Journal of Economic Cooperation and Development, **39**, 3 (2018), 1-38

The Multidimensional Approach to Poverty Measurement in Indonesia: *Measurements, Determinants and its Policy Implications*

Dwi Rani Puspa Artha[1] and Teguh Dartanto[2]

The notion of poverty is diverse, dynamic, and multidimensional. Conventional poverty measurement using either the consumption or the income approach is insufficient for explaining the multiple deprivations faced by the poor. Therefore, this study aims at analyzing a multidimensional poverty measurement in Indonesia. Applying Alkire and Foster's multidimensional framework and utilizing the 2011 National Socio-Economic Survey Indonesia, this study confirmed that the monetary measurement of poverty should be complemented with the multidimensional poverty measurement to capture a comprehensive picture of deprivation in Indonesia. Around 61% of populations categorized as non-poor by the conventional poverty measurement are still categorized as poor using the multidimensional poverty measurement. Although Spearman's rank correlations shows that both poverty measurements at the provincial level are weakly correlated, our econometric estimations confirmed that both determinants of poverty are relatively similar – for instance, a higher educational attainment of the household head leads to a higher probability of being non-poor in terms of both monetary and multidimensional poverty. Our study also identifies that a health indicator is the major source of multidimensional poverty in Indonesia; therefore, a universal health program launched in 2014 is important for tackling multidimensional poverty as well as improving human capital.

Keywords: Multidimensional poverty; Monetary poverty; Determinants of poverty; Indonesia

1. Introduction

The broadening of the definition of poverty has caused increased criticism regarding the measurement of poverty, which is based solely on monetary attributes such as income or consumption. Critics argue that monetary

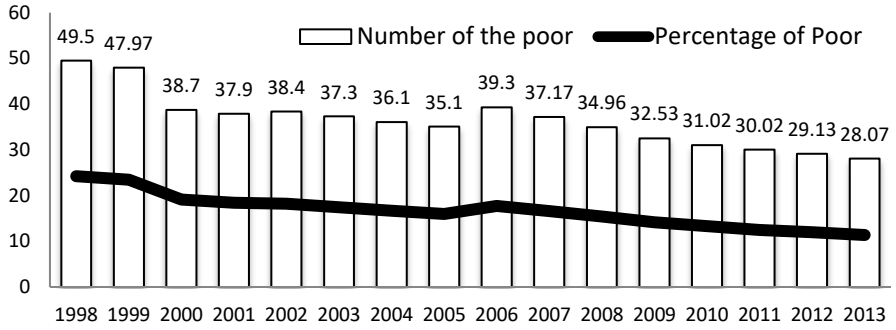
[1] Institute for Economic and Social Research, Faculty of Economics and Business, Universitas Indonesia
[2] Department of Economics, Faculty of Economics and Business, Universitas Indonesia Campus, Indonesia Corresponding Author: teguh.dartanto@ui.ac.id

poverty measurements alone are insufficient to explain multiple deprivations of the poor. Poverty measurement should involve basic human needs such as health and education (Tsui, 2002). Poverty is essentially a multidimensional phenomenon, so it should be explained by a multidimensional approach (Bourguignon and Chakravarty, 2003). Many researchers have proposed new methods of poverty measurement employing a multidimensional approach. For example, Alkire and Foster (2007) proposed a multidimensional poverty measurement using FGT's (Foster, Greer, and Thorbecke) class of one-dimensional poverty measurements.

Indonesian poverty measurement uses the concept of ability to satisfy minimum basic food and non-food needs measured from the consumption side (monetary attribute only). Over the past 15 years, Indonesia has recorded a significant reduction of poverty by over 40% (Figure 1). However, as mentioned previously, a single measurement of poverty might not be sufficient to capture the multiple deprivations of the poor, since those categorized as non-poor by the monetary poverty measurement could still be categorized as poor by the multidimensional poverty approach due to shortcomings in their living standard – for instance, a lack of basic sanitation.

Based on the 2011 National Socio-Economic Survey (SUSENAS), we found that the non-poor of monetary poverty are also still deprived in non-monetary indicators, such as health (childbirth processes), education (illiteracy), housing, drinking water, sanitation, cooking fuel, and asset ownership. Almost 20% of those among the monetary non-poor are deprived in terms of health, while 8% are deprived in the area of education. Over 20% of the monetary non-poor cannot afford clean drinking water, while almost 40% do not have access to basic sanitation, proper cooking fuel and asset ownership. Even though the poverty indicator (monetary measure) is statistically decreasing, the statistical figure cannot comprehensively capture human deprivation in terms of non-monetary indicators. Therefore, it is important to employ the Multidimensional Poverty Index (MPI) to complement the money metric of poverty measurement.

Figure 1: Poverty in Indonesia (1998–2013)



Source: Central Statistics Agency of Indonesia

This paper aims at addressing the following two research objectives: (1) measuring and comparing the headcount of multidimensional poverty (MPI henceforth) and the monetary poverty index in Indonesia; and (2) exploring the determinants of the multidimensional poverty and the money metric of poverty. The MPI informs policymakers that human deprivation is not always about money; therefore, government programs and interventions aimed at alleviating poverty should also address non-monetary issues. In addition, the MPI can aid effective and efficient allocation of resources by targeting those most affected by poverty. It can also help address SDGs (sustainable development goals) strategically and monitor impacts of policy intervention.

Previous research about the Multidimensional Poverty Index in Indonesia has been conducted by Alkire and Santos (2010) and Whardana (2010). Alkire and Santos (2010) measured the Multidimensional Poverty Index in 104 countries, including Indonesia. They used three dimensions: health, education, and living standard. They found that 1.7 billion people are living in multidimensional poverty and most of them live in middle-income countries. Whardana (2010) compared multidimensional poverty and monetary poverty using the Indonesian Family Life Survey (IFLS). This study revealed that human assets (health and education) contribute more than physical assets (living standard) in terms of multidimensional poverty.

Unlike all previous studies that used the Indonesian Family Life Survey (IFLS 1, 2, 3, 4), this study utilizes the 2011 National Socio-Economic Survey Indonesia (Susenas) collected by the Central Statistics Agency of Indonesia. Susenas data is more up to date than Indonesian Family Life Survey (IFLS) data. Susenas covers all provinces in Indonesia and presents a better overall picture compared to that of the IFLS data, which only covers 13 of 33 provinces. Therefore, using the Susenas dataset, we could disaggregate the multidimensional poverty measurements to the provincial level. This research therefore provides an alternative approach for exploring multidimensional poverty in Indonesia using the most available and most suitable data. We also accommodate some new indicators of the poverty dimension that capture new dimensions of deprivation in Indonesia.

The article proceeds as follows: section 2 provides a literature review of multidimensional poverty measurement; section 3 presents the methodological framework, data and econometric estimation procedure; section 4 analyzes the findings of the MPI as well as its determinants; lastly, the concluding section of the paper summarizes the key findings and discusses policy implications.

2. Literature Review

2.1 Defining poverty measurement

Poverty measurements have improved compared to those employed a hundred years ago. The United Nations Development Programme (UNDP) and Amartya Sen have created the Human Development Index (HDI) as an alternative assessment to determine whether a country is developed, developing, or underdeveloped, using not only economic indicators but also social indicators. The HDI comprises three components: health, education, and standard of living. Health is measured by life expectancy at birth; education is measured by a combination of adult literacy and gross enrollment; and the standard of living is measured by GDP per capita. The HDI, however, is not responsive to changing policies over a short time period. Therefore, the Human Poverty Index (HPI) was introduced to improve the HDI. The HPI used the deprivation concept,

whereby poverty is considered a situation in which people are not able to fulfill the basic needs of life.

