Employment Correlates of Multidimensional Poverty in the Philippines

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Abstract

Multidimensional poverty index (MPI) captures more welfare characteristics than the income- or expenditure-based poverty measures. It is an emerging social statistic, which must be understood to guide poverty alleviation policies and program. This paper finds robust employment characteristics on MPI using Bayesian averaging of classical estimates (BACE). Notably, being employed decreases MPI, while length and nature of employment both increase MPI. Community public goods, as well as remittances, reduce MPI, among other control variables considered. For policy, prioritization to laborers, who work for different employers, than contractual workers would significantly reduce MPI.

Keywords: *MPI, underemployment, BACE*

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1. Introduction

End poverty in all its forms everywhere is the first of the 17 Sustainable Development Goals (SDG) of the United Nations (United Nations, 2014), which continues the achievements of the Millennium Development Goals (MDG) in improving the welfare of the society. Since the introduction of the MDG in 2000 and SDG in 2015, the UN measures progress in poverty reduction in terms of the expenditure-based poverty headcount, defined as the number of people living on less than PPP-adjusted USD 1.25 per day. Based on this measure, poverty had reduced by more than half from 1.9 billion in 1990 to 836 million people in 2015 (United Nations, 2015).

Despite achieving the poverty gap MDG target of 4.7 percent, the Philippines, however, was unable to meet the MDG poverty incidence target of 17.2% by 2015 (PSA, 2016) as full year poverty incidence in 2015 was estimated at 21.6%. Nonetheless, a stark decline in poverty incidence of 3.6 percentage points was observed from 2012 to 2015 compared to 0.3 and 1.1 percentage points for periods 2006-2009 and 2009-2012, respectively. This relatively large decrease in poverty

incidence can be attributed to high gross domestic product (GDP) growth during those periods. Unemployment rate in 2015 is low at 4% and does not pose a problem.

When unemployment rate was disaggregated by age group, almost 50% of the labor force with ages 15 to 24 are unemployed in 2015, and around 30.8% are unemployed with ages 25 to 34 (PSA, 2016). This high youth unemployment is a barrier for the country to reap the demographic dividend due to favorable demographic structure (Mapa, et al. 2016). Moreover, while growth rate of GDP per person employed and employment-to-population ratio had been increasing from 1990 to 2014, underemployment is still high at 21% in the July round of 2015 Labor Force Survey (LFS). This shows that a high proportion of workers in the labor force are not satisfied with the income they receive from their primary occupation. These dismal results cause frictions to poverty alleviation.

Therefore, it is important to determine the poorest subgroup of the population in terms of a more comprehensive measure of poverty. This paper will follow the methodology of Balisacan (2015) to calculate household-level MPI. The household level MPI is generated using the 2012 FIES merged with the 2012 LFS, 2010 Census of Population and Housing (CPH) Barangay Schedule. The household-level MPI is linked to the employment and other control variables using a regression model. Moreover, the robustness of the effects is tested using the Bayesian Averaging of Classical Estimates of Sala-i-Martin et al. (2003). The study was inspired by the aim of the current administration to end contractualization in the labor market. Briefly, results show that laborers who work for different employers are poorer than those with short-term contracts. The results of the study would help socio-economic policies prioritize interventions toward the more vulnerable employment group.

2. MPI and its Correlates

2.1. Poverty Measurement and Issues

The general method of estimating poverty incidence is as follows: First, a certain welfare indicator is selected to represent poverty, which could either be per capita income or per capita expenditures. Second, a threshold level is decided for the selected poverty indicator. Finally, individual or household-level data of the indicator is aggregated to get the measure of poverty (Balisacan, 2015). The most common indicator for this level of poverty is based on the expenditure level, adjusted accordingly for inflation. This methodology, while effective for yielding a global and cross-country comparable poverty measure, is not without criticisms. Alkire (2007) raised the issue that there are dimensions that are important to the poor but were not captured by money-metric measures of poverty. Basu (2015) mentioned that global poverty measure is arbitrary in nature and argued that poverty is not simply money metric but is multidimensional in nature.

Alkire and Foster (2011) proposed a set of measures where several dimensions of poverty can be aggregated to create a multidimensional poverty index (MPI). This is achieved by assigning weights to each aspect of dimension then adding them to produce the single-value index. It is based on the Foster-

Greer-Thorbecke's (1984) class of poverty measures. Alkire and Santos (2010) measured the MPI of 104 developing countries in 2010. In this study, the MPI was composed of poverty dimensions such as education, health, and household assets.

Balisacan (2015) used the same Alkire and Foster method to generate a regional level MPI for the Philippines using data from different nationwide surveys such as the Family Income and Expenditure Survey (FIES), Annual Poverty Indicators Survey (APIS) and the National Demographic and Health Survey (NDHS) from 1988 to 2012. The study allowed for poverty analysis for more targeted interventions.

2.2. Employment and Other Correlates of MPI

The relationship of employment and other household correlates to poverty is prevalently studied in the literature (Lipton and Ravallion, 1995; Herrin and Racelis, 1994). In targeting poor households, Mapa and Albis (2013) included employment and poverty correlates in the new proxy means test of the Department of Social Welfare and Development in targeting the poor.

Balisacan (1993) showed that self-employed households are poorer than wage-dependent households, and that poverty in the agricultural sector did not decrease substantially even if there was rapid agriculturalization in the 1960's. The link of technical progress in agriculture to poverty alleviation in the Philippines is unclear (Coxhead and Warr, 1995). Economic growth must be supported by improvements in infrastructure and human capital, with the support of political economy and agrarian reform (Balisacan & Pernia, 2002). This shows that the agricultural sector is most vulnerable to poverty.

Results of the positive effect of education to income are consistent in the literature. Education helped the household in the rural areas to shift from low-wage agricultural employment to relatively high-wage non-agricultural employment, which resulted in a decline in rice-growing villages in the Philippines (Estudillo et al., 2008). Moreover, education inequality was found to be higher in poorer provinces, while nonpoor provinces were found to have relatively lower education inequality (Mesa, 2007).

The young dependents are family members from zero to 18 years old, while old dependents are those older than 60 years old. The ratio between total number of young and old dependents, and the total household size is called the dependency ratio. Babu et al. (2014) showed that from 1991 to 1992, poorer households in Malawi have a higher dependency ratio compared to non-poor households, 57 percent and 51 percent, respectively; this six percentage point difference is found to be significant via chi-square tests. A high dependent ratio results in lower per capita income due to the low productive base in the household.

Mapa, Balisacan, and Briones (2006) showed that the proportion of young dependents has a robust negative effect on economic growth. Mapa, Albis and Lucagbo (2012) showed that proportion of young dependents also has a substantial effect in increasing the probability of the household towards being subsistence poor. Orbeta (2005) provided a comprehensive summary of the literature showing the adverse effects of large family size to household welfare. Furthermore, Orbeta (2006) showed that limited access to contraceptives made the situation worse.

Overseas contract workers (OCW) household members can affect the poverty status of the household. Those who work abroad are paid in foreign currency and usually send back a portion of income to their household. Hence, it is expected that the number of OCW household members decreases MPI (Semyonov & Gorodzeisky, 2005). However, currency shocks affect the inflow of remittances to the Philippines that lessen remittances' poverty alleviation effects (Yang and Martinez, 2005).

3. Methodology

3.1. MPI Calculation

This paper follows the definition of multidimensional poverty of Balisacan (2015), which includes the health, education, and standard of living dimensions, from the FIES. The FIES is a household survey conducted by the Philippine Statistics Authority (PSA) every three years that began in 1985, and is a rider survey for the Labor Force Survey (LFS). The FIES is used to calculate the official poverty statistics as it contains detailed information about the households' sources of income, expenditures, as well as various household characteristics, demographics and housing conditions. The advantage of using the FIES is that it can be merged with the LFS, which includes detailed household member information, and with the Census of Population and Housing (CPH) Barangay Schedule, which captures community characteristics.

In this paper, the MPI at the household-level is constructed by aggregating the multidimensional poverty indicators following the weights in Appendix 1 using the 2012 Merged FIES-LFS with the 2010 CPH Barangay Schedule, which implicitly assumes that the changes in the barangay characteristics between 2010 and 2012 are negligible. This study used the 2012 merged FIES-LFS because household asset indicators were updated that year. Thus, given the change in household asset indicators in 2012, household asset components of the MPI may be incomparable with earlier rounds of FIES and LFS.

