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RESEARCH ARTICLE

Winning the War on Poverty: Tracking Living Standards in the Philippines Using a Class of Axiomatic Indices

John Paolo R. Rivera
Asian Institute of Management, Makati City, Philippines
jrivera@aim.edu

Poverty has persistently badgered the Philippines and alleviating it has been the fundamental thrust of government. However, this was hampered by the recent pandemic resulting in economic contraction plunging many Filipino households into poverty and widening inequality. Bootstrapping the economy is needed to fast-track recovery through resumption of innovative reforms vital to pursue a higher growth path that will accelerate poverty reduction. To do this, it is necessary to understand where the Philippines stands, using household data. Without updated measures and well-informed national and regional profiles on living standards, poverty reduction is bleak, as programs to facilitate it remain to be ineffective. We contribute to addressing these constraints by estimating metrics that will aid interregional comparisons, give directions to policy formulation, and assess whether the country is winning the war on poverty.

Keywords: inequality, living standards, poverty, welfare

JEL Classifications: D63, I32

Prior to the coronavirus (COVID-19) pandemic, the Philippine economy has been susceptible to slow down due to uncertainties and a challenging external and internal environment, resulting to a meek investment growth (World Bank [WB], 2019). Despite this, macroeconomic fundamentals remain strong due to policy mix implemented by government and monetary authority accompanied by improving labor market conditions and sustained growth in real household incomes, all of which contributed to poverty reduction (de Vera, 2020a; Rivas, 2020; WB, 2019). In fact, in 2018, as cited by Valencia (2019) from the Philippine Statistics Authority (PSA) and National Economic and Development Authority (NEDA), the number of Filipinos living below poverty was reduced despite faster growth in inflation and rising poverty thresholds. It has indicated that national poverty incidence decreased from 28% to 21% in the first half of 2015 to 2018. Despite this, the PSA described that nearly 20% of Filipinos do not earn enough to cover

basic food and nonfood needs (Fiestada, De La Rosa, & Mangahas, 2018). According to partial estimates of the 2018 Family Income and Expenditure Survey (FIES), household incomes in lower deciles grew at a faster pace than average (de Vera, 2019). This is due to improvements in the quality of employment and expansion in government social services. In 2019, as reported by de Vera (2019) from WB, the poverty rate in the country is expected to further decline to 20% amid easing inflation and constantly rising incomes. Hence, despite the challenges in economic growth, the Philippines is making progress in getting closer to achieving shared prosperity[1] and Sustainable Development Goal (SDG) 1: no poverty (Heinemann, 2019).

However, in 2020, the COVID-19 pandemic hit the Philippines affecting its growth trajectory as funds amounting to at least PHP 275 billion (approximately USD 5.5 billion) for infrastructure development and poverty alleviation were directed towards managing the crisis (Gita-Carlos, 2020; Limos, 2020). On top of this, the government continued to augment its fiscal resources through foreign borrowing (at least USD 1.25 billion) and financial aids (at least PHP 6.5 billion or approximately USD 130.4 million) to augment its response (de Vera, 2020b; Kabiling, 2020; Lalu, 2020). The pandemic affected the poor the hardest. It exposed the deep inequities in accessing basic necessities—food, shelter, and healthcare (Coronel, 2020; Santos, 2020). Had the pandemic not happened, these funds could have been used towards the continuance of existing programs to reduce poverty. Getting back on track "will depend on the effectiveness of government measures in containing the virus" (Leyco, 2020, par. 1).

Henceforth, in creating a postpandemic response to poverty, it is necessary to understand where the Philippines stands in poverty alleviation. The country's post-COVID-19 response to poverty cannot be fundamentally similar to previous ones. It calls for more innovative reforms incorporating lessons from the pandemic. To do this, a baseline is needed. Through existing household data, we can set up the baseline that would be constantly updated as information comes along. As emphasized by Branch and Collins (2020), there is a need for leaner and faster poverty measurement, particularly in the time of COVID-19. While waiting for timely data, it is essential to create the baseline that will create the structure of tracking living standards towards a more systematic understanding of the poverty situation in the Philippines.

Given this backdrop, our overarching objective is to track the inequality and poverty situation in the country through certain measures.[2] Estudillo (1997); Balisacan (1999); Jao, Ng, and Vicente (2000); Balisacan and Pernia (2002); Tiongco (2016); Albert and Vizmanos (2018); and Rivera (2020), among others, have laid the foundations. Existing studies with baseline poverty estimates, along with tracking surveys that can measure short-term changes in welfare, will be a vital resource in understanding the poverty situation (Branch & Collins, 2020). Most importantly, with the emergence of more encompassing and axiomatic inequality and poverty measures, we continue their track by using earlier and more recent Philippine household data to determine such metrics. As emphasized by Jao et al. (2000), social welfare measures are useful indicators in assessing society's well-being by incorporating direct and indirect factors affecting individual welfare (Kakwani, 1981).