The HPI measures deprivation in each dimension of human development, while the HDI measures the average achievements. Both measurements are only able to analyze at regional/national levels; however, they are unable to analyze poverty at the household level. The Multidimensional Poverty Index (MPI) is then employed to complement both previous measurements. The MPI is able to analyze poverty at household/individual level. Alkire and Santos (2010) introduced the MPI as a composite measure of health, education, and standard of living. Health is approached in terms of nutrition and child mortality. Education is measured by years of schooling and enrollment levels. Standard of living considers a combination of cooking fuel availability, sanitation, water quality, electricity, floor conditions, and asset conditions.

Alkire and Foster (2007) propose a new approach of a weighting system to identify the poor. Any person deprived in a certain dimension will be given a certain weight. The total weight is ranked 0–1. Each dimension has an equal weight, so if we use n-dimensions, the weight for each dimension is 1/n. If one dimension consists of several indicators, then each indicator's weight in the same dimension has equal value. The second cutoff is simply the number of dimensions in which a deprived person must be in order to be considered poor (Alkire and Foster, 2011a; 2011b). The advantage of this method is that the identification approach is applicable to ordinal variables. All cardinalizations of ordinal variables yield identical conclusions when applying both cutoffs. Also, these methods are sensitive to the joint distribution of deprivations (Alkire and Foster, 2011a; 2011b).

This method has been applied in many countries around the world. Awan et al. (2011) applied Alkire and Foster's method (AFM) for measuring multidimensional poverty in Punjab Province, Pakistan. This study uses eight dimensions to measure multidimensional poverty: housing, water, sanitation, electricity, assets, education, expenditure, and land. The results show that land, expenditure, sanitation, housing, and education are the major contributors within overall multidimensional poverty. Other research conducted by Batana (2008) in sub-Saharan Africa defines four

dimensions of MPI: assets, health, schooling, and empowerment. This study concludes that AFM is appropriate for measuring poverty in developing countries such as those in sub-Saharan Africa. Whelan et al. (2014) applied AFM by using 20 non-monetary indicators grouped into four dimensions – basic deprivation, consumption, health, and neighborhood environment – for 28 European countries. Naveed and Tanweer-ul-Islam (2011) applied AFM in Pakistan to calculate multidimensional poverty measurements with four dimensions: education, health and nutrition, living standard, and wealth. The results show that multidimensional poverty incidence is significantly higher than monetary poverty incidence (which is consumption based). This study also verifies that consumption alone does not sufficiently explain deprivations faced by the poor.

Alkire and Foster (2007) already illustrated multidimensional poverty measurement using Indonesian data. In 2010, Alkire and Santos (2010) measured multidimensional poverty incidence in Indonesia by using three dimensions: education, health, and standard of living. Similar to three dimensions used by Alkire and Santos (2010), Whardana (2010) also estimated multidimensional poverty incidence in Indonesia compared to monetary poverty. This study reveals that human assets (health and education) contribute more to the Multidimensional Poverty Index than physical assets (living standard).

2.2 Determinants of poverty

Many studies have found that the key determinants of monetary poverty are human capital, demographic factors, geographical location, physical assets, and occupational status. Fissuh and Harris (2005) found that regional unemployment is positively related to poverty in Eritrea, while remittance, house ownership, access to sewage, and sanitation have negative effects. Awan and Iqbal (2010) found that public employment, the informal sector, household size, and age and sex compositions of heads of households are determinants of food calorie (consumption) poverty in Pakistan. Baiyegunhi and Fraser (2010) showed that age, level of education and occupation of household heads, dependency ratio, exposures to idiosyncratic risk, and access to credit are significant in explaining a household's vulnerability to poverty in South Africa. Usman,

Sinaga, and Siregar (2006) confirmed that agricultural activity, education, family health, and infrastructure are other important factors often associated with poverty in Indonesia.

Dartanto and Otsubo (2013) also proved that the determinants of consumption poverty are educational attainment, size of household, physical assets, employment status, health shocks, sectors in which people work, the availability of microcredit programs, and regional characteristics such as agricultural productivity, the Human Development Index and sanitation availability. In addition, Dartanto and Nurkholis (2013) also confirm that the determinants of poverty dynamics in Indonesia are educational attainment, the number of household members, physical assets, employment status, health shocks, the microcredit program, access to electricity, and changes in employment sector and employment status.

Bruck and Kebede (2013) compared consumption poverty and multidimensional poverty in rural Ethiopia. They found that the determinants of these two poverty measurements are different. A household's size matters in consumption poverty but not in multidimensional poverty. This also applies to the drought shock effect. Short-term shocks are reflected more in consumption poverty, while simultaneous shocks are significant for multidimensional poverty. Abufhele and Puentes (2011) compared income poverty to the multidimensional poverty approach. They verified that increasing the years of schooling could provide a more sustainable contribution to staying out of impoverished conditions in the long run. Level of education has the strongest relation to both poverty measurements. The age of a household head or house owner has a positive relation to multidimensional poverty.

3. Methodology

3.1 Counting multidimensional poverty

We follow Alkire and Foster's methodology of multidimensional poverty (2007). Suppose we have a group of individuals. Let d≥2 be the number of dimensions and $x = [x_{ij}]$ the n x d matrix of achievements, where x_{ij}

is the achievement of individual i (i = 1, ..., n) in dimension j (j =1, ..., d). x is of the following form:

$$x = \begin{pmatrix} x_{11} & . & x_{1j} & . & x_{1d} \\ . & . & . & . & \text{d dimension} \\ x_{i1} & . & x_{ij} & . & x_{id} \\ . & . & . & . & . \\ x_{n1} & . & x_{nj} & . & x_{nd} \end{pmatrix} \Big\} \text{n individual}$$

Let z be a row vector of dimension-specific thresholds z_j, x_i the row vector of individual i's achievements in each dimension, and x_ja column vector of dimension j's achievements across the set of individuals. Suppose matrix deprivation $x^0 = [x_{ij}^0]$ is derived from x as follows:

$$x_{ij}^0 = \begin{cases} 1 \; if \; x_{ij} < z_j \\ 0 \; otherwise \end{cases}$$

$x_{ij}^0 = 1$ means that individual i is deprived in dimension j, while $x_{ij}^0 = 0$ means that individual i is not. Let k be the cutoff. By summing each row of x_{ij}^0, we obtain a column vector c of deprivation counts containing c_i, the number of deprivations suffered by individual i. An individual i will be considered as poor if $c_i \geq k$

$$p_k = \begin{cases} 1 \; if \; c_i \geq k \\ 0 \; if \; not \end{cases}$$

The first measure is given by a headcount ratio *H*. Let q_k be the number of poor identified according to the threshold vector *z* and the cutoff *k. H* is calculated as follows:

$$H = \frac{q_k}{n}; q_k = \sum_{i=1}^{n} p_k$$

The share of possible deprivations suffered by a poor individual i is given by:

$$\bar{c}_i(k) = \frac{1}{d}[c_i p_k]$$

and the average deprivation share across the poor is given by:

$$A = \frac{1}{q_k d} \sum_{i=1}^{n} c_i p_k$$

The adjusted headcount ratio is the total number of deprivations experienced by the poor divided by the maximum possible number of deprivations experienced by all people (Alkire and Foster, 2007). It integrates the headcount ratio of poverty (H) and the average deprivation share among the poor (A). A is the average deprivation gap and is calculated as the sum of deprivation divided by the total number of poor people. The adjusted headcount not only provides information about the percentage of the poor, but also about the depth of deprivation among the poor. Then, the adjusted headcount ratio is the so called Multidimensional Poverty Index (MPI=H.A).

$$M_0 = H\,A = \frac{1}{nd} \sum_{i=1}^{n} c_i p_k$$

3.2 Data and selection of dimensions, indicators, and cutoffs *Data*

This paper uses the 2011 National Socio-Economic Survey Indonesia (Susenas) data collected by the Central Statistics Agency of Indonesia. The survey covers all of the 33 provinces in Indonesia, providing rich information on education, health, employment, housing, and other social information. Susenas surveyed 285,307 households and 1,118,239 individuals. This paper also combines the 2011 Susenas and the 2011 Village Potential Statistics (Podes). The 2011 Podes provides information about village characteristics for all villages in Indonesia (77,961). It is surveyed in the context of the periodic censuses (Agriculture, Economy, and Population). Using the emerging data, we obtained data about 253,280 households from a total of 56,848,691 households in Indonesia. The Susenas data is used for calculating the MPI, while the combined dataset between Susenas and Podes is used for estimating poverty determinants.