The FIES captures most of the multidimensional poverty indicators; the education and standard of living dimensions of MPI are well represented. However, the FIES lacks on the health dimension as it only includes information about water source, sanitation and food poverty, and misses out on child mortality and nutrition. Child mortality and nutrition are available in the NDHS; however, this survey cannot be merged with the FIES.

3.2. MPI Regression Model

The household-level MPI is regressed with the employment correlates controlled by regional indicators, young and elderly dependents, community characteristics, and household characteristics other than those included in the MPI formula. Income- and expenditure-related variables were excluded in the models to avoid potential endogeneity issues.

Employment-related indicators included the following: (i) number of employed household members; (ii) number of household members by nature of employment: permanent, short term contract or with different employers; (iii) number of household members by class of work: worked in private household, private establishment, self-employed, in government service, etc.; (iv) number of household members by the first-digit of the Philippine Standard Occupation Codes (PSOC); [1] (v) two digit PSOC for the unskilled class of workers;[2] and (vi) number of OCWs in the household.

Number of young dependents was disaggregated into the following age intervals: (i) less than 1 year old, (ii) 1 to less than 5 years old, and (iii) 5 to less than 18 years old. The community characteristics are represented by community public goods index created using principal components analysis of the 2010 CPH Barangay Schedule.[3] Urbanity dummy was also included as a control variable. Household characteristic control variables include the family size, educational attainment, sex, and age of the household head. Regional disparities were addressed by adding regional dummy variables in the model.

The determinants are linked to the MPI through a regression model:

$$MPI_i = \boldsymbol{\gamma}'\mathbf{L}_i + \boldsymbol{\delta}'\mathbf{D}_i + \boldsymbol{\eta}'\mathbf{C}_i + \boldsymbol{\beta}'\mathbf{X}_i + \epsilon_i \quad \textbf{(1)}$$

where MPI_i multidimensional poverty index of household i, $\mathbf{L}$ is a vector of employment-related variable, $\mathbf{D}$ is a vector of variables related to the number of young and elderly dependents, $\mathbf{C}$ is a vector of community characteristics, and $\mathbf{X}$ is a vector containing household-level information, with coefficients $\boldsymbol{\gamma}$, $\boldsymbol{\delta}$, $\boldsymbol{\eta}$ and $\boldsymbol{\beta}$, respectively, and $\boldsymbol{\epsilon}_i$ is the random fluctuation following the usual assumptions.

3.3. Robustness Procedure

This paper uses the Bayesian averaging of classical estimates (BACE) as a robustness check on the effects of the employment variables on the MPI. The BACE starts with the extreme bounds analysis (EBA) of Leamer (1983) as

[1] The Philippine Standard Occupation Codes is the official standard classification of occupation by the PSA. The first digit of the code gives the major occupation groups: 1-Managers, 2-Professionals, 3-Technicians and Associate Professionals, 4-Clerical Support Workers, 5-Services and Sales Workers, 6-Skilled Agricultural, Forestry and Fishery Workers, 7-Craft and Related Trades Workers, 8-Plant and Machine Operators and Assemblers, 9-Elementary Occupations (Unskilled Workers), 10-Armed Forces Occupations.

[2] Only the following two-digit PSOC for unskilled workers were captured by the FIES: 9.1-Cleaners and Helpers, 9.2-Agricultural, Forestry and Fishery, 9.3 Laborers in Mining, Construction, Manufacturing and Transport.

[3] The community public goods index is the first principal component of the availability dummy variables of the following facilities in the barangay: town/city hall or provincial capitol; church, chapel or mosque; public plaza or park for recreation; cemetery; market place where trading activities are carried out at least once a week; elementary school; high school; college or university; public library; hospital; puericulture center or barangay health center; landline telephone system or calling station; cellular phone signal; post office or postal service; community waterworks system; seaport in operation; fire station or public fire-protection service; and public-street sweeper.

applied by Levine and Renelt (1992) in testing the robustness of the determinants of growth using a cross country data. The EBA estimates regression models of the form:

$$\boldsymbol{MPI} = \mathbf{L}_j \boldsymbol{\gamma}_j + \mathbf{F}_j \boldsymbol{\beta}_j + \boldsymbol{\epsilon}_j \quad \textbf{(2)}$$

where ***MPI*** is regressed with a vector of employment variables $\mathbf{L}_j$, given a vector of fixed control variables that always enter the model $\mathbf{F}_j$, with corresponding coefficients $\boldsymbol{\gamma}_j$ and $\boldsymbol{\beta}_j$, respectively, and $\boldsymbol{\epsilon}_j$ being the error term. The vector $\mathbf{L}_j$ represents the $\boldsymbol{j^{th}}$ combination of variables taken 1 at a time up to $\boldsymbol{K}$ at time from the pool of all employment variables $\boldsymbol{\chi}$, i.e. $\mathbf{L}_j \boldsymbol{\epsilon}\, \boldsymbol{\chi}^{(K)}$, where p represents the number of employment variables. For the j^{th} regression, estimates coefficients $\widehat{\boldsymbol{\gamma}}_j$ and $\widehat{\boldsymbol{\beta}}_j$ are obtained with their corresponding standard errors denoted by $\boldsymbol{\sigma}_{\gamma j}$ and $\boldsymbol{\sigma}_{\beta j}$, respectively. The total number of models to be estimated is 2^K.

Following Sala-i-Martin, Doppelhoffer and Miller (2003), denote j^{th} the model, M_j, as a length K binary vector in which the value one indicates that the corresponding variable in the vector is included in the model and the value zero means that the variable is excluded. Then the prior probability of model j, as specified by the researcher, is given as:

$$P(M_j) = \left[\prod_{i=1}^{k_j} M_{ji}\ \overline{k}/K\right]\left[\prod_{i=1}^{k_j}(1 - M_{ji})(1 - \ \overline{k}/K)\right] \quad \textbf{(3)}$$

where k_j is the number of included variables in model j, $\overline{k}$ is the prior mean model size, and M_{ji} is the i^{th} element of the vector. Assuming equal prior inclusion probabilities across the variables, the prior probability of model j given above is simplified to:

$$P(M_j) = (\overline{k}/K)^{k_j}(1 - \overline{k}/K)^{K-k_j} \quad \textbf{(4)}$$

The posterior probability of the j^{th} model is a normalized function of prior model probabilities and sum of squared error of the j^{th} model, and is given by:

$$P(M_j|y) = P(M_j)T^{-k_i/2}SSE_j^{-T/2} \Big/ \sum_{i=1}^{2^K} P(M_i)T^{-k_i/2}SSE_i^{-T/2} \quad \textbf{(5)}$$

where T is the sample size and SSE_i is the OLS sum of squared errors under model i.

The posterior mean and variance of $\boldsymbol{\gamma}$ are given respectively:

$$E(\boldsymbol{\gamma}|y) = \sum_{j=1}^{2^K} P(M_j|y)\hat{\boldsymbol{\gamma}}_j \quad \textbf{(6)}$$

$$Var(\boldsymbol{\gamma}|y) = \sum_{j=1}^{2^K} P(M_j|y)\sigma_{\gamma j}^2 + \sum_{j=1}^{2^K} P(M_j|y)\{\hat{\boldsymbol{\gamma}}_j - E(\boldsymbol{\gamma}|y)\}^2 \quad \textbf{(7)}$$

4. Results of Household-Level MPI Calculation and Regressions

4.1. Household-Level MPI

Table 1 shows the calculated national and regional MPI using the 2012 FIES and the 2010 CPH disaggregated by poverty indicator. The MPI, column 1, is the weighted average of the multidimensional poverty indicators with corresponding weights in Appendix 1. Columns 2 to 12 indicate the poverty incidence of households in terms of the corresponding multidimensional poverty indicator. Figure 1 shows that estimated kernel density of MPI exhibits positive skewness. MPI values closer to one mean high poverty index, while values closer to zero imply low multidimensional poverty. Households' MPI is concentrated around 0.1 to 0.2, yet a sizable proportion of household have MPI higher than 0.4.