As such, we pose the following research inquiry: *how can tracing national and regional inequality and poverty measures aid in policy evaluation and planning and facilitate interregional comparisons?* To address this, we set the following specific objectives:

1. To review how the Philippines fares on its poverty reduction initiatives by conducting an in-depth literature review on tracking inequality and poverty measures in the country;
2. To examine how inequality and poverty have evolved in the country through determining axiomatic national and regional metrics; and
3. To develop recommendations that will help identify target areas and assist initiatives on improving inequality and reducing poverty.

We contribute to literature by corroborating baseline studies that can help uncover the nuances of Philippine inequality and poverty and improve the ability of anti-poverty programs to respond to evolving poverty challenges. Our major contribution is the computation of several axiomatic national and regional inequality and poverty measures for the country, which has not yet been widely emphasized and documented in Philippine literature. Also, working on more rounds of data allows for the accurate measurement of poverty (Branch & Collins, 2020), which is vital in tracking

short-term impacts of economic environment on poverty. Meanwhile, results can complement existing poverty understanding that can be valuable in making interregional comparisons, providing direction to policy formulation, and offering basis for poverty policies that will allow the Philippines to win against poverty.

As a limitation, Jao et al. (2000) discussed that the choice of an appropriate welfare indicator (i.e., income or expenditure) is already a challenge because we have not yet found a single, practical, and comprehensive individual welfare measure. The suggested remedy is to select an individual welfare measure that closely exemplifies such paradigms. Hence, in this study, we would be subjecting a welfare measure to determine various inequality and poverty measures, while taking into account their respective particularities.

LITERATURE REVIEW

The literature (see Graaff, 1957; Hicks, 1940, 1958; Kaldor, 1939; Little, 1950) has explored the "problem of living standard comparison" (Sen, 1984, p. 74). That is, as explained by Jao et al. (2000), among heterogeneous communities, there will always be an intuitive attempt to compare which community is better off through casual observations or sampling estimates that will lead to conclusions such as "a community of wealthy individuals must have a higher living standard than a community of marginalized individuals" (p. 7). However, this conclusion is hasty as there is no well-defined criterion used.

Due to this, various studies on measuring living standards have emerged to build the discourse on establishing a set of well-defined criteria that will measure and compare society's welfare. However, capturing all the criterions in a single metric is a challenge motivating various studies to devise an encompassing welfare measure. To date, the literature offers a diversity of living standard measures that serve as elements of socioeconomic profiles developed to track accomplishments in poverty reduction.

Since our study is Philippine specific, we focus on local literature that measured living standards in the country. These have also followed the track of major international literature (see Tsakloglou, 1982; Kakwani, 1986, 1990; Glewwe, 1990; Grosh & Glewwe, 1998; Montgomery, Gragnolati, Burke, & Paredes, 2000; Scott, Steele, & Temesgen, 2005; Brewer & O'Dea, 2012; Haque & Haque, 2015; Booth, 2019; WB, n.d.), which is welfare measurement towards policy assessment (Jao et al., 2000).

Philippine Poverty Studies on Living Standards

In addressing our first research objective, we begin with the study of Estudillo (1997), who looked into the factors affecting household income inequality for each population grouping in the Philippines via the Gini coefficient, Theil *T*, Theil *L*, and variance of log income derived from the 1965, 1971, 1985, and 1991 FIES household income data. Results showed that urban-rural location, age distribution, and educational attainment of household head impact sector inequality.

Balisacan (1992, 1999, 2001) did a more complete poverty profile of the population groupings. Using the 1997 FIES consumption expenditure data, an alternative and practical approach to measuring poverty for spatial comparison and for performance monitoring was introduced. Results have indicated that inequality is higher when income is used as a measure, rather than consumption. From Estudillo (1997) using income to Balisacan (1992, 1999, 2001) using consumption as a welfare measure, Montgomery et al. (2000) argued that "household consumption expenditures are preferred to measures on income on some theoretical grounds, and consumption data are somewhat easier to gather" (p. 155). However, properly collecting and measuring income and consumption variables are tedious endeavors. Alternatively, Raya (2001) discussed the "menu of poverty measures" (p. 99) and introduced the Quality of Life Index.

Meanwhile, Collas-Monsod and Monsod (1999) evaluated the Social Reform Agenda of former President Fidel V. Ramos through the use of provincial poverty incidence rates and certain outcome-based poverty measures in the form of the Human Development Index (HDI), Human Poverty Index (HPI), and Capability Poverty Measure (CPM). Results reflected by poverty incidence or outcome-based measures have shown that those provinces given priority attention in terms of the provision of minimum basic needs were not necessarily the poorest.