Selection of dimensions, indicators, and cutoffs

The selection of dimensions, indicators, and cutoffs for each indicator is complex and incorporates methodological decisions and political considerations (Abufhele and Puentes, 2011). Most past studies did not explain how dimensions were chosen explicitly. Alkire and Foster (2011a & 2011b) concluded five methods of selection, and most were used implicitly: (1) using ongoing participatory public deliberation; (2) using lists that have achieved a degree of legitimacy through public consensus; (3) implicit or explicit assumptions about what people value or should value; (4) convenience or a convention that is taken to be authoritative or used because these are the only data available that have the required characteristics; (5) empirical evidence regarding people's values, data on consumer preferences and behaviors, or studies of what values are most conducive to people's mental health or social benefit.

Based on the literature and available data, the dimensions considered in this study are: health, education, and standard of living. After identifying the dimensions, Table 1 shows a list of indicators and a cutoff point for each indicator. The advantage of AFM is that it allows for categorical/ordinal data or even qualitative data as long as we can clearly identify who is deprived in a particular dimension. The next step is to assign weight to various dimensions/indicators on the basis of specific criteria. AFM provides the opportunity to assign the same or different weights to various dimensions, depending upon their relative importance. For example, if policymakers want to emphasize the education dimension, they can allocate deprivation a higher weight in this dimension than in others. We assign equal weights to all three dimensions. The dimension weight is then equally divided into its nested indicators. The indicators in the same dimension have the same weight. The details of weights are provided below in Table 1.

Table 1: Preliminary Indicators

Dimension	Indicator (question code)	Deprived if	Weight
Health	Unhealthy (b5r2)	Any household member has experienced illness in the previous one month prior to the survey	0.167
	Health insurance (b7r6a-g)	Household is not covered by health insurance	0.167
Education	Adult illiteracy (b5r19a)	At least one household member cannot read or write (age≥15)	0.167
	Years of schooling (b5r17)	At least one adult member in the household did not complete secondary school (junior high school; age≥18)	0.167
Standard of living	House floor (b6r7)	Majority of house floor is sand	0.056
	Sanitation (b6r13a-b)	House has no toilet with septic tank / shares public toilet	0.056
	Drinking water (b6r9a)	Household does not use proper drinking water, i.e. bottled water/mineral water, tap water, pump/well, protected spring water	0.056
	Electricity (b6r14a)	House does not have installed electricity	0.056
	Cooking fuel (b6r15)	Household's cooking fuel is firewood/charcoal/briquettes	0.056
	Asset ownership (b7r4a-j)	Household does not own a vehicle (car, boat, bike, motorbike) and does not own more than one of these: TV, air conditioner, heater, or refrigerator	0.056

Source: Authors' compilation

Education is important for increasing individuals' well-being. Educated people, including those in low-income developing countries, enjoy higher earnings than those who are less educated (Roberts, 2003). There is also a private benefit from education. It gives individuals the opportunity to participate actively in social, economic, and political activities of their lives (Naveed and Tanweer-ul-Islam, 2011). The two indicators selected under this dimension are described below:

a. Adult illiteracy: The literacy rate of 15–24-year-olds is one of the indicators for achieving sustainable development goal (SDG) 4. This indicator is used to look at the quality of education in the whole household.

b. Years of schooling: Access to universal primary education is SDG 4. However, since May 1994, Indonesia already has its own program called the "9-year Compulsory Education Program," which encourages children to complete secondary school. It further states that an important stage in the development of education is to improve compulsory education between the ages of six and nine years old. Implementation of the program has become more widespread under Law Number 20 of 2003.

Like education, health also has an important role in determining individuals' well-being. Health, as a part of well-being, is becoming SDG 3. Health conditions will impact directly on daily activities. The two indicators selected under this dimension are described below:

a. Unhealthy: This indicator reflects the condition of household members' health – being healthy or not. Unhealthy workers will have decreased productivity. Unhealthy students will struggle to learn and concentrate.

b. Health insurance: the poorest countries in the world are characterized by extremely low expenditure on health compared with high-income countries. Expanding coverage of health insurance would be one strategy for developing countries to increase access to health services as well as to provide financial protection to low-income groups (OECD, 2003).

The standard of living dimension has several indicators that portray the conditions under which households live. A total of six indicators are selected under this dimension:

a. House floor: This indicator describes the quality of housing by identifying whether the majority of the house floor is built of mud.

b. Sanitation: Having a private toilet is an important dimension of a household's' well-being. Poor sanitary facilities can have disastrous consequences for human health (Bartram et al., 2004). Having improved sanitation is also part of SDG 6.

c. Drinking water: Clean drinking water is also an important dimension of a household's well-being. Water contamination is the major source of many diseases, such as typhoid, cholera, hepatitis, worm infestation, diarrhea, skin infection, eye infection, stomach problems, and allergies (Jabeen et al., 2011). Increased access to safe drinking water is also part of SDG 6.

d. Electricity: This indicator is also an important dimension of a household's well-being. It gives the household access to several activities.

e. Cooking fuel: The type of fuel used for cooking is crucial for the health of a household, particularly for women who are almost exclusively involved in cooking in Pakistan (Naveed and Tanweer-ul-Islam, 2011). Moreover, cooking fuel also affects the environment and indirectly corresponds to SDG 7.

f. Asset ownership: Household assets reflect the long-term material well-being status of the household. Asset ownership shows the stock of wealth.

We apply these indicators to the household data in Susenas. We then calculate the headcount index of the MPI, and those that do not meet several indicators are categorized as multidimensional poor households.

3.3 Model for determinants of multidimensional poverty and monetary poverty

We use a logit model to examine the determinants of poverty measurements of each of the poverty categories – that is, why households are categorized as poor or not poor in terms of monetary poverty and multidimensional poverty (Eq. 1). We also apply an ordered logit model to examine the relative effects of different household characteristics on their poverty outcomes (Dartanto and Otsubo, 2013) – that is, why individuals only experience one poverty measurement while others experience poverty in two measurements (Eq. 2).

The logit and ordered logit models are as follows:

$$\Pr\left(y_i^{LM} = 1\right) = \frac{e^{\sum_{n=1}^{N} \alpha_n CH_{ni} + \sum_{m=1}^{M} \alpha_m RC_{mi} + e_i}}{1 + e^{\sum_{n=1}^{N} \alpha_n CH_{ni} + \sum_{m=1}^{M} \alpha_m RC_{mi} + e_i}} \quad (1)$$

$$\Pr\left(y_i^{OLM} = 0\right) = \frac{e^{\sum_{n=1}^{N} \alpha_n CH_{ni} + \sum_{m=1}^{M} \alpha_m RC_{mi} + e_i}}{1 + e^{\sum_{n=1}^{N} \alpha_n CH_{ni} + \sum_{m=1}^{M} \alpha_m RC_{mi} + e_i}} \quad (2)$$

where,

- y_i^{LM} is a poverty category for each of two poverty measurements: 1 = poor, 0= non-poor;
- y_i^{OLM} is a poverty experience: 0 = non-poor in two poverty measurements; 1 = poor in only monetary measurements; 2 = poor in two poverty measurements;
- e_i is an error term;
- i is the household identifier (i = 1, …, 253,280);
- CH_i is a vector of household characteristics, including marital status of household head, educational attainment of household head, number of household members, locational dummy, size of house, and access to the government's credit program (n=1, 2, …, N);

- RC_i is a vector of village characteristics, including village location, being directly adjacent to the sea, ratio of males in the population, ratio of agricultural families and ratio of male migrant workers in the village, heterogeneity of ethnicity in the village, ratio of medical experts living in the village, road condition in the village, and availability of a commercial bank in the village (m=1, 2, …, M).