Regions 1 to IVA along with NCR and CAR have MPIs less than the MPI at the national level with an average of 0.20. Only regions in Luzon group of islands IVB and V have higher MPI than the national average because of relatively high proportion of households in the two regions that were poor in terms of access to clean water and sanitation. Moreover, there is also a high proportion of households in the two regions with per capita income less than the subsistence level, and high poverty in terms of education. The two regions are also relatively asset poor compared to the other regions in the Luzon island group.

Table 1. Multidimensional Poverty Indicators by Region (2012)

Region	MPI	Water	Sanitation	Food	Years of Schooling	Schooling Potential	Electricity	Roof	Wall	Mobility	Other Income	Assets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
NCR	0.1105	0.2246	0.0126	0.0062	0.0091	0.0568	0.0162	0.0261	0.0438	0.0254	0.7878	0.3166
CAR	0.1975	0.5221	0.1903	0.0656	0.0589	0.0909	0.1019	0.0538	0.0719	0.0786	0.7916	0.4981
I - Ilocos Region	0.1588	0.4662	0.0507	0.0480	0.0277	0.0542	0.0538	0.0731	0.1635	0.0599	0.6869	0.4921
II - Cagayan Valley	0.1887	0.5166	0.1004	0.0291	0.0652	0.0673	0.0964	0.0893	0.1632	0.0751	0.8159	0.5418
III - Central Luzon	0.1397	0.3147	0.0367	0.0296	0.0304	0.0664	0.0445	0.0576	0.1008	0.0330	0.7513	0.4324
IVA - CALABARZON	0.1412	0.3196	0.0388	0.0276	0.0279	0.0611	0.0442	0.0505	0.1011	0.0897	0.7627	0.4055
IVB - MIMAROPA	0.2788	0.5853	0.2566	0.1023	0.1096	0.1233	0.2250	0.3407	0.4542	0.1010	0.8801	0.6885
V - Bicol Region	0.2598	0.5993	0.1825	0.1384	0.0568	0.1253	0.1598	0.3149	0.3123	0.1273	0.8838	0.6342
VI - Western Visayas	0.2424	0.6255	0.2070	0.0743	0.0791	0.1064	0.1390	0.1969	0.4251	0.1360	0.7792	0.5807
VII - Central Visayas	0.2335	0.4945	0.1570	0.1370	0.1009	0.1012	0.1428	0.1608	0.3478	0.0841	0.8061	0.5531
VIII - Eastern Visayas	0.2745	0.6207	0.2065	0.1531	0.1089	0.1371	0.1253	0.2736	0.3424	0.1069	0.8668	0.6787
IX - Zamboanga Peninsula	0.3075	0.7038	0.2186	0.1304	0.1237	0.1618	0.2675	0.3428	0.4298	0.1624	0.8866	0.7163
X - Northern Mindanao	0.2343	0.5150	0.1470	0.1483	0.0777	0.1221	0.1534	0.1290	0.2397	0.0213	0.8641	0.5944
XI - Davao Region	0.2371	0.5667	0.1264	0.1018	0.0864	0.1216	0.1610	0.1402	0.3115	0.1003	0.8729	0.5559
XII - SOCCSKSARGEN	0.2841	0.5775	0.2110	0.1760	0.1047	0.1547	0.2263	0.1955	0.4445	0.1074	0.8758	0.6578
Caraga	0.2378	0.5114	0.1053	0.1280	0.0754	0.1415	0.1298	0.3344	0.2565	0.0387	0.8429	0.6275
ARMM	0.4229	0.8628	0.7752	0.1684	0.1676	0.2534	0.4187	0.3065	0.3995	0.3014	0.9346	0.8156
Philippines	0.2024	0.4618	0.1277	0.0777	0.0611	0.0971	0.1124	0.1411	0.2290	0.0836	0.8086	0.5189

Notes:

1. MPI in column 1 is the weighted average of the multidimensional poverty indicators.
2. Columns 2 to 12 are household-level poverty incidence.

Source: Authors' computation

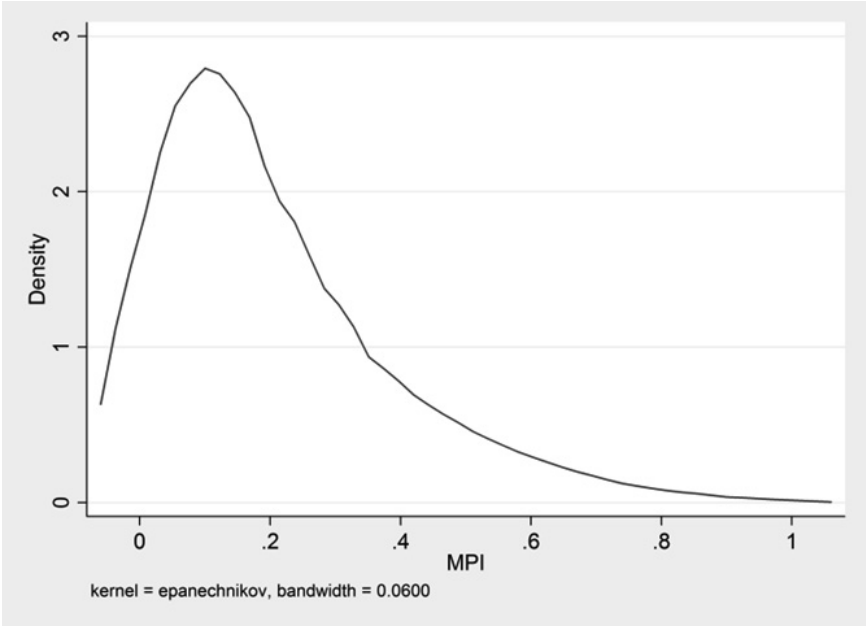

Figure 1. Kernel Density Estimates of MPI (2012) showing positive skewness. Households' MPI is concentrated around 0.1 to 0.2, which means households have relatively low MPI, yet a sizable proportion of households have MPI higher than 0.4 implying extreme levels of multidimensional poverty.

Regions VI, VII and VIII in the Visayas group of islands have almost identical MPI levels with VIII - Eastern Visayas having the highest MPI. In Eastern Visayas, around 15% of households were food poor, and around 27% of the households have roofs made of light or salvaged materials. Households in Eastern Visayas also have higher incidence of household asset poverty, which could be a result of unavailability of income from sources other than salaries or wages.

In the Mindanao group of islands, all regions are above the MPI level at the national level. Regions X-Northern Mindanao, XI-Davao, and CARAGA have almost the same MPI at around 0.23. Most of the multidimensional poverty indicators of Mindanao regions are above the national averages. ARMM has the highest MPI at 0.43.

4.2. Regression Results

Several regression models were estimated with different combinations of employment variable. Control variables are all present in the regression models. Summary statistics of the variables are presented in Appendix 2. Model 1 is the model of MPI with the number of employed household members controlling for the community public goods index, family size, sex, age and education of the household head, and regional dummy variables. Results show that MPI moves negatively with the number of employed household members. This implies the importance of capturing employment to explain MPI. MPI decreases with the

community public goods index, thus characteristics of the neighborhood and availability of public amenities can also affect MPI. This result is parallel to Balisacan (1998) in using community characteristics to target poor household. (Refer to Table 2)

Table 2. Regression Results (Dependent=MPI): Nature of Employment and Class of Worker

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Employed HH Members	-0.0054***			
	(0.0007)			
Nature of Employment: Permanent		-0.0103***		
		(0.0008)		
Nature of Employment: Short Term		0.0032***		0.0123***
		(0.0011)		(0.0011)
Nature of Employment: Worked for Different Employer		0.0251***		0.0350***
		(0.0025)		(0.0025)
Class of Worker: Worked for Private HH			0.0078***	0.0032
			(0.0020)	(0.0020)
Class of Worker: Worked for Private Establishment			-0.0053***	-0.0124***
			(0.0009)	(0.0009)
Class of Worker: Worked for Gov't/Gov't Corporation			-0.0351***	-0.0387***
			(0.0014)	(0.0014)
Class of Worker: Self-employed without any paid employee			-0.0123***	-0.0146***
			(0.0012)	(0.0012)
Class of Worker: Employer in own family-operated farm of business			-0.0506***	-0.0522***
			(0.0024)	(0.0024)
Class of Worker: Worked with pay on own family-operated farm of business			-0.0128**	-0.0144***
			(0.0052)	(0.0050)
Class of Worker: Worked without pay on own family-operated farm of business			0.0148***	0.0112***
			(0.0017)	(0.0017)
Community Public Goods Index	-0.0072***	-0.0071***	-0.0113***	-0.0069***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Urbanity (Urban = 1)	-0.0405***	-0.0405***		-0.0413***
	(0.0019)	(0.0019)		(0.0019)
Family Size	0.0072***	0.0069***	0.0072***	0.0072***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Sex of Household Head (Female = 1)	-0.0144***	-0.0156***	-0.0183***	-0.0175***
	(0.0017)	(0.0017)	(0.0017)	(0.0017)

