes the provinces of Compostela Valley, Davao del Norte, Davao del Sur, Davao Occidental, Davao Oriental
[13] Includes the provinces of Agusan del Norte, Agusan del Sur, Dinagat Islands, Surigao del Norte, Surigao del Sur

IV. Empirical strategy

We assume that $p(y_i = n \mid x, z) = f(x, z; e)$ where y is an indicator of poverty status. Two y indicators are constructed: y_1 is equal to 1 if the household is food poor and 0 if not food poor and y_2 takes the value of 0 up to 6 to represent the number of times the household has become food poor. Probit regression is used for y_1 and multinomial logit regression is used for y_2. The variable x is a vector of head's attributes such as age, education, and marital status, demographic composition, labor market participation, and membership in NGO and/or cooperatives. The variable z refers to geographical characteristics including rainfall deviation, a dummy for areas with armed conflict, and a dummy for urban areas. The variable e is assumed to be an independently and identically distributed error term.

To control for the heterogeneity in the capacity to pay/purchase, a score to proxy for asset ownership is generated by the principal component analysis (PCA). The PCA is a technique to reduce the dimension of the data by creating uncorrelated indices or components, where each component is a linear weighted combination of the initial variables. The variance of each of the component is generated such that the first component contains the largest variation in the original data; the second explains additional but less variation and so on[14]. An application of PCA is on household assets to create an indicator for socioeconomic status in the absence of income and expenditure data (see for example, Filmer and Pritchett, 2001). Positive scores generated by the PCA are associated with higher socioeconomic status (Vyas and Kumaranayake, 2006).

While FIES has detailed data on asset ownership, the assets included in the PCA are those that are collected in both APIS and FIES. These include radio, television, component, refrigeration, washing machine, air conditioning unit car, landline, personal computer, and gas range. The overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is around 0.86 in each year, which indicates that these assets contain enough similar information to warrant the factor analysis[15]. Based on the score generated by the PCA, a dummy is created equal to 1 if the score is positive in all years and 0 otherwise. Following Vyas and Kumaranayake (2006), this dummy variable proxies for high socioeconomic status.

Areas with conflict include Western Mindanao, Central Mindanao, Autonomous Region in Muslim Mindanao, Davao del Sur, Sarangani, South Cotabato, and Sultan Kudarat in Southern Mindanao, Quezon, Rizal, Mindoro, Bicol, Masbate, and Sorsogon. MIMAROPA and provinces in Bicol region are plagued by the unrest sown by the New People's Army while Mindanao areas are torn by the resistance to central control and the resentment at the increasing number of Christian settlers (Schiavo-Campo and Judd, 2005).

[14] For technical details, see Filmer and Pritchett (2001).

[15] The KMO statistic is a test if the data are suited for factor analysis by measuring the sampling adequacy for 1) each variable and 2) for the complete model (Kaiser, 1970). This statistic is a summary of how small the partial correlations are relative to the original correlations. If the variables share common factor/s, then the partial correlations should be small and the KMO should be close to 1.0 (http://www-01.ibm.com/support/docview.wss?uid=swg21479963).

The labor market participation of the household head and that of the spouse are also included as explanatory variables. A dummy equal to 1 is created if the household head/spouse is employed in all the survey years and 0 otherwise. For dependent variable y_1, explanatory variables are yearly values while for y_2 and y_3, explanatory variables like family size and demographic composition are averages from 2003 to 2009.

Attrition bias

A common problem to the use of any longitudinal data is that the sample collected becomes smaller in succeeding survey years. This problem is serious when non-participants have systematic characteristics that are related to poverty. If households with high opportunity costs are likely to drop out of the succeeding surveys and these households happen to be nonpoor, then estimates based on the remaining samples are likely to be bias upward.

Attrition bias, a case of selection bias, arises from the non-participation of respondents in succeeding survey years. It can affect the external and internal validities of multiwave studies (Miller and Hollist, 2007). External validity means that the characteristics of the subsequent samples are generalizable to the initial samples. Internal validity means that the correlations among the variables are similar across survey years. While the PSA has ensured that each replicate of the APIS and FIES possesses the properties of the master sample, we have imposed additional restrictions based on the head's age and sex to ensure that the same families are tracked down throughout the survey years. These restrictions could be a possible window for attrition bias.

Following Miller and Wright (1995) to test for attrition bias, we run a logit regression on 'stayers'[16] using the independent variables extracted from 2003. 'Stayers' is equal to 1 if the sample participated in the succeeding wave and equal to 0 otherwise. Independent variables include the characteristics of the household head, household assets, demographic composition, and geographical location dummies. These should not be statistically significant to rule out attrition bias. Result indicates that the characteristics of the household head, the asset score, urban dummy, and some of the regional dummies are statistically significant determinants of participation in the entire survey wave[17]. Box M-test is used to check for internal validity and tests for the equality of the two covariance matrices for the samples observed only in the first period and for the samples observed in all periods using the Box M-test. The null hypothesis using this test is that the two covariance matrices are equal indicating no threats to internal validity. The p-value computed using the Box M-test is 0.00, which indicates the rejection of the null hypothesis.

Following Heckman (1979) to correct for attrition bias, the inverse Mills' Ratio or $IMR = \frac{\phi(\beta x)}{\Phi(\beta x)}$ [18], is computed from the probit regression of the 'stayers' against the characteristics of the household head, asset index, households' demographic composition, and

[16] Equal to1 if participated in the succeeding wave and equal to 0 if not.

[17] Results are available from the author upon request.

[18] $\phi(\beta x)$ is the probability density function and $\Phi(\beta x)$ is the cumulative density function.

geographical location dummies. IMR is included as one of the explanatory variables in the estimation done below.

V. Discussion of results

On the poor versus the non-poor

From table 1, households headed by persons with at least a college degree are less likely to be food poor relative to households headed by persons with less than a college degree. Households with members who belong to NGOs or cooperatives are also less likely to be food poor. Family size increases the probability of households being food poor and this is noted when there are many household members aged 7 and below. Households in urban areas and households with many older members are less likely to be food poor. On the other hand, households in areas with armed conflict and those that experience deviation of rainfall from its normal value are more likely to be food poor.

On the frequency of poverty

From table 2, households headed by at least a college graduate are more likely to be never food poor and are less likely to be always food poor. These households are also more likely to be three times food poor although the probability is lower than the probability of being never food poor. Households with big family size are less likely to be never food poor and are more likely to be always food poor. In terms of age composition, households with many young members are less likely to be never food poor and are more likely to be moving in and out food poverty. These households are also more likely to be always food poor although its probability is lower than the probability of becoming once, twice, thrice, or four times food poor. In addition, households headed by persons who work and those with durable assets are more likely to be never or once food poor.