Eq. 1 is a logit model with binary response outcomes y = {0, 1}. The logit model solves these problems:

$$\ln\frac{p}{1-p} = \sum_{n=1}^{N} \alpha_n CH_{ni} + \sum_{m=1}^{M} \alpha_m RC_{mi}\,;\; p = Pr(y = 1)$$

The estimated probability is:

$$p = \frac{1}{\left(1 + e^{-\left(\sum_{n=1}^{N} \alpha_n CH_{ni} + \sum_{m=1}^{M} \alpha_m RC_{mi}\right)}\right)}$$

Eq. 2 is an ordered response model with three outcomes y = {0, 1, 2}. Ordered logit is often conceptualized as a latent variable model. The latent variable y* is determined by,

$$y^* = x\beta + e, e|x \sim Normal(0,1)$$

where β is a kx1 coefficient vector, and for reasons to be seen, vector **x** does not contain a constant.

We estimate all parameters using the maximum likelihood estimation. The estimated coefficients cannot be interpreted directly but the signs have exactly the same meaning as those estimated by ordinary least squares (OLS). A negative sign implies that the choice probabilities shift to lower categories when the explanatory variable increases. We are interested in the response probabilities or partial effects of the ordered probit/logit models (for a detailed explanation of the response probabilities, see Wooldridge (2010).

Table 2: Explanatory variables used in logit and ordered logit models

Variables	**Measurements and units**	**Expected effect**
Household Characteristics		
Marital status of household head	1=married; 0=other	+/–
Educational attainment of household head	Completed schooling of household head (0=no schooling, 1=elementary, 2=junior high, 3=senior high, 4=one to three years of vocational training, 5=undergraduate, and 6=post graduate level education)	–
Number of household members	The number of household members	+
Location dummy	1=urban; 0=other	-
Size of house	Log size of the house (square meters)	-
Access to poverty credit program	1=having; 0=other	-
Village Characteristics		
Village location	1=flatland; 0=other	-
Adjacent to the sea	1=yes; 0=no	-
Ratio of agricultural families in the village		+
Ratio of male migrant workers in the village		+
Ethnic groups in the village	1=having more than one ethnic group; 0=other	-
Ratio of medical experts living in the village		-
Main road condition in the village	1=asphalt; 0=other	-
Availability of a commercial bank in the village	1=having commercial bank; 0=not having	-

Source: Authors

4. Multidimensional poverty analysis

4.1 The Multidimensional Poverty Index in Indonesia

Table 3 presents a headcount index for all provinces in Indonesia. The national poverty index of both poverty measurements in 2011 is 12.14% (for monetary poverty) and 73.4% (for multidimensional poverty). There was over a 60 percentage-point difference in poverty outcomes between monetary and multidimensional poverty. This indicates that the monetary indicator of poverty does not sufficiently represent the deprivation of society in Indonesia. People might not be categorized as poor in terms of monetary poverty, but when they do not have access to education, health, and clean energy sources, then they most certainly are poor.

The highest level of monetary poverty is found in Papua (33.27%), and the highest level of multidimensional poverty is found in East Nusa Tenggara (84.93%), while the lowest level of monetary poverty is found in Jakarta (3.45%), and the lowest level of multidimensional poverty is found in the Riau Islands (50.79%). The top three provinces in terms of the biggest percentage-point differences in poverty outcomes between monetary and multidimensional poverty are West Kalimantan (75.1%), Central Kalimantan (73.14%), and West Sulawesi (70.78%). These three provinces have over a 70 percentage-point difference in poverty outcomes between monetary and multidimensional poverty. In addition, their monetary poverty index is much lower than the national monetary poverty index, while their Multidimensional Poverty Index is higher than the national Multidimensional Poverty Index. It indicates that the income is spent in a small portion to fulfill the needs of health, education and living standard. Those living in these three provinces do not have a serious concern on the issues of health, education and living standard.

Table 3: Headcount ratios of monetary and multidimensional poverty (%)

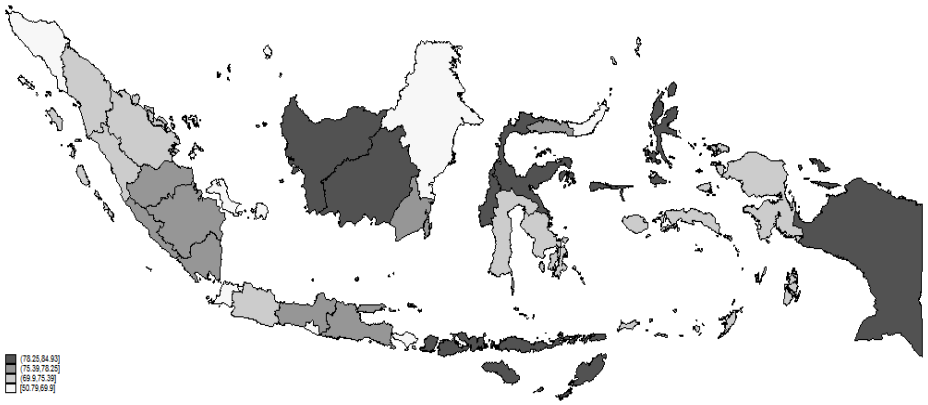
Province	**Headcount Monetary Poverty Index**	**Headcount Multidimensional Poverty Index**
Aceh	18.18	59.58
North Sumatra	9.59	73.04
West Sumatra	8.19	75.39
Riau	7.81	73.42
Jambi	7.73	78.25
South Sumatra	14.1	77.4
Bengkulu	16.63	75.58
Lampung	16.42	78.1
Bangka Belitung	4.39	65.26
Riau Islands	7.25	50.79
Jakarta	3.54	56.47
West Java	10.48	71.36
Central Java	15.43	77.15
Yogyakarta	15.56	61.51
East Java	13.92	78.09
Banten	6.7	68.5
Bali	4.74	63.11
West Nusa Tenggara	17.99	79.78
East Nusa Tenggara	23.82	84.93
West Kalimantan	7.65	82.75
Central Kalimantan	5.93	79.07
South Kalimantan	5.09	75.48
East Kalimantan	6.9	52.17
North Sulawesi	7.6	69.9
Central Sulawesi	14.18	79.48
South Sulawesi	11.67	71.41
Southeast Sulawesi	12.04	72.78
Gorontalo	18.09	78.1
West Sulawesi	12.53	83.31
Maluku	19.61	73.54
North Maluku	9.92	79.05
West Papua	26.83	70.52
Papua	33.27	83.26
National	12.14	73.4

Source: Authors' calculation

Figures 2 and 3 show the headcounts of the monetary poverty index and the Multidimensional Poverty Index in each province of Indonesia. The map categorizes the province index into four levels: very low, low, medium, and high. The figures clearly portray the shifting of the index level in some provinces. Some provinces that are at a low level among all the provinces in the monetary poverty index move to a high level in the Multidimensional Poverty Index. Central Kalimantan raises three levels from monetary poverty to multidimensional poverty: very low in the monetary poverty index to high in the Multidimensional Poverty Index. This means that the monetary poverty is not enough in capturing the deprivation of the poor.