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Age of Household Head	-0.0023***	-0.0022***	-0.0021***	-0.0021***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Household Head Education: Elementary Undergraduate	-0.1172***	-0.1162***	-0.1166***	-0.1143***
	(0.0064)	(0.0064)	(0.0064)	(0.0064)
Household Head Education: Elementary Graduate	-0.2176***	-0.2157***	-0.2145***	-0.2109***
	(0.0064)	(0.0064)	(0.0063)	(0.0063)
Household Head Education: Highschool Undergraduate	-0.2510***	-0.2483***	-0.2470***	-0.2414***
	(0.0065)	(0.0065)	(0.0064)	(0.0064)
Household Head Education: Highschool Graduate	-0.2949***	-0.2903***	-0.2895***	-0.2809***
	(0.0063)	(0.0063)	(0.0063)	(0.0063)
Household Head Education: College Undergraduate	-0.3225***	-0.3163***	-0.3150***	-0.3033***
	(0.0065)	(0.0065)	(0.0065)	(0.0064)
Household Head Education: College Graduate or Higher	-0.3531***	-0.3448***	-0.3397***	-0.3262***
	(0.0063)	(0.0063)	(0.0063)	(0.0063)
Constant	0.5406***	0.5372***	0.5004***	0.5284***
	(0.0073)	(0.0073)	(0.0072)	(0.0072)
Observations	40,141	40,141	40,141	40,141
R-squared	0.433	0.439	0.438	0.450
Adjusted R-squared	0.432	0.439	0.438	0.450
F-stat	1025	972.2	874.1	828.1
p-value	0.000	0.000	0.000	0.000
RMSE	0.139	0.138	0.138	0.137

Robust standard errors in parentheses
Notes: With regional dummy variables
Household Head Education Base Category: No Education
*** p<0.01, ** p<0.05, * p<0.1

MPI increases with family size, reflecting the fact that poor households have higher family size compared to non-poor household (Orberta, 2005). Female headed households have lower MPI than male headed households, which is also consistent with the literature (Chant, 1997; Mapa et al, 2010). Age of the household head is negatively related with MPI, which may be explained by saving dynamics of households. The square of the household head was not included because number of elderly dependent households enters in the subsequent models. MPI decreases as the education of the household head improves, which highlights the importance of education in lowering poverty. Coefficients of the regional dummy variables are available in Appendix 4. The signs of the coefficients of control variables are robust across all models.

In Model 2, nature of employment enters the model. The number of employed household members is dropped because of collinearity. MPI decreases with the number of household members with permanent employment, which implies that workers with regular jobs have lower MPI. The number of household members with short-term employment is positively significant in this model, while the number of household members working for different employers has the largest positive coefficient among the natures of employment. This emphasizes the need to address underemployment issues in the country. The government should focus on improving job stability and security to combat poverty.

The class of worker enters in Model 3. MPI decreases with all classes of worker variables except with the number of household members working in private households and those who are working without pay on own family-operated farm or business. These workers are most likely daily-wage short-term employment workers for different employers. The story is the same for Model 4, which brings back the nature of employment in the model. The number of workers in private household became insignificant because most likely those workers are the ones working for different employers, whose coefficient slightly increased in value.

In Table 3, Model 5 retains the nature of employment and adds the Philippine Standard Occupational Classification (PSOC) major occupation codes. The number of household members working in the armed forces is insignificant. Hence, it is not clear if households with armed forces personnel are more likely nonpoor. MPI decreases with the number of household members working as managers, professionals and technicians, or in clerical, services, craft and related trades and factories. MPI increases as the number of household members working in the agricultural, forestry and fishery sectors increases, even if these workers are skilled. MPI increases as the number of unskilled workers in the household increases. This emphasizes the vulnerability of skilled agricultural households and workers in the informal sector to poverty (Balisacan, 1993).

Table 3. Regression Results (Dependent=MPI): Philippine Standard Occupation Codes and Young Dependents

Variables	Model (4)	Model (5)	Model (6)
Nature of Employment: Short Term	0.0071***	0.0068***	0.0072***
	(0.0011)	(0.0011)	(0.0011)
Nature of Employment: Worked for Different Employer	0.0214***	0.0178***	0.0179***
	(0.0025)	(0.0025)	(0.0025)
Philippine Standardized Occupation Codes			
Armed Forces	-0.0008	-0.0000	0.0042
	(0.0089)	(0.0088)	(0.0086)
Managers	-0.0357***	-0.0355***	-0.0315***
	(0.0012)	(0.0012)	(0.0012)
Professionals	-0.0342***	-0.0344***	-0.0269***
	(0.0016)	(0.0015)	(0.0016)
Technicians and Associate Professionals	-0.0248***	-0.0251***	-0.0181***
	(0.0023)	(0.0023)	(0.0022)

Variables	Model (4)	Model (5)	Model (6)
Clerical	-0.0325***	-0.0329***	-0.0244***
	(0.0016)	(0.0016)	(0.0016)
Services and Sales	-0.0195***	-0.0189***	-0.0134***
	(0.0012)	(0.0012)	(0.0012)
Skilled Agricultural, Forestry and Fishery	0.0182***	0.0148***	0.0191***
	(0.0017)	(0.0017)	(0.0017)
Craft and Related Trades	-0.0154***	-0.0143***	-0.0089***
	(0.0018)	(0.0018)	(0.0018)
Plant and Machine Operators and Assemblers	-0.0255***	-0.0253***	-0.0193***
	(0.0020)	(0.0020)	(0.0019)
Elementary Occupations (Unskilled)	0.0133***		
	(0.0011)		
Unskilled: Cleaners and Helpers		-0.0004	0.0024
		(0.0015)	(0.0015)
Unskilled: Agricultural, forestry and fishery		0.0218***	0.0251***
		(0.0014)	(0.0014)
Unskilled: Laborers in mining, construction, manufacturing and transport		0.0010	0.0069***
		(0.0021)	(0.0021)
Young Dependents: <1 yr old			0.0702***
			(0.0129)
Young Dependents: 1 to <5 yrs old			0.0777***
			(0.0065)
Young Dependents: 5 to <18 yrs old			0.0888***
			(0.0038)
Constant	0.5043***	0.5015***	0.4632***
	(0.0071)	(0.0071)	(0.0073)
Observations	40,141	40,141	40,141
R-squared	0.471	0.474	0.481
Adjusted R-squared	0.470	0.473	0.481
F-stat	814.6	781.9	742.5
p-value	0.000	0.000	0.000
RMSE	0.134	0.134	0.133

Note: Model controls for community public goods index, family size, sex, age and education of the household head, and regional dummy variables.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Model 6 disaggregates the unskilled occupations into cleaners and helpers, agricultural, and manufacturing etc. Notice that unskilled cleaners and helpers, and laborers in manufacturing have insignificant coefficients. Only the number of households in agricultural, forestry and fisheries has positive and significant coefficient. This result further increases the need to focus on the agricultural households. Agricultural households are prone to economic and meteorological shocks that may abruptly reduce household's income, increasing their MPI.

(Balisacan et at., 2010a; Balisacan et al., 2010b, Mapa et al., 2011). Furthermore, the agricultural industry in the Philippines is labor intensive, thus health shocks have large negative effects on productivity and income.

Model 7 includes the number of dependents in households. When these variables are added, the number of unskilled laborers in mining, construction, manufacturing and transport becomes positively significant for MPI. All variables for the number of young dependents are significant. One can also observe that that the number of young dependents from 5 to less than 18 years old has the highest effect on MPI. This age range overlap with the schooling period of children, hence more resources are needed during this span of time.

Models 8.1 to 8.3 in Table 4, includes the number of elderly dependents given several cutoffs. Regardless of the cutoff used, the number of elderly dependents increases with MPI. Furthermore, MPI decreases with the number of OCWs in the household as seen in Model 9. This is due to the potential remittances that the household receives from the OCW member.