In terms of geographical attributes, households in areas with armed conflict are less likely to be once or twice food poor and are more likely to be always food poor. Urban households are more likely to be never food poor. These households are also more likely to be once or twice food poor and are less likely to be always food poor. While the effect of rainfall deviation on the probability of households being never food poor or five times food poor is positive, its effect on the latter is higher. Relative to households in the rural areas, households that experience rainfall deviation in the urban areas are less likely to be never food poor and are more likely to be always food poor.

On the predicted chronic food poverty based on some scenarios

Chronic food poverty is also predicted based on the multinomial logit regression estimates. Based on the counting of food poor using the data, chronic food poor is defined as households that became food poor 6 times from 2003 to 2009.

To assess the contribution of different variables, chronic food poverty is predicted for a benchmark household[19] with the following characteristics: household headed by a person who is

[19] Evaluating the marginal effects using benchmark characteristics, or marginal effects calculated at representative values (MER), is different from the marginal effects at the means (MEM) and the average marginal effects (AME) in that the latter two rely on averages.

married, is not always employed, has less than college degree, and has a spouse who is not always employed. The benchmark household is also assumed to have two members who are less than 1-year-old, one member who is between 1 to 6 year-old, with asset scores less than zero at times, and located in an area with armed conflict. The benchmark household is also assumed to experience zero rainfall deviation. To assess the contribution of different variables, chronic food poverty is predicted by changing one attribute in the benchmark characteristics each time. Comparisons of predicted chronic food poverty are presented in figure 5. Prediction is done using households in provinces that are at most 20 kilometers away from the weather station[20].

Chronic food poverty using benchmark characteristics in rural areas is around 46%, 20 percentage points higher than in urban areas. Compared to the probability using benchmark attributes, chronic food poverty in urban areas is around 8 percentage points lower for households in non-conflict areas and 11 percentage points lower for households headed by persons with at least a college degree. Chronic food poverty is around two times lower for households that always have positive asset score while it is around 4 percentage points lower when head and head's spouse are always employed. When rainfall deviation is 150 millimeters[21] higher than the benchmark, chronic food poverty is around 6 percentage points higher.

In rural areas, chronic food poverty is around 9 percentage points lower for households in non-conflict areas and 12 percentage points lower for households headed by persons with at least a college degree. Chronic food poverty is around 8 percentage points lower for households that always have positive asset score while it is around 3 percentage points lower when head and head's spouse are always employed. When rainfall deviation is 150 millimeters higher than the benchmark, chronic food poverty is around 8 percentage points higher.

VI. Summary and conclusions

Using a simple spells approach, this paper finds that rural areas have substantially higher percentage of always food poor households than urban areas. NCR has the highest percentage of never food poor households. Most Luzon and Visayas regions have very high percentage of never food poor households. Most regions in Mindanao have high food poverty, the highest of which is the ARMM. This paper analyzes the effects of key variables on chronic and food poverty using probit and multinomial logit regressions. Results show that the probability of chronic food poverty is affected by education, employment, assets, conflict, and rainfall deviation.

While the House of Representatives and the Senate have ratified the Bill on free tuition fee in SUCs, there is still much to be hurdled. Tuition fee is just a portion of education-related expenditures. Assistance to address daily expenditures like meals and transportation should also be strengthened as these expenses are equally important to ensure that students from poor households will finish college and that public investments in their education are not wasted.

[20] Similar exercise is done for samples that are at most 40 and 10 kilometers away from the weather station and trends are similar.
[21] This is the maximum value of the rainfall deviation in the data. Other values of rainfall deviation are also used and the trends are similar.

In addition, the government should carefully consider the institutionalization of the 4Ps program. The Program has some weaknesses on monitoring health and 4Ps can do better by imposing time-bound conditions on education. Nevertheless, 4Ps has not only assisted the poor in sending their children to school but has enhanced the community and *Bayanihan* spirit as well. It has empowered members of poor families through the Family Development Sessions and has educated beneficiaries on bio-intensive gardening, communal gardening, and reforestation, among others.

The possible role of assets in consumption-smoothing should be emphasized as well. Accumulation of assets, not only financial, but social and human capital, is assured when livelihoods are stable. Along this line, the government should explore the role of Social Enterprises (SE), which use local knowledge and resources to address not only financial but social and environmental issues within the community. The Department of Social Work and Development's Sustainable Livelihood Program (SLP) through its Employment Facilitation track can be linked with SE by giving SEs incentives to put up enterprises for communities where SLP is in place. Ballesteros and Llanto (2017) identify the following government support for SEs: 1) legal/regulatory framework to facilitate experimentation and innovation, 2) incentives for mixed financing, and 3) improving the suitability of the environment for grants, international aid, and venture capitalists.

Armed conflict contributes to the destruction of different assets. It damages human assets by disrupting schooling and worker's mobility, displaces people so it damages social assets such as informal network within the community, and disrupts the delivery of social protection programs to the affected communities. Finding solutions to armed conflict is not easy but a good first step is to engage stakeholders not only to understand the needs of the community and to come up with feasible initiatives but to develop strong ownership for these initiatives. The plan of the former secretary of the Department of Environment and Natural Resources to involve the New People's Army into its ecotown projects is a step towards achieving multiple objectives: sustainable use of the environment for livelihood, end armed conflict, and eventually address chronic poverty.

Weather-related events also affect chronic food poverty. Based on PAGASA's projections using mid-range emissions scenario, weather events like increasing temperature and precipitation are likely results of climatic shift. People in rural areas can easily slip in and out of poverty since their livelihood depends on stable environments such as stable temperature and steady supply of water. To address the adverse effect of sustained weather fluctuations, LGUs should spearhead the development of a climate-smart agriculture that fits the needs of the community. Working with the community to harness local skills and knowledge in the development of good agricultural and livelihood practices instill strong ownership among community members and adaptation is likely to be successful.

The Philippine Development Plan 2017-2022 acknowledges that especially in LGUs, funding for climate change adaptation competes with other development priorities. However, there are some adaptation funds that remain untapped. One, the People's Survival Fund (PSF) was created through Republic Act 10174 signed on August 16, 2012 as an annual fund for LGUs

to implement climate change adaptation programs/projects[22]. PSF is appropriated PhP1 Billion per year. While there are a number of proposals submitted to CCC for PSF grant, only two projects are approved (one in Surigao del Sur and one in Surigao del Norte) with total requested PSF funding of around PhP120 Million. The PSF secretariat has indicated that most of the proposals submitted to the Climate Change Commission (CCC) lack the climate change adaptation component and are returned to proponents for revision. CCC can enhance their technical assistance by providing LGUs an annual technical workshop on crafting proposals with strong climate change adaptation initiatives. CCC should also improve its information dissemination campaign not only to inform the public what CCC does but to increase awareness on what climate change adaptation is and how to access the various services CCC provides.