Figure 2: Map of Headcount of the Monetary (Expenditure) Poverty Index

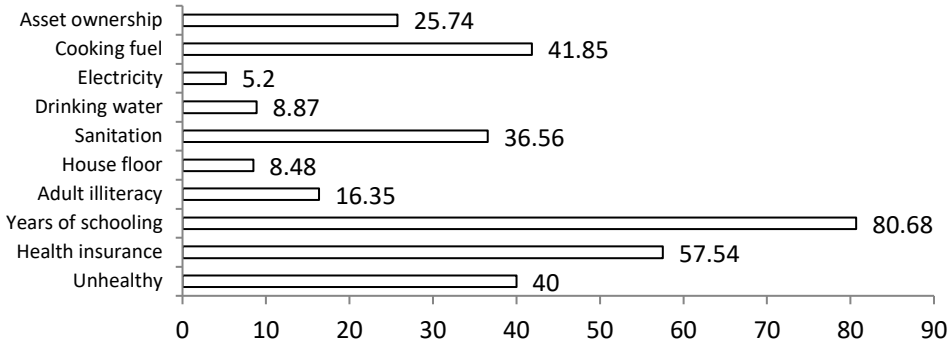
Figure 3: Map of Headcount of the Multidimensional Poverty Index



4.2 Driver of multidimensional poverty and its policy implications

Figure 4 presents the percentage of individuals under the cutoff for each indicator of the three dimensions. In terms of years of schooling, the cutoff is any adult member in the household who has completed secondary school; over 80% of individuals are deprived in years of schooling. This finding illustrates that the level of education in Indonesia is still low. In terms of cooking fuel, since 2007, Indonesia has had a program encouraging 40 million poor households to use gas. It appears that this program has not provided satisfactory results. In terms of standard of living, 34% of individuals do not have improved sanitation. House floor and drinking water conditions appear average. The figure shows that almost all Indonesians have access to electricity. Almost 60% of individuals are deprived of health insurance and 41% are deprived of cooking fuel. Although, since 2005, the Indonesian government has issued a special program for the funding of social health insurance to protect the poor, it is not widely distributed to cover the entire population.

Figure 3: Percentage of deprivation for various indicators

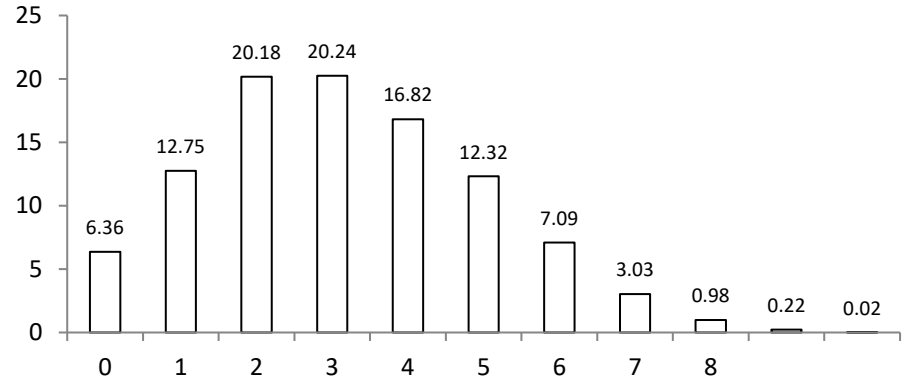


Source: Authors' calculation

Figure 5 presents the percentage of individuals facing deprivation for exact numbers of indicators. Very few individuals (6.36%) are found to have no deprivation at all. The result is quiet shocking, with over 90% of individuals deprived in at least one of the indicators. If we use the union approach and set the indicator as a dimension, then almost all households are categorized as poor. Most individuals are deprived in two to four

indicators. The figure also reveals that over 50% of individuals are deprived in three or more indicators. About 4.25% of individuals are deprived in seven or more indicators, and 0.02% of individuals are deprived in all indicators.

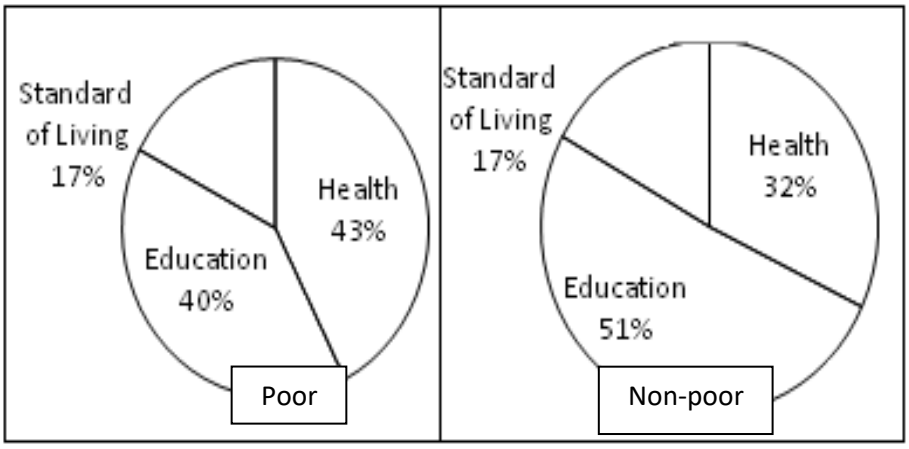
Figure 4: Percentage of individuals facing various numbers of deprivations



Source: Authors' calculation

Figure 6 presents the contribution of each dimension to the overall deprivation experienced by those falling below the poverty line (second cutoff, k=1/3). It shows the dimension-wise deconstruction of multidimensional poverty at the aggregate level. Health makes the highest contribution in overall deprivation faced by the multidimensional poor. This reflects the poor state of health in the whole country. The next contributor to poverty is lack of education. This reflects the unsatisfactory education level in Indonesia. In order to alleviate multidimensional poverty, the government and other stakeholders should prioritize health, particularly awareness of health insurance, due to it being one of the main drivers of multidimensional poverty.

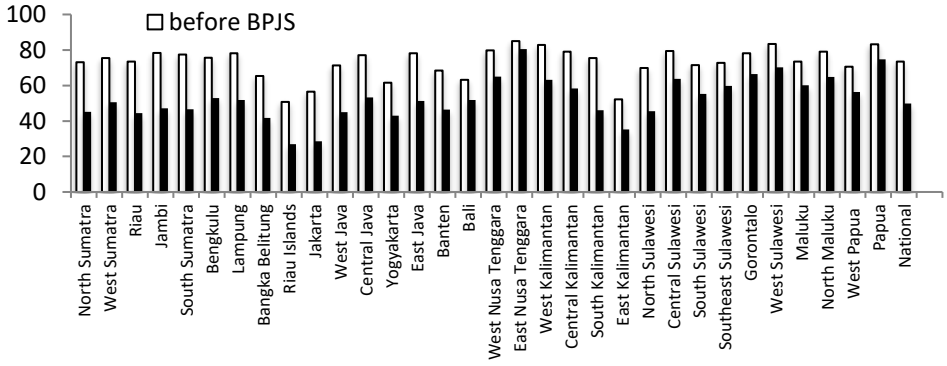
Figure 5: Poverty drivers of the multidimensional poor and non-poor (%)



Source: Authors' calculation

Since 2014, the government has introduced National Health Insurance (*Jaminan Kesehatan Nasional* / *JKN*) with the aim of Indonesia having universal health coverage by 2019. The new program mandates all Indonesian citizens and those foreigners that have been in Indonesia for at least six months to register with BPJS Health (National Health Insurance Institution). This program will significantly change the Multidimensional Poverty Index in Indonesia. We simulated multidimensional poverty in Indonesia with an assumption that all Indonesian citizens have health insurance. Figure 7 illustrates the change in the headcount ratio index of multidimensional poverty before and after the BPJS is implemented successfully. It shows a large impact on reducing the number of multidimensional poor. At the national level, the Multidimensional Poverty Index decreases by 23.5%, from 73.4% to 35.7%. This policy is most effective when applied in Jambi, South Sumatra, South Kalimantan, Riau, Jakarta, and North Sumatra, with the Multidimensional Poverty Index decreasing by around 30% in these provinces.