Table 4. Regression Results (Dependent=MPI): Elderly Dependents and Overseas Contract Workers

Variables	Model (8.1)	Model (8.2)	Model (8.3)	Model (9)
Nature of Employment: Short Term	0.0073***	0.0072***	0.0072***	0.0070***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Nature of Employment: Worked for Different Employer	0.0183***	0.0181***	0.0181***	0.0172***
	(0.0025)	(0.0025)	(0.0025)	(0.0024)
Young Dependents: <1 yr old	0.0695***	0.0686***	0.0688***	0.0598***
	(0.0128)	(0.0128)	(0.0128)	(0.0127)
Young Dependents: 1 to <5 yrs old	0.0767***	0.0757***	0.0760***	0.0729***
	(0.0065)	(0.0065)	(0.0065)	(0.0063)
Young Dependents: 5 to <18 yrs old	0.0928***	0.0908***	0.0896***	0.0899***
	(0.0038)	(0.0038)	(0.0038)	(0.0037)
Elderly Dependents: >65 yrs old	0.0660***			0.0581***
	(0.0040)			(0.0040)
Elderly Dependents: >70 yrs old		0.0748***		
		(0.0046)		
Elderly Dependents: >75 yrs old			0.0739***	
			(0.0055)	
Overseas Contract Worker				-0.0784***
				(0.0018)
Constant	0.4729***	0.4725***	0.4696***	0.4681***
	(0.0072)	(0.0072)	(0.0072)	(0.0072)

Variables	Model (8.1)	Model (8.2)	Model (8.3)	Model (9)
Observations	40,141	40,141	40,141	40,141
R-squared	0.485	0.485	0.484	0.502
Adjusted R-squared	0.484	0.484	0.483	0.502
F-stat	733.6	734.8	732.7	754.4
p-value	0.000	0.000	0.000	0.000
RMSE	0.132	0.132	0.132	0.130

Note: Model controls for PSOC major occupation groupings, community public goods index, family size, sex, age and education of the household head, and regional dummy variables.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.3. Robustness Results

4.3.1 EBA

The EBA requires numerous estimated regressions to ascertain the robustness of the variables. In the analysis, all 37 control variables were deemed as fixed regressors. The employment variables such as the: (i) nature of employment, (ii) PSOC single-digit codes, (iii) PSOC two-digit code for unskilled workers, and (iv) number of OCW household members were included in the pool of variables denoted by χ; the young and elderly dependents were also included in this pool. All in all, there are 20 variables in χ resulting in 2^{20}-1=1,048,575 estimated regression models.

Results of the extreme bounds analysis are given in Appendix 5. A 90% confidence interval was calculated for all variables in all the estimated regressions. The stringent robustness condition of the EBA that the extreme lower bound and the extreme upper bound of all confidence intervals does not contain zero, leaves few robust employment variables. The number of unskilled workers in the agricultural, forestry and fishery sector has a robust positive sign for MPI, which implies that the households with high number of workers in the said sector are on the average poorer than the other sectors. The number of OCW has a robust negative sign for MPI, which supports the results in the literature that the existence of OCW household members improves the welfare of the household.

The percentage of young dependents ages 5 to less than 18 has a robust positive sign for MPI, as this is the schooling age range for children. Moreover, the percentage of elderly dependents also has a robust positive sign for MPI. This robust results support interventions to help poor households with schooling-age children and elderly household members. The conditional cash transfers (CCT) and social pension of the Department of Social Welfare and Development (DSWD) are programs that provide cash transfers to poor households with young and elderly dependents, respectively.

Robustness of the control variables are also reported but must be interpreted with caution. The control variables were not part of the pool of variables to be selected and always enter in the models.

4.3.2 BACE

Given the regression results of the EBA, the posterior inclusion probability, posterior mean, and posterior variances were computed using the estimated likelihood function of the models as weights. The sign certainty probability gives the probability that the sign of the variable is on one side of zero, assuming the normal distribution. The sign of the variable is robust if the sign certainty probability is greater than 97.5%, which is equivalent to a two-sided test with a 5% level of significance. Prior probability was computed assuming that there are 15 non-fixed variables in the true model. Table 5 shows the BACE results for variables in the pool of non-fixed variables. Note that there are more robust variables under the BACE than the EBA. Appendix 6 gives the BACE results for the control variables.

Table 5. BACE Results (Dependent=MPI)

Variable	Posterior Inclusion Probability	Posterior Mean	Posterior Variance	Sign Certainty Probability	Robustness
Nature of Employment: Permanent	0.0574	-0.0129	0.0000	1.0000	Robust (-)
Nature of Employment: Short Term	0.0390	0.0067	0.0000	0.9993	Robust (+)
Nature of Employment: Worked for Different Employer	0.0483	0.0288	0.0000	1.0000	Robust (+)
PSOC 0: Armed Forces	0.0363	0.0050	0.0001	0.7033	
PSOC 1: Managers	0.1175	-0.0400	0.0000	1.0000	Robust (-)
PSOC 2: Professionals	0.0458	-0.0310	0.0000	1.0000	Robust (-)
PSOC 3: Technicians and Associate Professionals	0.0388	-0.0217	0.0000	1.0000	Robust (-)
PSOC 4: Clerical	0.0470	-0.0313	0.0000	1.0000	Robust (-)
PSOC 5: Services and Sales	0.0499	-0.0214	0.0000	1.0000	Robust (-)
PSOC 6: Skilled Agricultural, Forestry and Fishery	0.0569	0.0283	0.0000	1.0000	Robust (+)
PSOC 7: Craft and Related Trades	0.0378	-0.0103	0.0000	0.9999	Robust (-)
PSOC 8: Plant and Machine Operators and Assemblers	0.0414	-0.0237	0.0000	1.0000	Robust (-)
PSOC 9.1: Unskilled: Cleaners and Helpers	0.0365	0.0025	0.0000	0.8502	
PSOC 9.2: Unskilled: Agricultural, forestry and fishery	0.1869	0.0349	0.0000	1.0000	Robust (+)
PSOC 9.3: Unskilled: Laborers in mining, construction, manufacturing and transport	0.0365	0.0036	0.0000	0.8747	

Variable	Posterior Inclusion Probability	Posterior Mean	Posterior Variance	Sign Certainty Probability	Robustness
% Young Dependents: <1 yr old	0.0364	0.0044	0.0003	0.5997	
% Young Dependents: 1 to <5 yrs old	0.0369	0.0214	0.0002	0.9522	
% Young Dependents: 5 to <18 yrs old	0.0737	0.0840	0.0000	1.0000	Robust (+)
% Elderly Dependents: >65 yrs old	0.0495	0.0649	0.0000	1.0000	Robust (+)
Overseas Contract Worker	0.1815	-0.0802	0.0000	1.0000	Robust (-)

Number of household members with permanent employment has a robust negative sign for MPI, while the numbers of short-term and working-for-different-employers household members have a robust positive sign for MPI. The number of household members working short-term has a lower posterior mean than that of members working for different employers. The government should also focus on the latter as workers with this nature of employment are more vulnerable to poverty and have worse job security than those with short-term contracts.

Number of household members employed in the armed forces has a non-robust sign for MPI. The number of skilled workers in the agricultural, forestry and fishery sector has a robust positive sign for MPI. This result is consistent with the literature that agricultural households are vulnerable to poverty. All other one-digit PSOC-code variables have a robust negative sign on MPI.

Not all households with a number of unskilled workers are vulnerable to high MPI. The number of unskilled household members that are cleaners and helpers, and laborers in mining, construction, manufacturing and transport have non-robust signs for MPI. Positive robust results on the unskilled workers in agricultural, forestry and fishery sector are consistent with the regressions and the EBA. Moreover, the young and elderly dependents are also robust in terms of their sign.

5. Conclusion and Recommendations

This paper estimated the household-level MPI and correlated it through regressions with employment and other household-related control variables. Robustness of the employment variables was determined using the BACE. The results of this paper may aid policy makers as to the prioritization of government interventions to more vulnerable households.