Other than the PSF, another financing alternative is the Adaptation fund (AF), which is established under the Kyoto Protocol of the UN Framework Convention on Climate Change. AF is a direct access to international financing mechanism that enables country institutions to directly participate in the design, implementation, and monitoring of the project. To avail of the fund, the country must designate a National Implementing Entity (NIE), which once accredited will be fully responsible for program/project implementation and management. CCC can be the best national agency that can spearhead NIE and should start looking into how the country can tap this additional adaptation funding source. Proposals need to be evaluated for AF grant. This, again, highlights the need for strong CCC-led capacity-building in LGUs so that LGUs can come up with community-driven and well-defined adaptation projects and programs.

The government should also explore Adaptive Social Protection initiatives. These initiatives support pro-poor climate change adaptation and disaster risk reduction by strengthening the resilience of vulnerable populations to shocks (Davies et al., 2009). One ASP initiative that can be explored is to include environment protection as a condition to 4Ps. 4Ps strengthens human capital and self-sufficiency but does not explicitly address risks associated with climate change and with resulting shifts in weather patterns. Without adaptation, those who are at risk of being food poor are most vulnerable to adverse shifts in weather patterns. The Program has to evolve with the needs resulting from climate change and changing weather patterns. ASP can take the form of including environmental protection such as planting X number of trees each year, beach reforestation, or the management of household solid wastes, as conditions to 4Ps.

Linking ecotowns to 4Ps can be explored as well. The Local Climate Change Action Plan is packaged using the concept of ecologically stable and economically resilient towns or ecotowns (Climate Change Commission, 2012). Assistance to the poor in these ecotowns is

[22] The AF has several disadvantages. One, it is a direct access to international financing mechanism that enables country institutions to directly participate in the design, implementation, and monitoring of the project. Two, based on data from ICSC and Oxfam (2010), 86% of funds coming from bilateral donors to finance adaptation projects (1992-2018) are loans and 14% are grants. 61% of funds coming from bilateral donors to finance mitigation projects (1992-2018) are loans and 39% grants. Assistance through loans goes against the principle of common but differentiated responsibilities, which acknowledges that countries have different responsibilities and capabilities in addressing climate change. Developed countries contribute to high greenhouse gas emissions and are more capable of climate change mitigation and adaptation. If the assistance comes in the form of loans, ICSC and Oxfam (2010) argue that this "reverses the burden-sharing role and imposes new debts to those severely affected by global climate change despite having contributed less to it."

granted on the condition of protecting ecosystems Linking ecotowns to 4Ps can help rationalize funds and those that are freed up can finance other ASP initiatives.

References

Balisacan, A. (2003a). Poverty and inequality in: A. Balisacan and H. Hill (eds) *The Philippine Economy: Development, Policies, and Challenges*, Oxford University Press, New York.

Balisacan, A. (2003b). Poverty comparison in the Philippines: Is what we know about the poor robust? In: C. Edmonds (ed) *Reducing Poverty in Asia: Emerging Issues in Growth, Targeting, and Measurement*, Edward Elgar, Cheltenham, UK.

Balisacan, A. and Pernia, E. (2002). The rural road to poverty reduction: Some lessons from the Philippine experience. *Journal of Asian and African Studies*, 37, 147-167.

Ballesteros, M. and Llanto, G. (2017). Strengthening social enterprises competitiveness for inclusive growth: Philippines. PIDS DP 2017-04. Philippine Institute for Development Studies, Quezon City, Philippines.

Bayudan-Dacuycuy, C. (2017). Energy consumption, weather variability and gender in the Philippines: A discrete/continuous approach. PIDS DP 2017-06. Philippine Institute for Development Studies, Quezon City, Philippines.

Bayudan-Dacuycuy, C. and Lim, J. (2014). Chronic and transient poverty and vulnerability to poverty in the Philippines: Evidence using a simple spells approach. *Social Indicators Research*, 118, 389–413.

Climate Change Commission (2012). National Climate Change Action Plan, 2011-2028. Quezon City.

Davies, M., Guenther, B., Leavy, J., Mitchell, T. and Tanner, T. (2009). Climate change adaptation, disaster risk reduction and social protection: Complementary roles in agriculture and rural growth? IDS Working Paper No. 320, The Institute of Development Studies, University of Sussex, Brighton, UK.

Dell, M., Jones, B. and Olken, B. (2009). Temperature and income: Reconciling new cross-sectional and panel estimates. *The American Economic Review*, Papers and Proceedings of the One Hundred Twenty-First Meeting of the American Economic Association, 99(2), 198-204.

Deschenes, O. and Greenstone, M. (2007). The economic impacts of climate change: Evidence from agricultural output and random fluctuations in weather. *The American Economic Review*, 97(1), 354-385.

Filmer, D. and Pritchett, L. (2001). Estimating wealth effect without expenditure data – or tears: An application to educational enrollments in states of India. *Demography*, 38, 115–132.

Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica*, 47, 153–161.

Intal, P. (1994). The state of poverty in the Philippines: An overview, in: P. S. Intal, Jr. and M. C. S. Bantilan (eds) *Understanding Poverty and Inequity in the Philippines*, Pasig, National Economic and Development Authority.

Institute for Climate and Sustainable Cities and Oxfam (2010). Financing adaptation or funding chaos? Adaptation, finance and Philippine Climate Policy. http://www.ejeepney.org.

Miller, R. and Hollist, C. (2007). Attrition Bias, in N. Salkind (ed) *Encyclopedia of measurement and statistics, 3 volumes,* Thousand Oaks: Sage Reference, 1, pp. 57-60.

Miller, R. and Wright, W. (1995). Detecting and correcting attrition bias in longitudinal family research. *Journal of Marriage and Family*, 57, 921-929.

Mina, C. and Imai, K. (2016). Estimation of Vulnerability to Poverty Using a Multilevel Longitudinal Model: Evidence from the Philippines. *Journal of Development Studies*, http://dx.doi.org/10.1080/00220388.2016.1265942.

Murray, L., O'Reilly, D., Betts, N., Patterson, C. Smith, G. and Evans, A. (2000). Season and outdoor ambient temperature: Effects on birth weight. *Obstetrics and Gynecology*, 96(5): 689-695.

Noy, I. and Vu. T (2010). The economics of natural disasters in a developing country: The case of Vietnam. *Journal of Asian Economics*, 21, 345-354.

Reyes, C., Tabuga, A., Mina, C., Asis, R. and Datu, M. (2010). Chronic and transient poverty. PIDS Discussion Paper Series Number 2010-30.

Schiavo-Campo, S and Judd, M. (2005). The Mindanao conflict in the Philippines: Roots, costs and potential peace dividend. World Bank Conflict Prevention and Reconstruction, Social Development Papers, Paper No. 24, Washington: World Bank.

Schlenker, W., Hanemann, W. and Fisher, A. (2005). Will US agriculture really benefit from global warming? Accounting for irrigation in the hedonic approach. *The American Economic Review*. Vol. 95. No. 1. 395-406.