Following the track of Estudillo (1997) and Balisacan (1992, 1999), the study of Jao et al. (2000) used the 1998 Annual Poverty Indicator Survey (APIS), as an alternative to the FIES, in constructing regional poverty profiles that would aid in identifying regions in the Philippines

requiring a more focused attention in strengthening region-specific redistribution policies.

Albert, Elloso, and Ramos (2007) argued that parallel to the analysis of poverty is the measurement of vulnerability. See Dercon (2001) for the definition of vulnerability they adapted. In estimating household vulnerability to income poverty, they employed a modified probit model that explains income volatilities through household characteristics. Derived vulnerability estimates from the 1997 FIES were higher than poverty rates. Their finding suggested that policy frameworks and interventions should have the capacity to minimize the likelihood that households will enter income poverty or should aid them in softening the impact of income poverty.

Alba (2007) explained high vulnerability to income poverty through national income accounts and workforce data from the Penn World Table and years of schooling data from Barro and Lee (2001). Results showed that the Philippines had been stuck in a low-growth trajectory requiring an improvement in total factor productivity to address low living standards.

From earlier poverty studies, we saw how the FIES and APIS were used in measuring living standards. Succeeding studies explored the use of the Community-Based Monitoring System (CBMS) survey. For instance, Arcilla, Co, and Ocampo (2011) generated poverty profiles and identified correlates of poverty for Pasay City and Mogpog, Marinduque, to represent an urban-rural area in the country using the 2005 census data from CBMS. From their bivariate and regression analysis, they found that significant correlates of poverty incidence were average household size, ownership of housing, and ownership of telecommunication devices. Moreover, there is lower poverty incidence in barangays located in urban areas compared to rural areas.

The CBMS data can also be useful in assessing the effectiveness of government programs on poverty alleviation. On one hand, Conchada and Rivera (2013) used the 2005 CBMS household data for Pasay City to estimate the difference in the impact between food and nonfood grant programs on poverty. Using the generalized method of moments and maximum likelihood estimation, they found that nonfood grants are more effective than food grants in poverty alleviation. On the other hand, Conchada and Tiongco (2017) continued this track by using the 2015 CBMS from selected provinces in implementing a propensity score matching method to empirically show that those who availed social health insurance and micro-savings programs have higher total income. This reinforces the need to expand program coverage especially for those in the informal sector to increase social inclusion and reduce poverty.

With more recent FIES, Rivera (2015) used the repeated cross-section method (RCM) on the 2003 and 2006 FIES to estimate the likelihood of a household moving out of poverty. Estimated bounds of mobility have indicated that households who invested in human capital and those with employed spouses have higher likelihood of escaping poverty. Likewise, with more recent APIS, Cudia, Rivera, and Tullao (2019) continued the track of Rivera (2015) by subjecting the 2008 and 2011 APIS to RCM to approximate the probability of a household moving out of poverty through entrepreneurship. Estimated bounds of mobility have indicated that entrepreneurship facilitates a household's departure from poverty.

According to Montgomery et al. (2000), in monitoring poverty, it "require[s] data sets that include both the indicators themselves and the economic variables that they are meant to represent – that is, household consumption expenditures or incomes" (p. 155), which certain Philippine household survey data such as the APIS, CBMS, and FIES contain. For more poverty-related studies utilizing Philippine household data, Tiongco (2016) assembled a number of country- and provincial-level poverty studies that contributed to empirical knowledge and research methods for measuring poverty. They highlighted theory-based empirical results and significant recommendations on reducing poverty.

Monitoring Poverty in the Philippines

The studies featured above have used either a single or a couple of survey periods of household data in their analysis. However, there are a few studies that tracked poverty measures using a series of survey periods. For instance, from the study of Albert et al. (2007) using the 1997 FIES, Albert and Ramos (2010) extended the measurement of household vulnerability to income poverty using the 2000, 2003, and 2006 FIES. With the release of the 2015 FIES, Albert and Vizmanos (2018) restructured the study by including the impact of price and climate shocks to vulnerability. Consistently, their combined vulnerability assessments necessitated the need for progressive initiatives that strengthen

the resilience of households not only to reduce the likelihood of future poverty but also to prevent it.

Similarly, Reyes, Tabuga, Mina, Asis, and Datu (2010) assessed whether there were significant improvements in the Philippine poverty situation using the 2000, 2003, and 2006 FIES. Findings revealed that the poverty situation varies among regions and is worse in rural areas. To support these findings, Rivera (2020) examined whether there is improvement in income distribution by calculating national and regional Gini coefficients and Foster-Greer-Thorbecke (FGT) indices from the 2000 to 2015 FIES. Results revealed some enhancements in the poverty situation both at the national and at the regional levels, albeit at varying paces. Unfortunately, there have been regions that have been left behind despite some improvements in welfare.