Underemployment is a crucial factor in determining poverty level. Job security must be improved as the number of household members with short-term contracts and working with different employers, increases with MPI. These workers may even belong to the informal sector. Moreover, household members working in the agricultural sector, regardless of whether they are skilled or unskilled, are more vulnerable to poverty compared to household members in other employment sectors. Other unskilled workers such as cleaners and helpers, and laborers in mining, and construction and transport, have a non-robust sign for

MPI. The government should not only reduce workers with short-term contracts, but should also focus on laborers who are working for different employers as they have worse job security.

Households with high dependency ratios were also found to be more likely in poverty than those with lower ratios. The MPI decreases as the number of OCW household members decreases, and this may help to offset effects of young and elderly dependents. Moreover, targeted government interventions may help alleviate the effects of dependents in the households.

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Appendices

Appendix 1. Multidimensional Poverty Indicator

Dimension	Indicator	Definition		Weight
Health	**Child Mortality**			
	Sanitation	If household does not use flush toilet	**Toilet Facilities:** (1) None; (2) Closed Pit; (3) Open Pit	1/12
	Drinking Water	If household does not have access to safe drinking water	**Main Source of Water Supply:** (1) Shared, faucet, community water system; (2) Shared tubed/piped deep well; (3) Dug Well; (4) Protected spring, river, stream, etc; (5) Unprotected spring, river, stream, etc; (6) Lake, river, rain and others; (7) Peddler	1/12
	Malnutrition			
	Food Poverty	If household is food poor	Household is food poor is per capita household expenditures is less than the 2012 food threshold	1/6
Education	**Years of Schooling**	If no household member has completed 6 years of schooling	Excludes domestic helpers and boarders	1/6
	Child Potential Schooling	If any school-aged (7-16 yrs old) child does not meet his/her education potential		1/6

Dimension	Indicator	Definition		Weight
Standard of Living	**Electricity**	If household does not have electricity		1/15
	Shelter			
	Roof	If household's roof is composed of light/ salvaged material	**Type of Roof:** (1) Light material; (2) Salvaged/makeshift materials; (3) Mixed but predominantly light materials; (4) Mixed but predominantly salvaged materials	1/30
	Wall	If household's wall is composed of light/ salvaged material	**Type of Walls:** (1) Light material; (2) Salvaged/ makeshift materials; (3) Mixed but predominantly light materials; (4) Mixed but predominantly salvaged materials	1/30
	Mobility	If household does not own a vehicle and is not accessible to national highway		1/15
	Ownership of Vehicle	Household has no car, jeep or van.		
	Accessibility to National Roads	The distance between the nearest point of the barangay and the national highway using the access road is more than 2 KMS.		
	Asset Ownership			
	Household Asset	If household does not own more than three of household assets	If the total number of assets, i.e. sum of all radio, TV, CD player, stereo, refrigerator, washing machine, air conditioner, landline, cellphone, personal computer, oven, motor banca, motorcycle, is less than 3	1/15
	Other Sources of Income	If household's other sources of income is less than 20% of total income		1/15

Source: Balisacan (2015)

Appendix 2. Summary Statistics of Variables from 2012 FIES (N=40,143)

	Variables	Mean	Std. Dev.	Min	Max
1	MPI	0.22	0.18	0	1
2	Employed HH Members	1.89	1.19	0	12
3	Nature of Employment: Permanent	1.38	1.12	0	12
4	Nature of Employment: Short Term	0.44	0.79	0	8
5	Nature of Employment: Worked for Different Employer	0.08	0.37	0	8
6	Class of Worker: Worked for Private HH	0.10	0.33	0	6

	Variables	Mean	Std. Dev.	Min	Max
7	Class of Worker: Worked for Private Establishment	0.79	0.98	0	9
8	Class of Worker: Worked for Gov't/Gov't Corporation	0.16	0.44	0	5
9	Class of Worker: Self-employed without any paid employee	0.56	0.69	0	6
10	Class of Worker: Employer in own family-operated farm of business	0.08	0.29	0	4
11	Class of Worker: Worked with pay on own family-operated farm of business	0.01	0.11	0	5
12	Class of Worker: Worked without pay on own family-operated farm of business	0.20	0.55	0	7
13	PSOC 10: Armed Forces	0.01	0.08	0	4
14	PSOC 1: Managers	0.31	0.55	0	5
15	PSOC 2: Professionals	0.09	0.33	0	4
16	PSOC 3: Technicians and Associate Professionals	0.05	0.24	0	5
17	PSOC 4: Clerical	0.09	0.33	0	4
18	PSOC 5: Services and Sales	0.22	0.53	0	9
19	PSOC 6: Skilled Agricultural, Forestry and Fishery	0.30	0.53	0	5
20	PSOC 7: Craft and Related Trades	0.12	0.38	0	6
21	PSOC 8: Plant and Machine Operators and Assemblers	0.09	0.31	0	4
22	PSOC 9: Elementary Occupations (Unskilled)	0.66	0.95	0	10
23	PSOC 9.1: Unskilled: Cleaners and Helpers	0.19	0.46	0	7
24	PSOC 9.2: Unskilled: Agricultural, forestry and fishery	0.38	0.81	0	9
25	PSOC 9.3: Unskilled: Laborers in mining, construction, manufacturing and transport	0.10	0.36	0	8
26	% Young Dependents: <1 yr old	0.01	0.05	0	0.5
27	% Young Dependents: 1 to <5 yrs old	0.06	0.11	0	0.8
28	% Young Dependents: 5 to <18 yrs old	0.26	0.23	0	1
29	% Elderly Dependents: >65 yrs old	0.09	0.22	0	1
30	% Elderly Dependents: >70 yrs old	0.06	0.19	0	1
31	% Elderly Dependents: >75 yrs old	0.04	0.14	0	1
32	Overseas Contract Worker	0.09	0.32	0	5

	Variables	Mean	Std. Dev.	Min	Max
33	Community Public Goods Index	0.00	2.02	-4	7
34	Urbanity (Urban = 1)	0.38	0.49	0	1
35	Family Size	4.70	2.19	1	20.5
36	Sex of Household Head (Female = 1)	0.21	0.41	0	1
37	Age of Household Head	50.76	14.10	15	99
38	Household Head Education: No Grade Completed	0.03	0.17	0	1
39	Household Head Education: Elementary Undergraduate	0.21	0.41	0	1
40	Household Head Education: Elementary Graduate	0.19	0.39	0	1
41	Household Head Education: Highschool Undergraduate	0.12	0.32	0	1
42	Household Head Education: Highschool Graduate	0.26	0.44	0	1
43	Household Head Education: College Undergraduate	0.08	0.27	0	1
44	Household Head Education: College Graduate or Higher	0.11	0.31	0	1
45	Region I: Ilocos Region	0.06	0.23	0	1
46	Region II: Cagayan Valley	0.05	0.22	0	1
47	Region III: Central Luzon	0.08	0.27	0	1
48	Region V: Bicol Region	0.06	0.23	0	1
49	Region VI: Western Visayas	0.07	0.26	0	1
50	Region VII: Central Visayas	0.06	0.24	0	1
51	Region VIII: Eastern Visayas	0.05	0.23	0	1
52	Region IX: Zamboanga Peninsula	0.04	0.20	0	1
53	Region X: Northern Mindanao	0.05	0.21	0	1
54	Region XI: Davao Region	0.06	0.23	0	1
55	Region XII: SOCCSKSARGEN	0.05	0.22	0	1
56	Region: NCR	0.11	0.31	0	1
57	Region: CAR	0.04	0.20	0	1
58	Region: ARMM	0.05	0.21	0	1
59	Region: Caraga	0.04	0.20	0	1
60	Region IVA: CALABARZON	0.10	0.30	0	1
61	Region IVB: MIMAROPA	0.04	0.19	0	1