Skidmore, M. and Toya, H. (2002). Do natural disasters promote long-run growth? *Economic Inquiry*, 40 (4), 664-687.

Thai, T. and Falaris, E. (2014). Child schooling, child health, and rainfall shocks: Evidence from rural Vietnam. *Journal of Development Studies*, 50, 1025-1037.

Vyas, S. and Kumaranayake, L. (2006). Constructing socio-economic status indices: How to use principal components analysis. *Health Policy and Planning*, 21. 459-468.

Yang, D. and Choi, H. (2007). Are remittances insurance? Evidence from rainfall shocks in the Philippines. *The World Bank Economic Review*, Vol. 21. No. 2. 219-248.

Table 1: Average marginal effects based on probit regression on food poor versus food non-poor

	Distance		
	At most 40 kms	At most 20 kms	At most 10 kms
Attributes in 2003			
Household head age	0.00*	0.00	0.00
	[0.00]	[0.00]	[0.00]
Married household head	-0.05	-0.03	-0.09
	[0.08]	[0.08]	[0.09]
College graduate household head	-0.16***	-0.16***	-0.17***
	[0.02]	[0.02]	[0.02]
Family size	0.08***	0.09***	0.08***
	[0.02]	[0.02]	[0.03]
Membership			
NGO/Cooperative	-0.04***	-0.04***	-0.04**
	[0.02]	[0.02]	[0.02]
Demographic characteristics			
Household members age < 1	0.08***	0.08***	0.08***
	[0.02]	[0.02]	[0.02]
Household members age ≥ 1 & age < 7	0.07***	0.06***	0.07***
	[0.01]	[0.01]	[0.01]
Household members age ≥ 7 & age < 15	0.05***	0.05***	0.05***
	[0.01]	[0.01]	[0.01]
Household members age ≥ 15 & age < 25	0.03***	0.03***	0.04***
	[0.01]	[0.01]	[0.01]
Household members age ≥ 25	-0.03***	-0.03***	-0.03***
	[0.00]	[0.00]	[0.01]
Positive asset score	-0.10***	-0.10***	-0.10***
	[0.01]	[0.01]	[0.01]
Labor market participation			
Job status of household head	0.02	0.01	0.02
	[0.02]	[0.02]	[0.03]
Employment of household head's spouse	-0.01	-0.01	0.00
	[0.01]	[0.01]	[0.02]
Geographic characteristics			
Areas with conflict	0.10***	0.08***	0.11***
	[0.02]	[0.02]	[0.02]
Urban	-0.20***	-0.17***	-0.20***
	[0.02]	[0.02]	[0.02]
Weather variables			
Rainfall deviation	0.05***	0.06***	0.06***
	[0.01]	[0.01]	[0.01]
Urban*Rainfall deviation	0.01	-0.01	0.00
	[0.02]	[0.02]	[0.02]
Observations	5698	4821	3545
Wald chi ^{2}	762.03	643.4	494.19
Prob > chi ^{2}	0.00	0.00	0.00

*/**/*** Significant at 10/5/1% level. Figures in brackets are robust standard errors.
Estimates are generated using Probit regressions for panel data.
Inverse Mills Ratio is included in the explanatory variables

Table 2. Average marginal effects based on multinomial logit regression on frequency of food poverty

	Distance at most 10 kms						
	Never poor	Once poor	Twice poor	Thrice poor	Four times poor	Five times poor	Always poor
Attributes in 2003							
Household head age	0.00**	0.00	0.00	0.00	0.00**	0.00	-0.00**
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Married household head	0.01	0.03	-0.02	0.00	0.04	0.00	-0.06
	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]	[0.04]	[0.06]
College graduate household head	0.12***	0.01	0.02	0.05**	-0.03	-0.03	-0.15***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.04]	[0.04]
Family size	-0.05***	-0.01	-0.02	0.03*	-0.02	0.00	0.07***
	[0.02]	[0.02]	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]
Membership							
NGO/Cooperative	0.01	0.02	0.03	-0.02	-0.02	0.00	-0.02
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Demographic characteristics							
Household members age < 1	-1.00***	0.29***	0.15***	0.16***	0.17***	0.11**	0.12**
	[0.09]	[0.05]	[0.06]	[0.06]	[0.04]	[0.05]	[0.06]
Household members age ≥ 1 & age < 7	0.03	-0.04*	0.04	-0.04	0.02	-0.01	0.01
	[0.03]	[0.02]	[0.02]	[0.03]	[0.03]	[0.02]	[0.03]
Household members age ≥ 7 & age < 15	0.02	-0.03	0.00	-0.04**	0.02	0.00	0.03
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Household members age ≥ 15 & age < 25	0.03	0.00	0.02	-0.03	0.02	0.01	-0.03
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Household members age ≥ 25	0.01	0.03	0.02	-0.04	0.03	0.01	-0.06*
	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.04]
Always positive asset score	0.13***	0.08***	0.04	0.00	0.06	-0.13	-0.18
	[0.02]	[0.02]	[0.03]	[0.05]	[0.04]	[0.11]	[0.11]
Labor market participation							
Job status of household head	0.01	-0.04	-0.03	-0.01	0.03	-0.03	0.07
	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.05]
Employment of household head's spouse	0.05**	-0.03	-0.01	-0.03	0.01	0.01	0.00
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]
Geographic characteristics							
Areas with conflict	-0.01	-0.11***	-0.05*	0.01	0.03	0.00	0.13***
	[0.03]	[0.03]	[0.03]	[0.03]	[0.02]	[0.03]	[0.04]
Urban	0.16***	0.11***	0.05*	0.04	-0.02	-0.03	-0.32***
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]	[0.05]
Weather variables							
Rainfall deviation	0.14**	0.02	-0.09	0.02	-0.12	0.16**	-0.13
	[0.07]	[0.08]	[0.09]	[0.09]	[0.08]	[0.08]	[0.11]
Urban*Rainfall deviation	-0.29**	-0.1	-0.19	-0.16	0.11	-0.1	0.74***
	[0.12]	[0.13]	[0.20]	[0.15]	[0.17]	[0.18]	[0.25]
Observations	699						

	Distance at most 20 kms						
	Never poor	Once poor	Twice poor	Thrice poor	Four times poor	Five times poor	Always poor
Attributes in 2003							
Household head age	0.00	0.00	0.00	0.00	0.00**	0.00	-0.00***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Married household head	-0.01	0.04	-0.02	0.00	0.02	0.04	-0.07
	[0.02]	[0.03]	[0.02]	[0.03]	[0.03]	[0.04]	[0.05]
College graduate household head	0.10***	0.02	0.03	0.05***	-0.01	-0.02	-0.17***