Figure 6: Headcount ratio of multidimensional poverty before and after BPJS



Source: Authors' calculation

4.3 Sensitivity analysis: changes in cutoff selection

This sub-section is used to analyze the effect of changes in cutoffs on poverty measurements. We lowered the cutoffs for the education dimension. We set a new cutoff for the years of schooling indicator: households are considered deprived if all adult members have not completed secondary school (junior high school). We also amended the cutoff for illiteracy: households are considered deprived if none of the adult members of a household are able to read/write. Cutoffs for all other indicators remained the same. We call it the "W-version of multidimensional poverty" to differentiate it from the version in the previous section. We analyze whether the headcount ratio of poverty is affected by adopting the two alternative definitions.

Table 4 shows that the W-version of multidimensional poor is a subgroup of the multidimensional poor, because the W-version multidimensional indicator cutoff is lower than the multidimensional poverty cutoff. The W-version of multidimensional poor is obviously also the multidimensional poor. Around 37% of the W-version multidimensional non-poor become the multidimensional poor after raising the cutoff of the education dimension. It indicates that the measurement is quite sensitive to the cutoffs of indicators. This implies that cutoff selection is crucial in the calculation of multidimensional poverty. Therefore, policy makers or

researchers should be careful and take a serious effort to choose the dimension and indicator when they would like to calculate the MPI as a poverty indicator.

Table 4: Cross tabulation between two definitions of multidimensional poverty

		Multidimensional poverty measurements "W-version"	
		Non-poor	Poor
Multidimensional poverty measurements	Non-poor	61,954,368	0
		26.6	0
	Poor	87,777,616	83,207,062
		37.68	35.72

Source: Authors' calculation

4.4 Relationship between monetary and multidimensional poverty

Table 5 presents a cross tabulation of 1,079,277 Indonesians extracted from the 2011 Susenas, being classified as poor or non-poor by two poverty measurements. While 87.86% of the population is categorized as monetary non-poor, only 26.6% of the population is reported as multidimensional non-poor. The main difference between the two measurements is that the monetary poverty measurement provides very conservative estimates of poverty. The multidimensional poverty estimates show that 73.4% of the population falls below the poverty line –six times higher than the result when using the monetary poverty measurement, which finds only 12.14% of the population to be below the poverty line.

Table 5 contrasts the status of the population using both measurements of poverty. Around 62.3% of the population is non-poor according to the monetary poverty measurement, but in higher poverty measurement are declared as poor. This provides strong evidence that monetary (consumption) measurements alone do not satisfactorily explain deprivations faced by the poor. On the other hand, 1% of the population declared as poor by the monetary poverty measurement is considered non-poor by the multidimensional poverty measurement.

Table 5: Cross tabulation between multidimensional poverty and monetary poverty

Poverty measurements		**Multidimensional poverty**	
		Non-poor	Poor
Monetary poverty	Non-poor	59,511,584	145151670
		25.55	62.31
	Poor	2,442,784	25,833,008
		1.05	11.09

Note: For each cell, the first row contains the number of people in that category. The number in the second row shows the percentage share of the total sample population.
Source: Authors' calculation

The relationship between the two methods of poverty estimation is explored by Spearman's rank correlation. Spearman's rank correlations among the provincial rankings for both poverty indicators found that the ranking of monetary and multidimensional poverty measurements is significantly correlated among the provincial rankings. The correlation coefficient is 0.39 (p-value = 0.025). This finding is similar to that reported by Naveed and Tanweer-ul-Islam (2011). The coefficient is statistically significant, but it is low and does not provide the basis for accepting the one-dimension measure as a single, comprehensive criterion for the estimation of poverty. Besides, monetary (consumption) deprivation has a low correlation with deprivation in other dimensions. The highest correlation of consumption is 0.24, with the cooking fuel indicator.

5. Analysis of determinants of poverty in Indonesia

Before we conducted an econometric estimation, we conducted a descriptive analysis by comparing two poverty groups (Table 6): monetary poor (5,125,462 households) and multidimensional poor (39,407,050 households). Compared with the monetary poor group, the multidimensional poor group was slightly better in educational attainment and had ownership of a larger land area. The multidimensional poor group has fewer household members, lives in urban areas, and has a lower percentage of members working in the agricultural sector or as migrant

workers. Their village conditions are also better, with better main roads and the availability of a commercial bank.

Table 6: Descriptive data on poverty status

Variables	**Monetary poor**	**Multidimensional poor**
	Mean	**Mean**
Household Characteristics		
Marital status of household head (1=married; 0=other)	0.896	0.859
Educational attainment of household head (Completed schooling)	0.927	1.254
Number of household members	4.827	3.946
Locational dummy (1=urban; 0=other)	0.248	0.427
Size of house (Log size of house [square meters])	3.862	3.982
Having government credit program (1=yes; 0=no)	0.072	0.106
Village Characteristics		
Village location (1=flatland; 0=other)	0.680	0.797
Directly adjacent to the sea (1=yes; 0=no)	0.112	0.109
Ratio of agricultural families in the village	0.648	0.408
Ratio of male migrant workers in the village	0.004	0.003
Ethnic groups in the village (1=having more than one ethnic group; 0=other)	0.740	0.798
Ratio of medical experts living in the village	0.001	0.001
Main road condition in the village (1=asphalt; 0=other)	0.712	0.789
Availability of commercial bank (1=having; 0= other)	0.108	0.211
Number of Observations	5,125,462	39,407,050

Completed schooling: 0=no schooling, 1=elementary, 2=junior high, 3=senior high, 4=one to three years of vocational training, 5=undergraduate, and 6=post graduate level education)

Source: Authors' calculations based on Susenas data

5.1 Determinants of poverty

The logit and ordered logit models are estimated by the maximum likelihood estimation with robust standard errors. The estimation results of the logit model (Eq. 1) are shown in Tables 7 and 8. Table 8 shows the estimation results of poverty determinants for both monetary and multidimensional poverty measurements. Table 8 summarizes the partial effects (dy/dx) of changes in the probability of households being poor or non-poor. Estimation results of the ordered logit model (Eq. 2) are reported in Table 9. The partial effects (dy/dx) of explanatory variables on the ordered poverty experiences are summarized in Table 10.

Characteristics of a household

The result of the logit analysis shows that all family characteristic variables of marital status, educational attainment, number of household members, locational dummy (1=urban or 0=rural), size of house, and having the poverty credit program are significant. The negative coefficient of the educational attainment variable means that higher educational attainment of the household head leads to a higher probability of being non-poor. The probability of being monetary and multidimensional poor will decrease by 0.02% and 0.14%, respectively, when the completed schooling of the household head increases from one step to the other, such as no schooling to elementary school (Table 8). The effect of educational attainment is higher in multidimensional poverty than monetary poverty. These findings confirmed the conclusions of previous studies such as those conducted by Baiyegunhi and Fraser (2010), Usman, Sinaga, and Siregar (2006), Abufhele and Puentes (2011), and Dartanto and Otsubo (2013).

On the other hand, a larger number of household members increases the probability of being poor in both monetary and multidimensional poverty measurements. The probability of being monetary and multidimensional poor will increase by 0.02% and 0.015%, respectively, when households have one more child. Married households tend to be poorer. The size of the house as an indicator of physical asset ownership affects monetary and multidimensional poverty negatively and significantly. The dummy variable of location also has a negative coefficient, which means that

households in urban areas tend to be less poor. This result is predictable, because urban areas are more developed than rural areas, and there are more jobs and facilities. The headcount index for rural areas is always higher than that for urban areas in all provinces in Indonesia.