Appendix 3. Control Variables: Household and Community Characteristics

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Community Public Goods Index	-0.0072***	-0.0071***	-0.0113***	-0.0069***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Urbanity (Urban = 1)	-0.0405***	-0.0405***		-0.0413***
	(0.0019)	(0.0019)		(0.0019)
Family Size	0.0072***	0.0069***	0.0072***	0.0072***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Sex of Household Head = 2, Female	-0.0144***	-0.0156***	-0.0183***	-0.0175***
	(0.0017)	(0.0017)	(0.0017)	(0.0017)
Age of Household Head	-0.0023***	-0.0022***	-0.0021***	-0.0021***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Household Head Education: Elementary Undergraduate	-0.1172***	-0.1162***	-0.1166***	-0.1143***
	(0.0064)	(0.0064)	(0.0064)	(0.0064)
Household Head Education: Elementary Graduate	-0.2176***	-0.2157***	-0.2145***	-0.2109***
	(0.0064)	(0.0064)	(0.0063)	(0.0063)
Household Head Education: Highschool Undergraduate	-0.2510***	-0.2483***	-0.2470***	-0.2414***
	(0.0065)	(0.0065)	(0.0064)	(0.0064)
Household Head Education: Highschool Graduate	-0.2949***	-0.2903***	-0.2895***	-0.2809***
	(0.0063)	(0.0063)	(0.0063)	(0.0063)
Household Head Education: College Undergraduate	-0.3225***	-0.3163***	-0.3150***	-0.3033***
	(0.0065)	(0.0065)	(0.0065)	(0.0064)
Household Head Education: College Graduate or Higher	-0.3531***	-0.3448***	-0.3397***	-0.3262***
	(0.0063)	(0.0063)	(0.0063)	(0.0063)
Observations	40,141	40,141	40,141	40,141
R-squared	0.433	0.439	0.438	0.450
Adjusted R-squared	0.432	0.439	0.438	0.450
F-stat	1025	972.2	874.1	828.1
p-value	0.000	0.000	0.000	0.000
RMSE	0.139	0.138	0.138	0.137

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)
-0.0053***	-0.0050***	-0.0049***	-0.0050***	-0.0050***	-0.0050***	-0.0050***
(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
-0.0296***	-0.0275***	-0.0260***	-0.0254***	-0.0255***	-0.0255***	-0.0250***
(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
0.0065***	0.0068***	0.0008*	0.0019***	0.0017***	0.0013***	0.0035***
(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
-0.0120***	-0.0109***	-0.0143***	-0.0134***	-0.0142***	-0.0145***	-0.0053***
(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0016)
-0.0020***	-0.0020***	-0.0014***	-0.0020***	-0.0019***	-0.0017***	-0.0019***
(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
-0.1104***	-0.1093***	-0.1092***	-0.1077***	-0.1076***	-0.1079***	-0.1070***
(0.0063)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0061)
-0.2015***	-0.1991***	-0.1979***	-0.1948***	-0.1944***	-0.1950***	-0.1936***
(0.0062)	(0.0062)	(0.0061)	(0.0061)	(0.0061)	(0.0061)	(0.0060)
-0.2263***	-0.2230***	-0.2222***	-0.2196***	-0.2195***	-0.2203***	-0.2174***
(0.0063)	(0.0063)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0061)
-0.2612***	-0.2581***	-0.2572***	-0.2535***	-0.2538***	-0.2547***	-0.2482***
(0.0062)	(0.0062)	(0.0061)	(0.0061)	(0.0061)	(0.0061)	(0.0060)
-0.2797***	-0.2770***	-0.2750***	-0.2714***	-0.2712***	-0.2722***	-0.2650***
(0.0064)	(0.0063)	(0.0063)	(0.0063)	(0.0063)	(0.0063)	(0.0062)
-0.2998***	-0.2966***	-0.2955***	-0.2931***	-0.2925***	-0.2931***	-0.2859***
(0.0063)	(0.0063)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0061)
40,141	40,141	40,141	40,141	40,141	40,141	40,141
0.471	0.474	0.481	0.485	0.485	0.484	0.502
0.470	0.473	0.481	0.484	0.484	0.483	0.502
814.6	781.9	742.5	733.6	734.8	732.7	754.4
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.134	0.134	0.133	0.132	0.132	0.132	0.130

Appendix 4. Control Variables: Regional Dummy Variables

Variables	Model (1)	Model (2)	Model (3)	Model (4)
I - Ilocos Region	-0.0269***	-0.0297***	0.0007	-0.0274***
	(0.0033)	(0.0032)	(0.0031)	(0.0032)
II - Cagayan Valley	-0.0283***	-0.0320***	0.0099***	-0.0208***
	(0.0035)	(0.0035)	(0.0033)	(0.0035)
III - Central Luzon	-0.0355***	-0.0377***	-0.0177***	-0.0354***
	(0.0026)	(0.0026)	(0.0026)	(0.0026)
V - Bicol Region	0.0496***	0.0482***	0.0790***	0.0502***
	(0.0038)	(0.0038)	(0.0036)	(0.0038)
VI - Western Visayas	0.0435***	0.0405***	0.0666***	0.0447***
	(0.0034)	(0.0033)	(0.0032)	(0.0033)
VII - Central Visayas	0.0333***	0.0348***	0.0545***	0.0358***
	(0.0035)	(0.0035)	(0.0034)	(0.0034)
VIII - Eastern Visayas	0.0376***	0.0376***	0.0687***	0.0406***
	(0.0040)	(0.0039)	(0.0038)	(0.0039)
IX - Zamboanga Peninsula	0.0853***	0.0873***	0.1069***	0.0890***
	(0.0041)	(0.0041)	(0.0041)	(0.0040)
X - Northern Mindanao	0.0404***	0.0360***	0.0627***	0.0365***
	(0.0039)	(0.0039)	(0.0038)	(0.0038)
XI - Davao Region	0.0478***	0.0464***	0.0632***	0.0500***
	(0.0034)	(0.0034)	(0.0035)	(0.0034)
XII - SOCCSKSARGEN	0.0725***	0.0689***	0.0923***	0.0714***
	(0.0039)	(0.0039)	(0.0039)	(0.0038)
CAR	0.0032	0.0014	0.0260***	0.0005
	(0.0036)	(0.0036)	(0.0035)	(0.0036)
ARMM	0.1343***	0.1375***	0.1568***	0.1350***
	(0.0044)	(0.0045)	(0.0044)	(0.0045)
Caraga	0.0296***	0.0281***	0.0537***	0.0300***
	(0.0040)	(0.0040)	(0.0040)	(0.0040)
IVA - CALABARZON	-0.0177***	-0.0181***	-0.0032	-0.0178***
	(0.0024)	(0.0024)	(0.0023)	(0.0023)
IVB - MIMAROPA	0.0622***	0.0599***	0.0926***	0.0635***
	(0.0045)	(0.0044)	(0.0043)	(0.0044)

Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)
-0.0345***	-0.0335***	-0.0338***	-0.0342***	-0.0342***	-0.0345***	-0.0288***
(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0031)
-0.0433***	-0.0471***	-0.0481***	-0.0478***	-0.0481***	-0.0484***	-0.0406***
(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0033)
-0.0343***	-0.0353***	-0.0358***	-0.0351***	-0.0353***	-0.0355***	-0.0300***
(0.0026)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
0.0439***	0.0443***	0.0408***	0.0406***	0.0407***	0.0408***	0.0380***
(0.0037)	(0.0037)	(0.0037)	(0.0036)	(0.0036)	(0.0036)	(0.0036)
0.0370***	0.0354***	0.0337***	0.0339***	0.0336***	0.0338***	0.0364***
(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0031)
0.0338***	0.0333***	0.0326***	0.0323***	0.0321***	0.0323***	0.0324***
(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0032)
0.0368***	0.0367***	0.0334***	0.0330***	0.0330***	0.0331***	0.0310***
(0.0038)	(0.0038)	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)
0.0750***	0.0723***	0.0689***	0.0696***	0.0695***	0.0691***	0.0675***
(0.0040)	(0.0040)	(0.0039)	(0.0039)	(0.0039)	(0.0039)	(0.0039)
0.0291***	0.0269***	0.0247***	0.0251***	0.0250***	0.0248***	0.0246***
(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)
0.0369***	0.0351***	0.0340***	0.0347***	0.0345***	0.0342***	0.0332***
(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)
0.0594***	0.0555***	0.0531***	0.0533***	0.0532***	0.0529***	0.0542***
(0.0038)	(0.0038)	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)
-0.0123***	-0.0142***	-0.0157***	-0.0156***	-0.0162***	-0.0160***	-0.0134***
(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)
0.1251***	0.1236***	0.1239***	0.1247***	0.1243***	0.1240***	0.1233***
(0.0044)	(0.0044)	(0.0044)	(0.0044)	(0.0044)	(0.0044)	(0.0043)
0.0237***	0.0235***	0.0205***	0.0210***	0.0209***	0.0209***	0.0187***
(0.0039)	(0.0039)	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)
-0.0151***	-0.0148***	-0.0157***	-0.0154***	-0.0154***	-0.0155***	-0.0113***
(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0022)
0.0519***	0.0502***	0.0458***	0.0455***	0.0450***	0.0454***	0.0436***
(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0042)