Research Gap

From the studies we have reviewed, summarized in Table 1, it has been apparent that indeed, "the fight against poverty is often hampered by the lack of information concerning the poverty situation and the particular circumstances of the poor. Such gaps in poverty analysis can easily result in deficient planning and poor targeting" (Raya, 2001, p. 96), which is more apparent at subnational levels, as evidenced by most studies. We have also seen that despite the availability of regional- and provincial-level data, there is still limited analysis on the inequality and poverty situation at the subnational level. This is critical because existing national-level poverty measures are not applicable at the local level (Raya, 2001). To bridge this gap, there is a need to continue the track taken by Reyes et al. (2010), Albert and Vizmanos (2018), and Rivera (2020)

Table 1. *Selected Poverty Studies in the Philippines*

Author(s)	Data Set	Methodology	General Findings
Estudillo (1997)	1965, 1971, 1985, and 1991 FIES income data	Derived Gini coefficient, Theil *T*, Theil *L*, and variance of log income	Urban-rural location, age distribution, and educational attainment of household head impact sector inequality.
Balisacan (1999)	1997 FIES consumption expenditure data	Spatial comparison of measuring poverty for performance monitoring	Inequality is higher when income is used as a measure, rather than consumption.
Collas-Monsod and Monsod (1999)	Provincial poverty incidence rates and outcome-based poverty measures (HDI, HPI, CPM)	Evaluation of the Social Reform Agenda of former President Fidel V. Ramos	Provinces given priority attention in terms of the provision of minimum basic needs were not necessarily the poorest.
Jao et al. (2000)	1998 APIS	Construction of regional poverty profiles (Lorenz curves, Gini coefficient, kernel density estimation, cost-of-living indices)	Identified regions in the Philippines requiring a more focused attention in strengthening region-specific redistribution policies
Albert et al. (2007)	1997 FIES	Modified probit model	Policy frameworks and interventions should minimize the likelihood that households will enter income poverty.
Alba (2007)	National income accounts and workforce from Penn World Table and years of schooling from Barro and Lee (2001)	Simple neoclassical model	The country has been stuck in a low-growth trajectory requiring an improvement in the country's total factor productivity to address low living standards.
Albert and Ramos (2010)	2000, 2003, and 2006 FIES	Modified probit model	There is a need to monitor current poverty and reduce future poverty.
Reyes et al. (2010)	2000, 2003, and 2006 FIES	Decomposition analysis	Poverty situation varies among regions; worse in rural areas.

Arcilla, Co, and Ocampo (2011)	2005 CBMS data for Pasay City and Mogpog, Marinduque	Bivariate and regression analysis	Correlates of poverty incidence are average household size and ownership of housing and telecommunication devices.
Conchada and Rivera (2013)	2005 CBMS data for Pasay City	Generalized method of moments and logistic regression	Nonfood grants are more effective than food grants in poverty alleviation.
Rivera (2015)	2003 and 2006 FIES	Repeated cross-section method	Households who invested in human capital and those with employed spouses have higher likelihood of escaping poverty.
Tiongco (2016)	Various	Various	Compilation of poverty studies towards theory-based empirical results and recommendations on reducing poverty
Conchada and Tiongco (2017)	2015 CBMS from selected Philippine provinces	Propensity score matching	Availment of social health insurance and micro-savings programs can reduce poverty.
Albert and Vizmanos (2018)	2003, 2006, 2009, 2012, 2015 FIES	Three-step feasible generalized least squares	Vulnerability assessment provides inputs to forward-looking interventions that build the resilience of households for preventing or reducing the probability of future poverty.
Cudia et al. (2019)	2008 and 2011 APIS	Repeated cross-section method	Bounds of mobility have indicated that entrepreneurship facilitates a household's departure from poverty.
Rivera (2020)	2000, 2003, 2006, 2009, 2012, 2015 FIES	Calculated Gini coefficients and FGT indices	There is some improvement in income distribution particularly in urban regions.

in order to pave the way for more comprehensive and robust inequality and poverty analysis after COVID-19. This is possible because existing data and methodologies have been validated and augmented. This also supports the call of Tiongco (2016) that there is still much work to be done in understanding the causes of poverty to formulate policies that will eradicate it in order to achieve shared prosperity and sustainable growth.

FRAMEWORK AND METHODOLOGY

In addressing our second research objective, we follow the study of Jao et al. (2000). However, rather than using a single survey round (i.e., 1998 APIS), we use multiple and successive rounds of the FIES—2000, 2003, 2006, 2009, 2012, and 2015. For a detailed explanation on the viability of FIES in conducting this study, refer to Rivera (2020).