Village Characteristics

All village characteristics, including village location, being directly adjacent to the sea, ratio of male population, ratio of agricultural families, ratio of male migrant workers, ethnic groups in the neighborhood, ratio of medical experts, main road conditions, and availability of a commercial bank, are significant. The availability of asphalt roads has a significant role in reducing poverty, both in the monetary and multidimensional measurements. The availability of asphalt roads significantly correlates with the probability of being poor in monetary (0.003%) and multidimensional (0.039%) poverty measurements. The existence of medical expertise has the biggest impact in reducing poverty. The probability of being monetary and multidimensional poor will decrease by 1.25% and 4.7%, respectively, when there is an increased number of medical experts in the neighborhood. Surprisingly, the number of ethnic groups has a negative coefficient in both measurements, which means that having more than one ethnic group in a neighborhood leads to a reduction in the number of poor. Having more than one ethnic group in a neighborhood significantly reduces the probability of being poor in monetary (0.02%) and multidimensional (0.005%) poverty measurements. The availability of a commercial bank has a negative effect on monetary poverty but has no effect on poverty status in the multidimensional poverty measurement.

Table 7: Estimation results of logistic regression of poverty determinants

Variables	**Monetary poverty**		**Multidimensional poverty**	
	Coef.	**Robust S.E.**	**Coef.**	**Robust S.E.**
Household Characteristics				
Marital status of household head (1=married; 0=other)	0.081***	0.024	0.451***	0.015
Educational attainment of household head (Completed schooling)	–0.344***	0.007	–0.795***	0.004
Number of household members	0.433***	0.004	0.085***	0.003
Locational dummy (1=urban; 0=other)	–0.699***	0.022	–0.379***	0.013
Size of house (Log size of house [square meters])	–0.704***	0.014	–0.138***	0.008
Having credit program (1=yes; 0=no)	–0.471***	0.027	0.016	0.017
Village Characteristics				
Village location (1=flatland; 0=other)	–0.356***	0.017	–0.217***	0.015
Directly adjacent to the sea (1=yes; 0=no)	–0.062***	0.018	–0.133***	0.013
Ratio of agricultural families in the village	0.792***	0.017	0.785***	0.013
Ratio of male migrant workers in the village	4.365***	0.558	3.064***	0.621
Ethnic groups in the village (1=having more than one ethnic group; 0=other)	–0.369***	0.018	–0.025*	0.015
Ratio of medical experts living in the village	–25.621***	3.275	–25.849***	1.781
Main road condition in the village (1=asphalt; 0=other)	–0.064***	0.016	–0.219***	0.015
Availability of a commercial bank (1=having; 0= other)	–0.302***	0.028	–0.017	0.013
Constant	**–0.480*** **	**0.061**	**2.648*** **	**0.041**
Wald Chi-Square	**32,867**		**78,096**	
Log Pseudo Likelihood	**–64,150**		**–115,393**	
Pseudo R2	**0.204**		**0.253**	
Number of Observations	**253,280**		**253,280**	

Note: *, **, and *** denote statistical significance at the 10%, 5% and 1% level, respectively.
Source: Authors' calculation

Table 8: Estimation results of marginal effect (dy/dx) of poverty determinants (%)

Variables	Monetary poverty	Multidimensional poverty
Household Characteristics		
Marital status of household head (1=married; 0=other)	0.004	0.089
Educational attainment of household head (Completed schooling)	–0.017	–0.144
Number of household members	0.021	0.015
Locational dummy (1=urban; 0=other)	–0.033	–0.070
Size of house (Log size of house [square meters])	–0.034	–0.025
Having poverty credit program (1=yes; 0=no)	–0.020	0.003
Village Characteristics		
Village location (1=flatland; 0=other)	–0.019	–0.038
Directly adjacent to the sea (1=yes; 0=no)	–0.003	–0.025
Ratio of agricultural families in the village	0.043	0.135
Ratio of male migrant workers in the village	0.212	0.557
Ethnic groups in the village (1=having more than one ethnic group; 0=other)	–0.020	–0.005
Ratio of medical experts living in the village	–1.247	–4.699
Main road condition in the village (1=asphalt; 0=other)	–0.003	–0.039
Availability of a commercial bank (1=having; 0= other)	–0.014	–0.003
Probability (y=j/x)	0.051	0.761

Source: Authors' calculation.

5.2 Determinants of ordered poverty experiences

In this sub-section, we will discuss determinants for multi-layered poverty – why some people experience poverty solely in the monetary poverty measurement while others experience poverty in both monetary and multidimensional poverty measurements. This analysis of ordered poverty experience is used to check the consistency and robustness of the

estimation result of the logit model (Eq. 1). The order of poverty experience is as follows: 0 = no experience of any of the poverty measurements; 1 = experience of monetary poverty; 2 = experience of both monetary and multidimensional poverty.

Household Characteristics

Households with a marriage status and having higher educational attainments tend not to be poor in either of the poverty categories. The probability of not being poor in either of the poverty categories increases by 0.02% following an increase in educational attainment (Table 10). Households with many family members tend to be poor in both categories of poverty. The probability of not being poor in either of the poverty categories decreases by 0.021% with an increase in the number of household members. The estimation results confirmed that households experiencing a positive shock, such as access to the government's credit program, tend not to be poor in either of the poverty categories. Having access to the government's credit program increases the probability of not being poor by 0.02%, and as expected, owning a larger house reduces the chances of being poor in either category.

Village Characteristics

The village characteristics of location (on flat land, or not, and adjacent to the sea, or not), the heterogeneity of ethnic groups, ratio of medical experts, main road conditions (asphalt/not), and availability of a bank significantly increase the probability of not being poor in either of the poverty categories. The probability of not being poor in either of the poverty categories increases by 1.29% with an increase in the ratio of medical experts living in the same village. This study also confirmed that infrastructure development is an effective policy for poverty alleviation. Having asphalt roads and a bank in the area will decrease the probability of being poor by 0.004% and 0.014%, respectively. On the other hand, the ratio of agricultural families and the ratio of male migrant workers decrease the probability of not being poor in both poverty categories. Having male migrant workers in the area decreases the probability of not being poor by 0.21%.

Table 9: Estimation results of ordered logit model of poverty experience

Variables	**Coefficient**	**Robust S.E.**
Household Characteristics		
Marital status of household head (1=married; 0=other)	0.085***	0.024
Educational attainment of household head (Completed schooling)	–0.348***	0.007
Number of household members	0.432***	0.004
Locational dummy (1=urban; 0=other)	–0.698***	0.022
Size of house (Log size of house [square meters])	–0.710***	0.014
Having government credit program (1=yes; 0=no)	–0.473***	0.027
Village Characteristics		
Village location (1=flatland; 0=other)	–0.371***	0.016
Directly adjacent to the sea (1=yes; 0=no)	–0.065***	0.018
Ratio of agricultural families in the village	0.808***	0.017
Ratio of male migrant workers in the village	4.368***	0.556
Ethnic groups in the village (1=having more than one ethnic group; 0=other)	–0.367***	0.018
Ratio of medical experts living in the village	–26.552***	3.281
Main road condition in the village (1=asphalt; 0=other)	–0.073***	0.016
Availability of a commercial bank (1=having; 0= other)	–0.301***	0.028
/cut1	**0.439**	**0.061**
/cut2	**0.582**	**0.061**
Wald Chi-Square	**33,341**	
Log Pseudo Likelihood	**–72,094**	
Pseudo R2	**0.188**	
Number of Observations	**253,280**	

Source: Authors' calculation

Table 10: Estimation results of partial effect (dy/dx) on ordered poverty experience (%)