	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.04]
Family size	-0.04***	-0.01	-0.02*	0.02*	-0.01	-0.01	0.07***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]
Membership							
NGO/Cooperative	0.02	0.02	0.01	-0.01	-0.01	-0.02	0.00
	[0.02]	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Demographic characteristics							
Household members age < 1	-0.82***	0.22***	0.14***	0.12***	0.15***	0.13***	0.06
	[0.07]	[0.04]	[0.05]	[0.04]	[0.04]	[0.04]	[0.05]
Household members age ≥ 1 & age < 7	0.01	-0.03	0.02	-0.03	-0.01	-0.01	0.04
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Household members age ≥ 7 & age < 15	0.00	-0.01	0.00	-0.04**	0.01	0.00	0.03
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Household members age ≥ 15 & age < 25	0.02	0.00	0.02	-0.03*	0.00	0.03	-0.03
	[0.01]	[0.01]	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]
Household members age ≥ 25	0.01	0.03	0.02	-0.02	0.01	0.02	-0.06**
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]
Always positive asset score	0.10***	0.06***	0.07***	0.03	0.02	-0.12	-0.17*
	[0.02]	[0.02]	[0.02]	[0.03]	[0.04]	[0.09]	[0.09]
Labor market participation							
Job status of household head	0.00	-0.02	-0.04*	0.01	0.06*	-0.01	0.01
	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.04]
Employment of household head's spouse	0.04**	-0.01	0.00	0.00	0.00	0.00	-0.03
	[0.02]	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]
Geographic characteristics							
Areas with conflict	-0.01	-0.09***	-0.05**	0.00	0.01	0.01	0.12***
	[0.02]	[0.03]	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]
Urban	0.14***	0.11***	0.03	0.04*	0.03	-0.07*	-0.28***
	[0.03]	[0.03]	[0.02]	[0.02]	[0.03]	[0.04]	[0.05]
Weather variables							
Rainfall deviation	0.11*	-0.01	-0.14**	0.05	-0.02	-0.02	0.04
	[0.07]	[0.07]	[0.06]	[0.06]	[0.05]	[0.07]	[0.08]
Urban*Rainfall deviation	-0.24***	-0.15	-0.05	-0.20*	-0.03	-0.03	0.70***
	[0.09]	[0.11]	[0.11]	[0.11]	[0.13]	[0.20]	[0.21]
Observations	962						

	Distance at most 40 kms						
	Never poor	Once poor	Twice poor	Thrice poor	Four times poor	Five times poor	Always poor
Attributes in 2003							
Household head age	0.00	0.00	0.00	0.00	0.00**	0.00	-0.00***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Married household head	-0.03	0.03	-0.02	0.02	0.01	0.04	-0.05
	[0.02]	[0.03]	[0.02]	[0.03]	[0.03]	[0.03]	[0.04]
College graduate household head	0.10***	0.02	0.03	0.05***	-0.01	-0.01	-0.17***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.04]
Family size	-0.03**	-0.02	-0.02	0.03**	-0.01	-0.02	0.07***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.02]
Membership							
NGO/Cooperative	0.02	0.01	0.01	-0.02	-0.01	-0.01	-0.01
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Demographic characteristics							
Household members age < 1	-0.09	-0.01	0.02	-0.02	0.05	0.06*	-0.01
	[0.06]	[0.03]	[0.03]	[0.04]	[0.03]	[0.04]	[0.04]

Household members age ≥ 1 & age < 7	-0.01	-0.03	0.01	-0.04*	0.00	0.03	0.04
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Household members age ≥ 7 & age < 15	0.00	-0.01	0.00	-0.04**	0.00	0.01	0.03
	[0.02]	[0.02]	[0.02]	[0.01]	[0.02]	[0.02]	[0.02]
Household members age ≥ 15 & age < 25	0.00	0.00	0.01	-0.03**	0.00	0.04***	-0.03
	[0.02]	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]	[0.02]
Household members age ≥ 25	0.00	0.03*	0.02	-0.03	0.01	0.03	-0.07**
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Always positive asset score	0.10***	0.06***	0.07***	0.02	0.01	-0.08	-0.18**
	[0.02]	[0.02]	[0.02]	[0.03]	[0.04]	[0.06]	[0.08]
Labor market participation							
Job status of household head	-0.02	-0.03	-0.04*	0.01	0.05**	0.00	0.03
	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.04]
Employment of household head's spouse	0.06***	-0.03	0.00	-0.01	0.00	0.00	-0.02
	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.03]
Geographic characteristics							
Areas with conflict	-0.04*	-0.09***	-0.03	0.00	0.02	0.02	0.11***
	[0.02]	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Urban	0.12***	0.11***	0.04**	0.04*	0.03	-0.05*	-0.28***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.04]
Weather variables							
Rainfall deviation	-0.04	0.01	-0.05	0.07	0.03	0.01	-0.03
	[0.06]	[0.06]	[0.05]	[0.05]	[0.05]	[0.05]	[0.06]
Urban*Rainfall deviation	-0.12	-0.1	-0.11	-0.18**	-0.03	-0.19	0.73***
	[0.08]	[0.08]	[0.09]	[0.09]	[0.12]	[0.20]	[0.20]
Observations	1145						

*/**/*** Significant at 10/5/1% level. Figures in brackets are robust standard errors.
Estimates are generated using multinomial logit regression. Continuous dependent variables, such as age demographic composition and rainfall deviation, are averages. Labor market participation is a binary variable equal to 1 if the head(spouse) have participated always.
Inverse Mills Ratio is included in the explanatory variables.

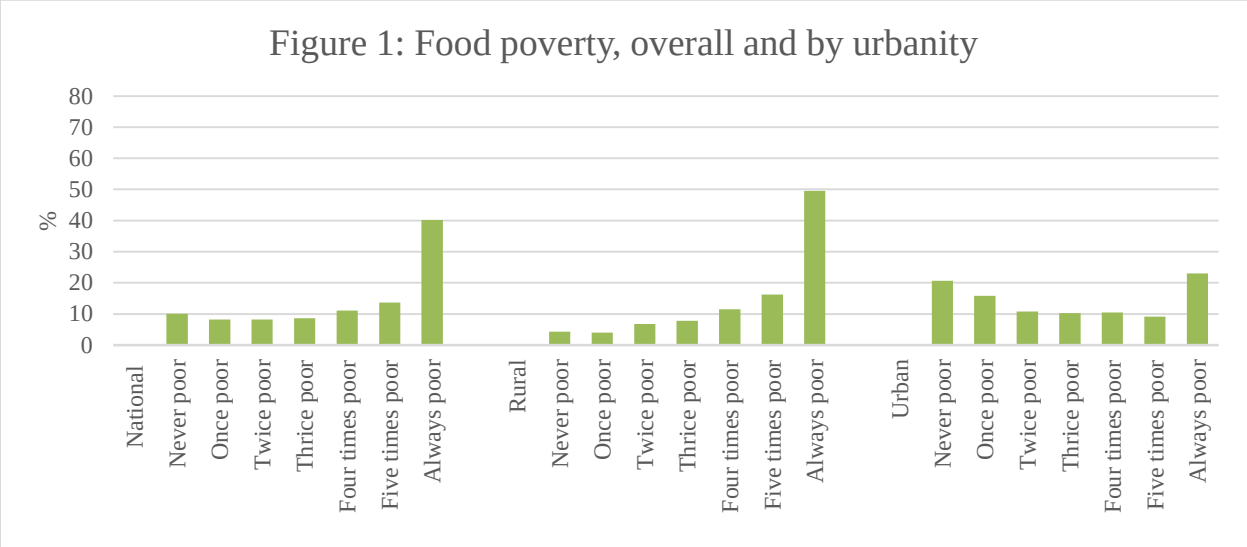
Figure 1: Food poverty, overall and by urbanity
%
80
70
60
50
40
30
20
10
0
National
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Rural
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Urban
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor

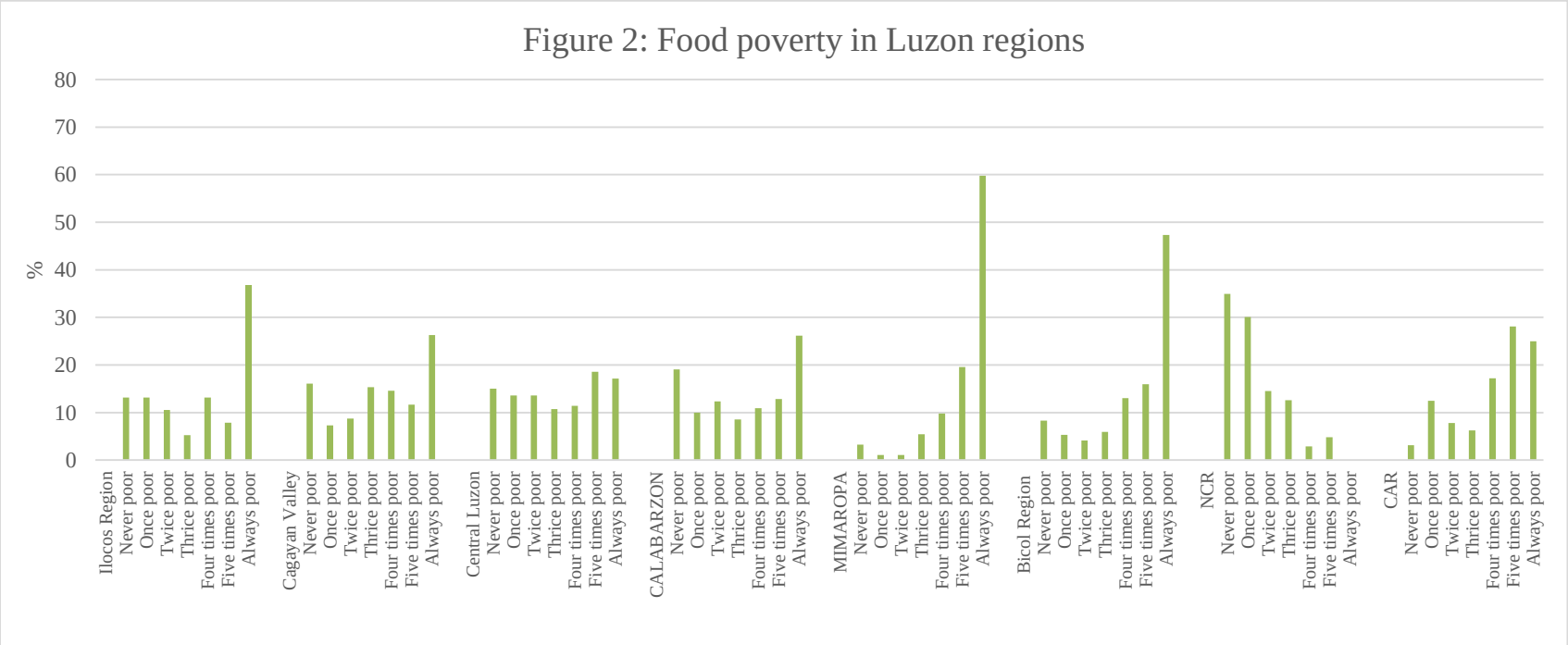
Figure 2: Food poverty in Luzon regions
%
80
70
60
50
40
30
20
10
0
Ilocos Region
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Cagayan Valley
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Central Luzon
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
CALABARZON
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
MIMAROPA
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Bicol Region
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
NCR
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
CAR
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor

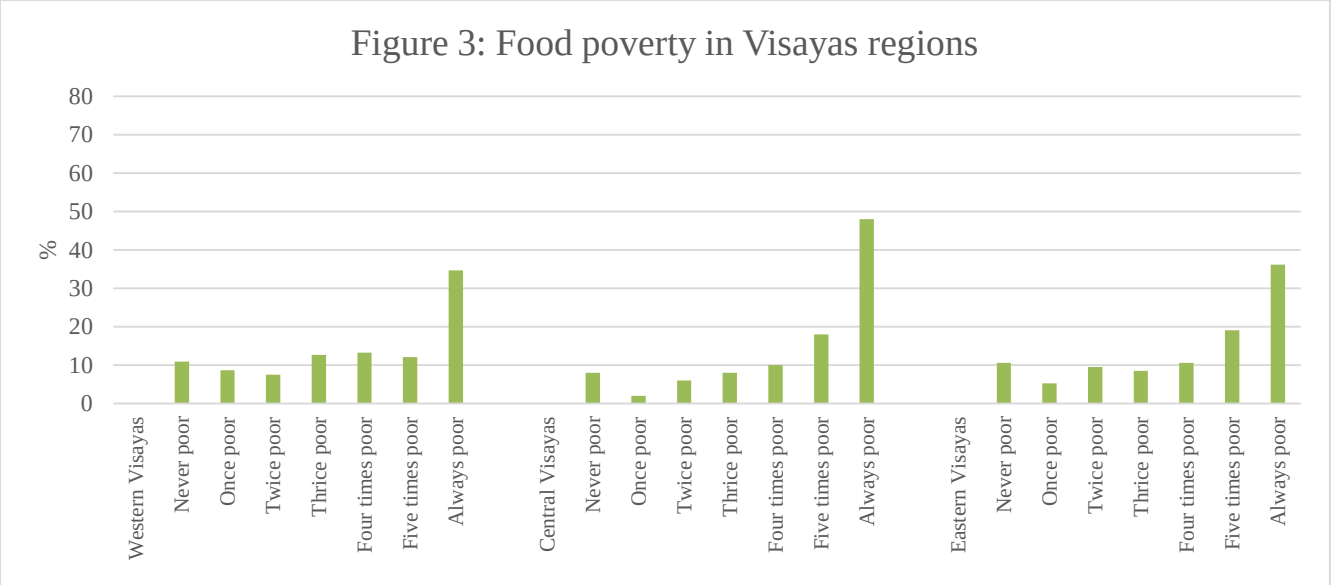
Figure 3: Food poverty in Visayas regions
%
80
70
60
50
40
30
20
10
0
Western Visayas
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Central Visayas
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Eastern Visayas
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor

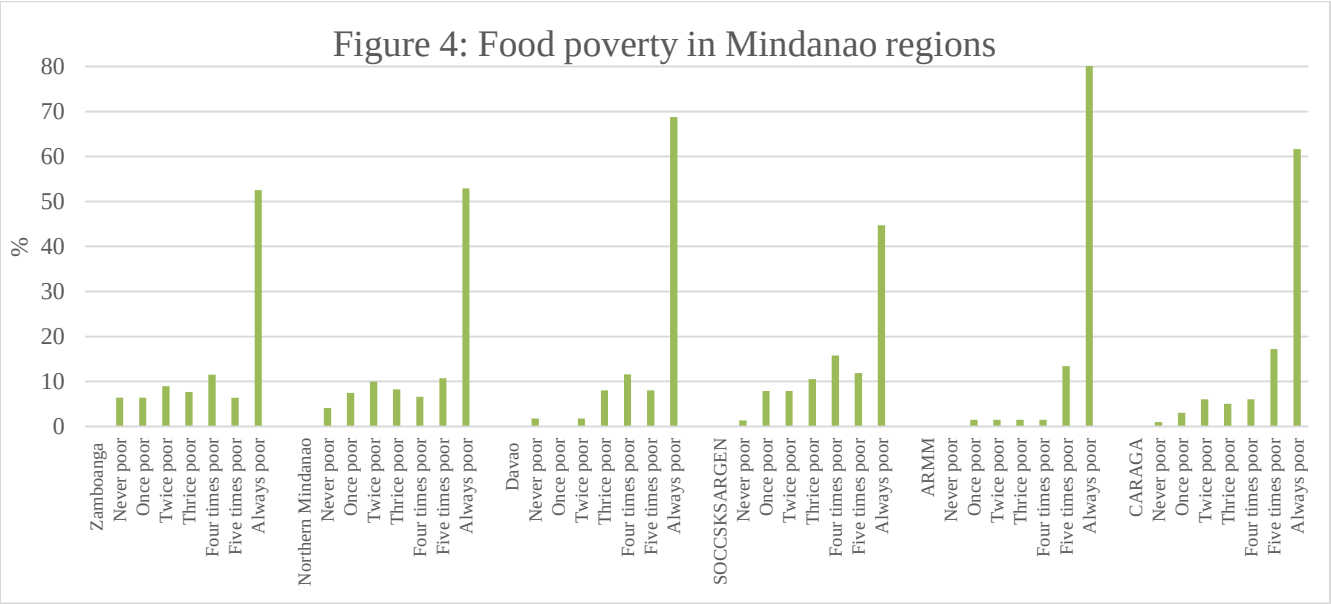
Figure 4: Food poverty in Mindanao regions
%
80
70
60
50
40
30
20
10
0
Zamboanga
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Northern Mindanao
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
Davao
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
SOCCSKSARGEN
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
ARMM
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor
CARAGA
Never poor
Once poor
Twice poor
Thrice poor
Four times poor
Five times poor
Always poor

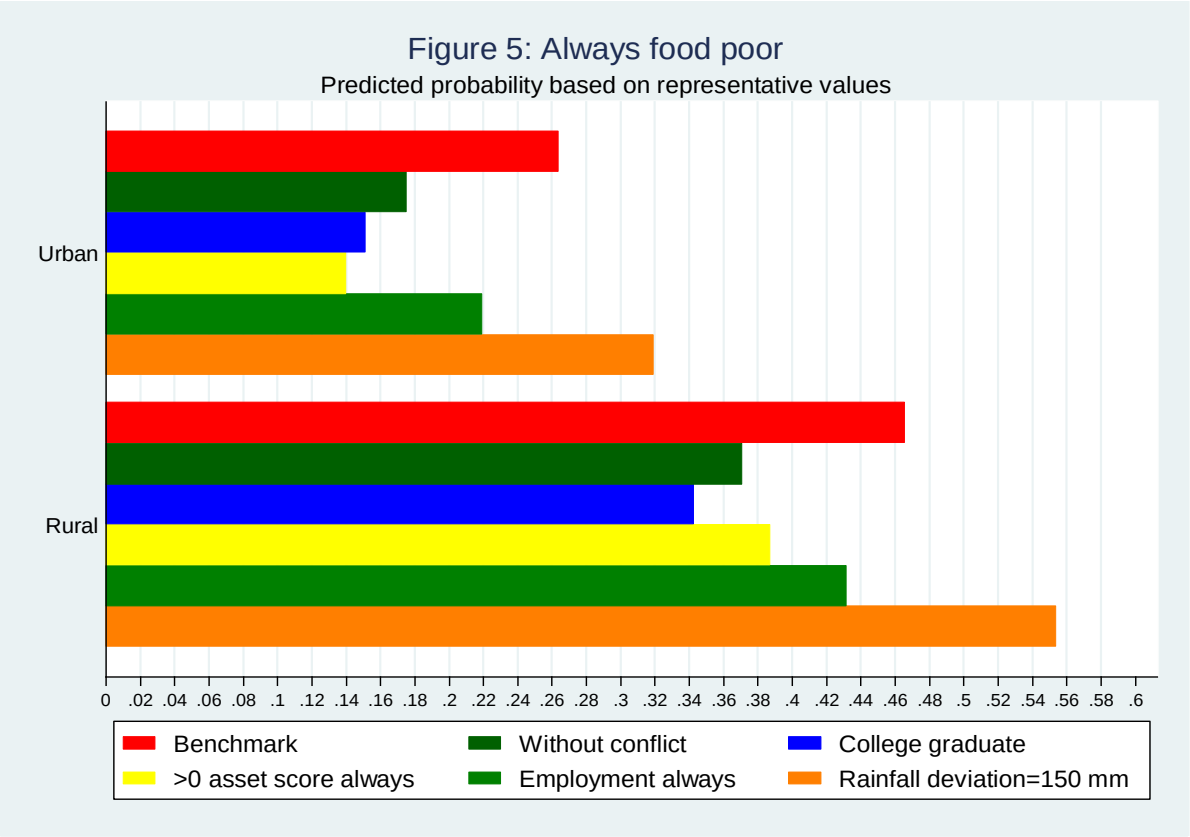
Figure 5: Always food poor
Predicted probability based on representative values
Urban
Rural
0 .02 .04 .06 .08 .1 .12 .14 .16 .18 .2 .22 .24 .26 .28 .3 .32 .34 .36 .38 .4 .42 .44 .46 .48 .5 .52 .54 .56 .58 .6
Benchmark
Without conflict
College graduate
>0 asset score always
Employment always
Rainfall deviation=150 mm