In evaluating welfare in an economy, there are three considerations: *welfare of the individuals comprising the area*, *welfare of the individual relative to other individuals in the same area*, and *condition of individuals whose welfare is below others*. Estimating the mean and variance of the welfare distribution, generating diagrams, and/or constructing kernel densities (Aliping, Pizarro, Reyes, & Rivera, 2016; Jao et al., 2000) can address these considerations, to some extent, but are still inadequate to capture the complexity of measuring living standards. Hence, we estimate scalar indices. However, as emphasized by Jao et al. (2000), scalar indices are only better metrics, as they are still insufficient to expansively depict social welfare.

Sen (1976) explicated the problems accompanying the definition of a welfare measure meant to capture available information on individuals. Succeeding studies such as those of Takayama (1979); Kakwani (1980); Clark, Hemming, and Ulph, (1981); and Thon

(1979, 1983) among others followed the track of Sen (1976) in constructing a comprehensive index that can cover poverty incidence, average deprivation, and relative deprivation. In doing so, Hagenaars (1987) discussed that the development of most welfare measures followed an axiomatic framework. Welfare measures should satisfy the following axioms: *monotonicity*, *transfer*, *population symmetry*, *proportion of poor*, *focus*, *transfer sensitivity*, and *decomposability*. For comprehensive definitions, discussions, and comparison of metrics, refer to Hagenaars (1987, pp. 584–585) and Josa and Aguado (2020).

Alternatively, Jao et al. (2000) stated that for a social welfare measure to fittingly reflect the society's well-being with respect to social values, a social welfare function must satisfy the following properties: *nondecreasing in each of its arguments*, *symmetry or anonymity*, and *preference to more equal distributions*. Moreover, welfare functions are also guided by the axioms of *relative equity*, *monotonic welfare*, *rank order*, and *normalization* to ensure their consistency with the three properties mentioned earlier. Furthermore, a suitable inequality index must satisfy the *Pigou–Dalton principle of transfers*, *mean independence*, *population-size independence*, and *decomposability* (Rivera, 2020).

Among the various axiomatic inequality and poverty measures we have today, there is no single optimal metric, as discussed and established by seminal studies (from Sen, 1976, to Shorrocks, 1995). Appendix 1 traces the evolution and development of welfare, inequality, and poverty measures. Given the comprehensive discussion on the advantages and limitations of the various measures, we will do away with an evaluation of how well they satisfy the said properties and axioms (see Hagenaars, 1987, pp. 588–589, for the cross-comparisons among the various measures). Rather, we estimate selected inequality and poverty indices for the Philippines and its regions, and we underscore which facet of welfare they illustrate best. We indicate in Table 2 the metrics we would estimate.

The selection of inequality and poverty measures to be estimated is grounded on the basis of an axiomatic approach, rather than a social welfare approach. That is, we estimate those measures that mostly, if not all, satisfy the properties and axioms of a suitable metric. As a caveat, Jao et al. (2000) emphasized that although they may satisfy the properties and axioms, there is still a likelihood of inconsistent findings since they capture different facets of welfare.

Note also that we would do away with estimating headcount and poverty gap ratios as PSA usually determines and reports these measures already. We would also do away with constructing Lorenz curves and estimating Gini coefficients and FGT indices as Rivera (2020) has already extensively covered this using the same data set we have.

Critical to operationalizing the selected inequality and poverty metrics listed in Table 2 is the choice of the appropriate welfare measure. As emphasized by Jao et al. (2000), "since welfare is not directly observable nor readily measurable, the welfare indicator for empirical work must be a variable which can serve as a reasonably good proxy" (p. 49). Hence, following Balisacan (1992, 1999, 2001), Tsakloglou (1993), Jao et al. (2000), and Montgomery et al. (2000), we would be using consumption expenditure as welfare measure.

However, measuring welfare must be done at the individual level. Since the FIES is household data, we would be using the variable *per capita consumption.* Kakwani (1985) raised concerns on the disadvantages of doing such, but Balisacan (1999) argued that equivalence scales always encompass arbitrariness. Therefore, we would use per capita consumption within a household "on the grounds of practicality and aversion to arbitrariness" (Jao et al., 2000, p. 52).