Variables	**Y=0**	**Y=1**	**Y=2**
Household Characteristics			
Marital status of household head (1=married; 0=other)	–0.004	0.000	0.004
Educational attainment of household head (Completed schooling)	0.017	–0.002	–0.015
Number of household members	–0.021	0.003	0.018
Locational dummy (1=urban; 0=other)	0.033	–0.004	–0.029
Size of house (Log size of house [square meters])	0.034	–0.004	–0.030
Having poverty credit program (1=yes; 0=no)	0.019	–0.002	–0.017
Village Characteristics			
Village location (1=flatland; 0=other)	0.020	–0.002	–0.018
Directly adjacent to the sea (1=yes; 0=no)	0.003	0.000	–0.003
Ratio of agricultural families in the village	–0.044	0.005	0.039
Ratio of male migrant workers in the village	–0.212	0.026	0.186
Ethnic groups in the village (1=having more than one ethnic group; 0=other)	0.020	–0.002	–0.018
Ratio of medical experts living in the village	1.287	–0.156	–1.131
Main road condition in the village (1=asphalt; 0=other)	0.004	0.000	–0.003
Availability of a commercial bank (1=having; 0= other)	0.014	–0.002	–0.012
Probability (y=j/x)	0.949	0.007	0.045

Source: Authors' calculation

6. Concluding remarks

The nature of poverty is not a single phenomenon; it is diverse, dynamic, and multidimensional. In the context of Indonesia, which is socio-economically, demographically, and geographically diverse, the current measurement of poverty based on an expenditure approach cannot comprehensively represent the deprivation faced by the poor. This paper adopted Alkire and Foster's multidimensional framework to estimate poverty and to identify the poor in Indonesia. It has analyzed data on 10 indicators pertaining to three valuable dimensions of well-being: education, health, and standard of living. This study finds that around 73% of the population are categorized as being multidimensional poor. Exploring the relationship between monetary and multidimensional poverty, we found that there is around a 60 percentage-point difference in the poverty headcount ratio computed by applying the monetary and multidimensional poverty metrics. This evidence provides a clear message that the expenditure-based poverty calculation in Indonesia does not comprehensively represent the deprivation within society. This paper also simulated the change in the MPI before and after BPJS implementation (the JKN program) to measure the effectiveness of current policy in reducing the MPI. The simulation shows that at the national level, the MPI decreased by 23.5%, from 73.4% to 35.7%. Therefore, the universal health coverage program (the JKN program) would significantly reduce the MPI.

Applying logit and ordered logit model estimations, we noted no much difference between the determinants of monetary poverty and multidimensional poverty. The main determinants of poverty are educational attainment of the household head, number of household members, physical assets (house ownership), positive shocks (having access to the property credit program), house location, existence of migrant workers, existence of medical expertise, and the heterogeneity of ethnicity in society. This study confirmed that higher educational attainment of the household head leads to a higher probability of being non-poor. The probability of being categorized within the monetary and multidimensional poor will decrease by 0.02% and 0.14%, respectively, when the completed schooling of the household head is raised by one step.

Though the MPI is very sensitive to the chosen indicators and cutoffs, it can inform policymakers that human deprivation is multidimensional. This study suggests that dimensions and indicators should be related to the indicators of SDGs; therefore, it would be beneficial for policymakers to allocate resources effectively and efficiently to reduce poverty and achieve SDGs immediately.

7. Acknowledgement

The authors would like to thank the anonymous referees, participants of the seminar at the Graduate Program in Economics, Universitas Indonesia, Prof. Mayling Oei, Dr. Arie Damayanti, and members of Dartanto's research group for their valuable comments. The authors would also like to express their gratitude to the Poverty and Social Protection Research Group of Institute for Economic and Social Research-Universitas Indonesia and the 2017 Hibah PITTA of Universitas Indonesia for partial financial support in conducting this research.

References

Abufhele, A. and Puentes, E. (2011), Poverty Transitions: Evidence for Income and Multidimensional Indicators, Chile, Santiago.

Alkire, S. and Foster, J. (2007), Counting and Multidimensional Poverty Measurement, *Oxford Poverty and Human Development Initiative (OPHI) Working Paper No. 7*.

Alkire, S. and Foster, J. (2011a), Counting and Multidimensional Poverty, *Journal of Public Economics*, 95(7-8), 476-487.

Alkire, S. and Foster, J. (2011b), Understandings and Misunderstandings of Multidimensional Poverty Measurement, *The Journal of Economic Inequality*, 9(2), 289-314.

Alkire, S. and Santos, M. E. (2010), Acute Multidimensional Poverty: A New Index for Developing Countries, *Oxford Poverty and Human Development Initiative (OPHI) Working Paper No. 38*.

Awan, M. S., Waqas, M., and Aslam, M. A. (2011), Multidimensional Poverty in Pakistan: Case of Punjab Province, *Journal of Economics and Behavioral Studies*, *3*(2), 133–144.

Awan, M. S. and Iqbal, N. (2010), Determinants of Urban Poverty: The Case of a Medium-Sized City in Pakistan, PIDE Working Papers No.60.

Batana, Y. M. (2008), Multidimensional Measurement of Poverty in Sub-Saharan Africa, *Oxford Poverty & Human Development Initiative (OPHI) Working Paper No. 13*.

Bartram, J. et al. eds. (2004), Pathogenic mycobacteria in water: A guide to public health consequences, monitoring and management, World Health Organization (WHO), Geneva.

Baiyegunhi, L. J. S. and Fraser, G. C. G. (2010), Determinants of Household Poverty Dynamics in Rural Regions of the Eastern Cape Province, South Africa. *A paper submitted for presentation at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th*

Agricultural Economists Association of South Africa (AEASA) Conference.

Bourguignon, F. and Chakravarty, S. R. (2003), The Measurement of Multidimensional Poverty, *Journal of Economic Inequality*, *1*(1), 25–49.

Brück, T. and Kebede, S. W. (2013), Dynamics and Drivers of Consumption and Multidimensional Poverty: Evidence from Rural Ethiopia, *German Institute for Economic Research (DIW) Discussion Paper No. 1287*.

Dartanto, T. and Nurkholis. (2013), The Determinants of Poverty Dynamics in Indonesia: Evidence from Panel Data, *Bulletin of Indonesian Economic Studies*, *49*(1), 61–84.

Dartanto, T. and Otsubo, S. (2013), Measurements and Determinants of Multifaceted Poverty: Absolute, Relative, and Subjective in Indonesia, *JICA-RI Working Paper No. 54*.

Fissuh, E. and Harris, M. (2005), Modelling Determinants of Poverty in Eritrea: A New Approach, Monash University, Clayton.

Jabeen, S., Mahmood, Q., Tariq, S., Nawab, B., and Elahi, N. (2011), Health Impact Caused by Poor Water and Sanitation in District Abbottabad, *J Ayub Med Coll Abbottabad*, *23*(1), 47–50.

Naveed, A. and Tanweer-ul-Islam. (2011), A New Methodological Framework for Measuring Poverty in Pakistan, *Sustainable Development Policy Institute Working Paper No. 122*.

OECD. (2003), DAC Guidelines and Reference Documents: Poverty and Health, OECD, France.

Roberts, J. (2003), Poverty Reduction Outcomes in Education and Health: Public Expenditure and Aid, *Overseas Development Institute Working Paper No. 210*.

Tsui, K. (2002), Multidimensional Poverty Indices, *Journal of Social Choice and Welfare*, *19*, 69–93.

Usman, Sinaga, B. M., and Siregar, H. (2006), Analisis Determinan Kemiskinan Sebelum dan Sesudah Desentralisasi Fiskal, Institut Pertanian Bogor, Bogor.

Wardhana, D. (2010), Multidimensional Poverty Dynamics in Indonesia (1993–2007), The University of Nottingham, Nottingham.

Whelan, C. T., Nolan, B., and Maitre, B. (2014), Multidimensional Poverty Measurement in Europe: An Application of the Adjusted Headcount Approach, *Journal of European Social Policy*, *24*(2), 183–197.

Wooldridge, J. M. (2010), Econometric Analysis of Cross Section and Panel Data: Second Edition, Cambridge: the MIT Press.