APPENDIX

Table 1A: Mapping of APIS-FIES provinces with the PAGASA weather stations

APIS-FIES Province/City	Weather Station	Provincial capital to weather station	Straight line/air distance (in kms)§
Misamis Oriental	Lumbia Airport, Misamis Oriental	CDO-Lumbia Airport	5.62
Benguet	Baguio City, Benguet	La Trinidad - Baguio City	8.63
Rizal	Science Garden, Quezon City	Rizal-Quezon City	8.93
Cebu	Mactan International Airport, Cebu	Cebu City - Mactan International Airport	10.7
Pangasinan	Dagupan City, Pangasinan	Lingayen - Dagupan City	10.83
Quezon	Taybas, Quezon	Lucena-Tayabas	11.04
Nueva Ecija	Cabanatuan, Nueva Ecija	Palayan City-Cabanatuan	17.96
Agusan del Norte	Butuan City, Agusan del Norte	Cabadbaran City - Butuan City	19.42
Cavite	Sangley Point, Cavite	Trece Martirez City - Sangley Point	20.66
Sarangani	General Santos, South Cotabato	Alabel - General Santos	21.08
Abra	Sinait, Ilocos Sur (former Vigan Station)	Bangued - Sinait	32.44
Sorsogon	Legaspi City, Albay	Sorosogon City-Legaspi	33.55
La Union	Baguio City, Benguet	San Fernando City-Baguio City	33.68
Bulacan	Science Garden, Quezon City	Bulacan-Quezon City	33.76
Batangas	Ambulong, Batangas	Batangas City - Ambulong	37.13
Tarlac	Cabanatuan, Nueva Ecija	Tarlac City-Cabanatuan	40.43
Kalinga	Tuguegarao, Cagayan	Kalinga-Tuguegarao	41.23
Aklan	Roxas City, Capiz	Aklan-Roxas City	43.61
Cotabato (North)	Davao City, Davao del Sur	Cotabato-Davao City	46.85
Davao del Norte	Davao City, Davao del Sur	Tagum City - Davao City	48.41
Davao del Sur	Davao City, Davao del Sur	Digos City - Davao City	49.5
Agusan del Sur	Butuan City, Agusan del Norte	Prosperidad-Butuan City	52.88
Basilan	Zamboanga City, Zamboanga del Sur	Basilan-Zambonaga City	55.65
Lanao del Sur	Lumbia Airport, Misamis Oriental	Marawi-Lumbia Airport	56.2
Laguna	Sangley Point, Cavite	Santa Cruz-Sangley	56.87
South Cotabato	General Santos, South Cotabato	Koronadal-General Santos	58.65
Nueva Vizcaya	Baguio City, Benguet	Bayombong-Kennon Road	59.51
Isabela	Tuguegarao, Cagayan	Ilagan-Tuguegarao	61.9
Isabela City	Tuguegarao, Cagayan	Isabela City-Tuguegarao	61.9
Catanduanes	Legaspi City, Albay	Virac-Legaspi	70.46
Biliran	Tacloban City, Leyte	Naval-Tacloban City	70.51
Eastern Samar	Guiuan, Eastern Samar	Borongan-Guiuan	71.26
Compostela Valley	Davao City, Davao del Sur	Nabunturan-Davao City	72.68
Apayao	Tuguegarao, Cagayan	Apayao-Tuguegarao	73.16
Marinduque	Tayabas, Quezon	Boac-Tayabas	75.46
Zamboanga del Sur	Dipolog. Zamboanga del Norte	Pagadian City-Dipolog	75.66
Ifugao	Baguio City, Benguet	Lagawe-Baguio City	78.65
Pampanga	Iba, Zambales	San Fernando City-Iba	79.15
Surigao del Sur	Hinatuan, Surigao del Sur	Tandag City-Hinatuan	80.76
Sultan Kudarat	General Santos, South Cotabato	Sultan Kudarat-General Santos	85.54
Mountain Province	Baguio City, Benguet	Bontoc-Baguio City	87.15
Misamis Occidental	Lumbia Airport, Misamis Oriental	Oroquieta City-Lumbia Airport	89.48

Masbate	Legaspi City, Albay	Masbate City-Legaspi City	90.04
Bataan	Iba, Zambales	Balanga-Iba	91.19
Davao Oriental	Davao City, Davao del Sur	Mati-Davao City	91.54
Camiguin	Lumbia Airport, Misamis Oriental	Mambajao-Lumbia Airport	92.3
Lanao del Norte	Lumbia Airport, Misamis Oriental	Tubod-Lumbia Airport	93.21
Iloilo	Roxas City, Capiz	Iloilo City-Roxas City	94.48
Camarines Sur	Virac, Catanduanes	Pili - Virac	100.13
Negros Occidental	Roxas City, Capiz	Bacolod city-Roxas City	104.27
Zamboanga Sibugay	Zamboanga City, Zamboanga del Sur	Ipil-Zamboanga City (from Zam. Del Sur)	111.18
Occidental Mindoro	San Jose, Oriental Mondoro	Mamburao-San Jose	113.17
Maguindanao	General Santos, South Cotabato	Shariff Aguak - General Santos	118.03
Antique	Roxas City, Capiz	San Jose de Buenavista-Roxas City	124.85
Quirino	Tuguegarao, Cagayan	Quirino-Tuguegarao	134.56
Cotabato City	Davao City, Davao del Sur	Cotabato City to Davao City	135.09
Sulu	Zamboanga City, Zamboanga del Sur	Jolo-Zambonaga City	149.25

Aurora	Baler, Aurora
Oriental Mindoro	Calapan, Oriental Mindoro
Northern Samar	Catamaran, Northern Samar
Samar (Western)	Catbalogan, Western Samar
Camarines Norte	Daet, Camarines Norte
Zamboanga del Norte	Dipolog, Zamboanga del Norte
Negros Oriental	Dumaguete, Negros Oriental
Zambales	Iba, Zambales
Ilocos Norte	Laoag City, Ilocos Norte
Albay	Legaspi City, Albay
Southern Leyte	Maasin, Southern Leyte
Bukidnon	Malaybalay, Bukidnon
NCR-4th Dist.	NAIA (MIA), Pasay City
Manila	Port Area (MC), Manila
Palawan	Puerto Princesa City, Palawan
Romblon	Romblon, Romblon
Capiz	Roxas City, Capiz
NCR-2nd Dist.	Science Garden, Quezon City
NCR-3rd Dist.	Science Garden, Quezon City
Ilocos Sur	Sinait, Ilocos Sur (former Vigan Station)
Surigao del Norte	Surigao, Surigao del Norte
Leyte	Tacloban City, Leyte
Bohol	Tagbiliran City, Bohol
Cagayan	Tuguegarao, Cagayan

Batanes
Guimaras

Taken from *http://distancecalculator.globefeed.com/Philippines_Distance_Calculator.asp*.