RESULTS AND DISCUSSION

Prior to estimating our inequality and poverty metrics using per capita consumption from several rounds of FIES, we describe the regional distribution of households in Table 3. For all survey periods, households are skewed towards highly industrialized (i.e., urban) regions, namely, the National Capital Region (NCR), CALABARZON, and Central Luzon. Meanwhile, highly agricultural (i.e., rural) regions such as those of MIMAROPA, the Cordillera Administrative Region (CAR), and Caraga have the least number of households. From here, we can only surmise on the impact of population levels on poverty. According to Rivera and See (2012), this "constrains the rate at which the economy can expand to accommodate the increased population through better provision of goods and services and increased employment" and "renders industries unable to absorb an increasing oversupply

Table 2. *Selected Axiomatic Inequality and Poverty Measures to be Estimated*

Measure	Code	Reference	• Description	• Particularities	• Interpretation
Theil inequality index (Theil *T*)	I_{TH}	Theil (1967, 1972)	• An entropy index that transforms population shares into income shares and gives greatest weight to extreme incomes	• Satisfies the following properties: relative-invariant indices, lying in the range from zero to plus infinity, and income transfers having greater effect among the poor than the rich ("Inequality," 1986)	• Lower values indicate more equality (Jao et al., 2000). • Ranges from zero (state of equal distribution) to infinity (increasing levels of inequality; Jenkins & Van Kerm, 2011)
Mean log deviation (Theil *L*)	I_{MLD}	Theil (1967, 1972)	• An entropy index that transforms population shares into income shares and gives greatest weight to low incomes		
Piesch inequality measure	I_{PIE}	Piesch (1975)	• Gives greatest weight to high incomes • Inequality is best indicated by the affluence of the few (Giaccardi, 1950).	• A Lorenz-based inequality index that satisfies the Pigou–Dalton principle of transfers ("Inequality," 1986)	• Gini coefficient can be expressed as a weighted average of the I_{PIE} and I_{MEH} indices ("Inequality," 1986). • Higher values represent increasing levels of inequality.
Mehran inequality measure	I_{MEH}	Mehran (1976)	• Concentrate on low incomes. • Substance of inequality is the existence of individuals with incomes below those of others (Nygard & Sandstrom, 1981).	• A Lorenz-based inequality index that satisfies the Pigou–Dalton principle of transfers ("Inequality," 1986)	
Generalized entropy (GE) inequality index	$GE(\alpha)$	Shorrocks (1980)	• Derived from information theory as a measure of redundancy in data • When $\alpha = 0$, *GE* is the *mean log deviation*; when $\alpha = 1$, *GE* is *Theil T*; and when $\alpha = 2$, *GE* is half the squared coefficient of variation.	• Inequality can be decomposed into population groups or income sources. • Sensitivities to inequalities at the top of the income distribution (α) can be chosen (De Maio, 2007).	• Ranges between 0 and infinity, with 0 being a state of equal distribution and values greater than 0 representing increasing levels of inequality (Jenkins & Van Kerm, 2011)
Kakwani inequality measure	I_{KAK}	Kakwani (1980, 1981)	• Weighted each income gap by the rank order according to the importance one attaches to the lowest incomes (Hagenaars, 1987)	• Sensitive at lower income levels because it is based on the length of the Lorenz curve than the area that it bounds ("Inequality," 1986) • Satisfies monotonicity, proportion of poor, transfer sensitivity, and focus axioms (Hagenaars, 1987)	• Ranges from −2 (indicating severe regressivity) to +1 (indicating strong progressivity; Wagstaff & van Doorslaer, 1992)

Watts poverty index	P_{WTS}	Watts (1964)	• Distribution sensitive since it uses logarithms • Transferring PHP 5,000 to a poor person is a larger contribution than transferring the same amount to a nonpoor person.	• Satisfies the focus, monotonicity, transfer, and decomposability axioms • Allows for the generation of poverty incidence curve (Saisana, 2014)	• Morduch (1998) pointed out that P_{WTS} can be used to estimate time to exit poverty, which is given by the ratio of the P_{WTS} and growth rate of per capita welfare measure among the poor, g.
Sen poverty index	P_{SEN}	Sen (1976)	• Combines in one index the effects of number of poor, depth of their poverty, and distribution of poverty within the group	• Derived from axioms; sensitive to income distribution among the poor (Saisana, 2014) • Cannot be used to decompose poverty into contributions from different subgroups because of its dependence on the Gini coefficient (Deaton, 1997)	• Similar to poverty severity; higher values indicate more severe poverty. • Indicates inequality among the population living below the poverty threshold
Takayama poverty index	P_{TKY}	Takayama (1979)	• Defined as the Gini inequality measure of a censored income distribution, where incomes of all nonpoor are equal to the poverty line (Hagenaars, 1987) • Decomposed the Gini coefficient of the censored income distribution into headcount ratio, poverty gap ratio, and Gini coefficient of the poor	• Satisfies the symmetry and focus axioms (Hagenaars, 1987) • Allows for an intensive study of poverty because the factors governing changes in poverty are determined	• Similar to poverty severity; higher values indicate more severe poverty. • Indicates inequality among the population living below the poverty threshold
Clark-Hemming-Ulph (CHU) poverty index	P_{CHU}	Clark et al. (1981)	• Based on a social welfare function defined over the truncated population • The addition of a poor person to the population increases poverty index if the income of that additional poor person is lower than the equally distributed equivalent of the censored income distribution (Hagenaars, 1987).	• Satisfies symmetry, proportion of poor, monotonicity, focus, and decomposability (Hagenaars, 1987)	• As β approaches 1, CHU approaches FGT_0 (equivalent to *headcount ratio*), which is insensitive to regressive income transfers among the poor (Clark et al., 1981).
Thon poverty index	P_{THN}	Thon (1981, 1982, 1983)	• Weighs the income gap of the poor with their rank order in the total income distribution (Hagenaars, 1987)	• Satisfies the transfer, proportion of poor, monotonicity, and focus axioms (Hagenaars, 1987)	• Similar to poverty severity; higher values indicate more severe poverty. • Indicates inequality among the population living below the poverty threshold