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Observations	40,141	40,141	40,141	40,141
R-squared	0.433	0.439	0.438	0.450
Adjusted R-squared	0.432	0.439	0.438	0.450
F-stat	1025	972.2	874.1	828.1
p-value	0.000	0.000	0.000	0.000
RMSE	0.139	0.138	0.138	0.137

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix 5. EBA Results (Dependent=MPI)

Variable
Nature of Employment: Permanent
Nature of Employment: Short Term
Nature of Employment: Worked for Different Employer
PSOC 0: Armed Forces
PSOC 1: Managers
PSOC 2: Professionals
PSOC 3: Technicians and Associate Professionals
PSOC 4: Clerical
PSOC 5: Services and Sales
PSOC 6: Skilled Agricultural, Forestry and Fishery
PSOC 7: Craft and Related Trades
PSOC 8: Plant and Machine Operators and Assemblers
PSOC 9.1: Unskilled: Cleaners and Helpers
PSOC 9.2: Unskilled: Agricultural, forestry and fishery
PSOC 9.3: Unskilled: Laborers in mining, construction, manufacturing and transport
% Young Dependents: <1 yr old
% Young Dependents: 1 to <5 yrs old
% Young Dependents: 5 to <18 yrs old
% Elderly Dependents: >65 yrs old
Overseas Contract Worker
Community Public Goods Index
Urbanity (Urban = 1)

Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)
40,141	40,141	40,141	40,141	40,141	40,141	40,141
0.471	0.474	0.481	0.485	0.485	0.484	0.502
0.470	0.473	0.481	0.484	0.484	0.483	0.502
814.6	781.9	742.5	733.6	734.8	732.7	754.4
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.134	0.134	0.133	0.132	0.132	0.132	0.130

% Negative Significance	% Positive Significance	Extreme Lower Bound	Extreme Upper Bound	Robustness
43.1	4.0	-0.0392	0.0265	
10.7	35.0	-0.0318	0.0348	
1.2	45.7	-0.0218	0.0476	
0.0	4.2	-0.0340	0.0446	
50.0	0.0	-0.0568	0.0000	
49.8	0.0	-0.0567	0.0088	
47.2	0.2	-0.0490	0.0173	
49.7	0.0	-0.0553	0.0097	
47.4	1.1	-0.0400	0.0177	
0.0	50.0	-0.0054	0.0524	
38.2	3.7	-0.0378	0.0242	
48.5	0.1	-0.0495	0.0145	
7.8	28.4	-0.0242	0.0369	
0.0	50.0	0.0108	0.0552	Positive
4.9	31.2	-0.0224	0.0390	
0.0	25.0	-0.0407	0.1204	
0.0	42.1	-0.0131	0.1211	
0.0	50.0	0.0519	0.1223	Positive
0.0	50.0	0.0314	0.0902	Positive
50.0	0.0	-0.0888	-0.0712	Negative
100.0	0.0	-0.0079	-0.0041	Negative
100.0	0.0	-0.0447	-0.0211	Negative

Variable
Family Size
Sex of Household Head (Female = 1)
Age of Household Head
Household Head Education: Elementary Undergraduate
Household Head Education: Elementary Graduate
Household Head Education: Highschool Undergraduate
Household Head Education: Highschool Graduate
Household Head Education: College Undergraduate
Household Head Education: College Graduate or Higher
Region I: Ilocos Region
Region II: Cagayan Valley
Region III: Central Luzon
Region V: Bicol Region
Region VI: Western Visayas
Region VII: Central Visayas
Region VIII: Eastern Visayas
Region IX: Zamboanga Peninsula
Region X: Northern Mindanao
Region XI: Davao Region
Region XII: SOCCSKSARGEN
Region: CAR
Region: ARMM
Region: Caraga
Region IVA: CALABARZON
Region IVB: MIMAROPA

% Negative Significance	% Positive Significance	Extreme Lower Bound	Extreme Upper Bound	Robustness
1.7	94.9	-0.0050	0.0133	
0.3	87.9	-0.0066	0.0240	
100.0	0.0	-0.0031	-0.0012	Negative
100.0	0.0	-0.1245	-0.0997	Negative
100.0	0.0	-0.2250	-0.1862	Negative
100.0	0.0	-0.2584	-0.2100	Negative
100.0	0.0	-0.3017	-0.2412	Negative
100.0	0.0	-0.3300	-0.2571	Negative
100.0	0.0	-0.3629	-0.2769	Negative
100.0	0.0	-0.0433	-0.0131	Negative
100.0	0.0	-0.0562	-0.0136	Negative
100.0	0.0	-0.0464	-0.0188	Negative
0.0	100.0	0.0294	0.0579	Positive
0.0	100.0	0.0248	0.0540	Positive
0.0	100.0	0.0212	0.0443	Positive
0.0	100.0	0.0199	0.0499	Positive
0.0	100.0	0.0565	0.0954	Positive
0.0	100.0	0.0135	0.0495	Positive
0.0	100.0	0.0249	0.0550	Positive
0.0	100.0	0.0429	0.0815	Positive
54.6	0.0	-0.0247	0.0124	
0.0	100.0	0.1075	0.1488	Positive
0.0	100.0	0.0079	0.0400	Positive
100.0	0.0	-0.0259	-0.0029	Negative
0.0	100.0	0.0334	0.0709	Positive

Appendix 6. BACE Results for Control Variables (Dependent=MPI)

Variable	Posterior Inclusion Probability
Community Public Goods Index	1.0000
Urbanity (Urban = 1)	1.0000
Family Size	1.0000
Sex of Household Head (Female = 1)	1.0000
Age of Household Head	1.0000
Household Head Education: Elementary Undergraduate	1.0000
Household Head Education: Elementary Graduate	1.0000
Household Head Education: Highschool Undergraduate	1.0000
Household Head Education: Highschool Graduate	1.0000
Household Head Education: College Undergraduate	1.0000
Household Head Education: College Graduate or Higher	1.0000
Region I: Ilocos Region	1.0000
Region II: Cagayan Valley	1.0000
Region III: Central Luzon	1.0000
Region V: Bicol Region	1.0000
Region VI: Western Visayas	1.0000
Region VII: Central Visayas	1.0000
Region VIII: Eastern Visayas	1.0000
Region IX: Zamboanga Peninsula	1.0000
Region X: Northern Mindanao	1.0000
Region XI: Davao Region	1.0000
Region XII: SOCCSKSARGEN	1.0000
Region: CAR	1.0000
Region: ARMM	1.0000
Region: Caraga	1.0000
Region IVA: CALABARZON	1.0000
Region IVB: MIMAROPA	1.0000

Note: Posterior inclusion probability of all variables is one because all control variables were fixed in the regressions.

Posterior Mean	Posterior Variance	Sign Certainty Probability	Robustness
-0.0068	0.0000	1.0000	Robust
-0.0383	0.0000	1.0000	Robust
0.0056	0.0000	0.9997	Robust
0.0108	0.0000	0.9925	Robust
-0.0023	0.0000	1.0000	Robust
-0.1157	0.0000	1.0000	Robust
-0.2139	0.0000	1.0000	Robust
-0.2454	0.0001	1.0000	Robust
-0.2873	0.0001	1.0000	Robust
-0.3135	0.0001	1.0000	Robust
-0.3439	0.0001	1.0000	Robust
-0.0258	0.0000	1.0000	Robust
-0.0302	0.0001	1.0000	Robust
-0.0340	0.0000	1.0000	Robust
0.0494	0.0000	1.0000	Robust
0.0428	0.0000	1.0000	Robust
0.0336	0.0000	1.0000	Robust
0.0379	0.0000	1.0000	Robust
0.0829	0.0000	1.0000	Robust
0.0375	0.0000	1.0000	Robust
0.0460	0.0000	1.0000	Robust
0.0698	0.0000	1.0000	Robust
0.0009	0.0000	0.5682	Fragile
0.1355	0.0000	1.0000	Robust
0.0290	0.0000	1.0000	Robust
-0.0161	0.0000	1.0000	Robust
0.0600	0.0000	1.0000	Robust