Table 3. *Regional Distribution of Households in FIES*

Year	2000		2003		2006		2009		2012		2015	
Regions^	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
1—Ilocos	1,887	4.76	2,449	5.82	2,259	5.87	2,277	5.93	2,270	5.65	2,348	5.65
Cordillera Administrative Region	1,662	4.20	1,621	3.85	1,536	3.99	1,581	4.12	1,722	4.29	1,725	4.15
2—Cagayan Valley	1,561	3.94	2,101	4.99	1,900	4.94	1,901	4.95	2,037	5.07	2,219	5.34
3—Central Luzon	4,055	10.24	3,389	8.05	3,114	8.09	3,028	7.89	3,154	7.85	3,237	7.79
National Capital Region*	4,141	10.45	3,972	9.44	4,454	11.57	4,285	11.16	4,323	10.76	4,130	9.94
4A—CALABARZON**	4,242	10.71	4,095	9.73	3,610	9.38	3,661	9.53	3,905	9.72	4,162	10.02
4B—MIMAROPA**	1,641	4.14	1,868	4.44	1,655	4.30	1,667	4.34	1,569	3.91	1,249	3.01
5—Bicol	2,099	5.30	2,532	6.02	2,250	5.85	2,212	5.76	2,293	5.71	2,472	5.95
6—Western Visayas	3,014	7.61	2,970	7.06	2,716	7.06	2,592	6.75	2,841	7.07	2,851	6.86
7—Central Visayas	2,333	5.89	2,892	6.87	2,503	6.50	2,526	6.58	2,530	6.30	2,541	6.12
8—Eastern Visayas	2,252	5.68	2,296	5.45	1,944	5.05	2,012	5.24	2,170	5.40	2,337	5.63
9—Zamboanga Peninsula	1,294	3.27	1,796	4.27	1,572	4.08	1,655	4.31	1,737	4.32	1,788	4.30
10—Northern Mindanao	2,696	6.81	2,090	4.97	1,724	4.48	1,768	4.60	1,814	4.52	1,887	4.54
11—Davao	1,434	3.62	2,186	5.19	2,030	5.28	2,151	5.60	2,260	5.63	2,446	5.89
12—SOCCSKSARGEN***	1,520	3.84	2,184	5.19	1,923	5.00	1,928	5.02	2,045	5.09	2,122	5.11
13—Caraga	1,490	3.76	1,851	4.40	1,644	4.27	1,568	4.08	1,637	4.08	1,782	4.29
Autonomous Region in Muslim Mindanao****	2,294	5.79	1,802	4.28	1,649	4.29	1,588	4.14	1,864	4.64	2,248	5.41
PHILIPPINES	**39,615**		**42,094**		**38,483**		**38,400**		**40,171**		**41,544**	

^The geographical divisions of the Philippines are the three island groups of Luzon, Visayas, and Mindanao. Luzon and Mindanao are both named after the largest island in their respective groups, while Visayas (also known as the Visayan Islands) is a group of islands. Regions 1 to 5, the Cordillera Administrative Region (CAR), and the National Capital Region (NCR) are located in Luzon; Regions 6 to 8 are in Visayas; and Regions 9 to 13 and the Autonomous Region in Muslim Mindanao (ARMM) are in Mindanao.

**Note that Manila and Metro Manila are different. Manila, also known as the City of Manila, is the official capital of the Philippines. Metro Manila is the alternative term for NCR, which includes the City of Manila and the cities of Caloocan, Las Piñas, Makati, Malabon, Mandaluyong, Marikina, Muntinlupa, Navotas, Parañaque, Pasay, Pasig, Quezon City, San Juan, Taguig, and Valenzuela and the municipality of Pateros (Gaerlan, 2015).*

***Region 4A and Region 4B were officially created with the partitioning of Region 4, Southern Tagalog, into the two on May 17, 2002, with the issuance of Executive Order No. 103 by former President Gloria Macapagal-Arroyo. The partitioning was done to promote efficiency in the government and accelerate social and economic development and improving public services in the provinces covered. The FIES for 2000 has recalibrated the data to incorporate the new regional classification. CALABARZON is comprised of the provinces of Cavite, Laguna, Batangas, Rizal, and Quezon. MIMAROPA is comprised of the provinces of Mindoro, Marinduque, Romblon, and Palawan.*

****Composed of the provinces of South Cotabato, Cotabato, Sultan Kudarat, Sarangani, and General Santos.*

*****Replacing ARMM, the Bangsamoro Autonomous Region in Muslim Mindanao was formed with the ratification of its basic law, the Bangsamoro Organic Law, following two legally binding referendums in Western Mindanao held on January 21, 2019. The Commission on Elections confirmed the ratification on January 25, 2019 (Kapahi & Tañada, 2018). It is the only Muslim-majority autonomous region in the country (Kapahi & Tañada, 2018). In this study, we would still use ARMM since our latest survey period is 2015, when ARMM was still recognized.*

Table 4. *Regional Mean Monthly Household per Capita Consumption**

Year	2000		2003		2006		2009		2012		2015	
Region	In PHP	% of National Mean	In PHP	% of National Mean	In PHP	% of National Mean	In PHP	% of National Mean	In PHP	% of National Mean	In PHP	% of National Mean
1	23,255.08	90.26	17,072.89	89.11	20,502.3	88.57	25,254.98	91.29	26,509.57	89.78	30,229.97	91.69
CAR	24,820.14	96.34	20,332.08	106.12	23,817.1	102.89	28,336.04	102.43	30,505.15	103.31	33,407.08	101.33
2	22,861.62	88.74	16,529.26	86.27	19,530.87	84.37	23,475.83	84.86	23,134.12	78.34	26,905.12	81.61
3	27,216.80	105.64	22,946.22	119.76	28,255.12	122.06	31,081.79	112.35	34,941.89	118.33	39,231.03	118.99
NCR	52,948.72	205.52	38,317.34	199.99	43,471.29	187.79	51,817.85	187.31	53,739.51	181.99	57,933.89	175.72
4A	34,823.89	135.17	26,173.92	136.61	30,559.63	132.01	34,724.79	125.52	38,081.68	128.97	43,601.73	132.25
4B	19,853.68	77.06	13,847.62	72.27	15,450.34	66.74	20,123.49	72.74	22,536.84	76.32	26,328.04	79.86
5	19,685.33	76.41	15,684.41	81.86	18,158.99	78.45	22,760.48	82.27	23,630.38	80.03	26,596.23	80.67
6	24,157.58	93.77	16,285.2	85.00	19,275.46	83.27	23,770.32	85.92	27,095.85	91.76	29,028.97	88.05
7	20,033.92	77.76	16,940.05	88.41	20,176.2	87.16	24,839.81	89.79	26,379.83	89.34	31,606.95	95.87
8	18,040.79	70.03	14,063.67	73.40	17,404.91	75.19	21,404.81	77.37	21,947.53	74.33	25,985.57	78.82
9	17,494.4	67.90	12,431.16	64.88	16,343.38	70.60	19,443.94	70.29	20,467.45	69.31	24,070.17	73.01
10	18,668.44	72.46	14,985.57	78.21	19,333.97	83.52	23,019.93	83.21	22,935.65	77.67	26,104.36	79.18
11	21,368.69	82.94	16,464.29	85.93	18,707.49	80.81	22,730.66	82.17	25,187.94	85.30	30,612.85	92.85
12	19,306.48	74.94	14,050.06	73.33	15,932.08	68.82	21,171.98	76.53	22,750.15	77.04	26,375.77	80.00
13	17,910.49	69.52	13,144.33	68.60	16,695.72	72.12	20,622.23	74.54	23,739.9	80.40	26,363.88	79.97
ARMM	12,522.30	48.61	11,096.39	57.91	12,550.33	54.22	16,274.66	58.83	18,655.49	63.18	18,272.53	55.42
PHL	**25,763.34**		**19,159.92**		**23,148.69**		**27,664.15**		**29,528.66**		**32,969.20**	

Note. CAR = Cordillera Administrative Region; NCR = National Capital Region; ARMM = Autonomous Region in Muslim Mindanao; PHL = Philippines.
**Estimates were computed using the survey mean (svy mean) command of Stata 13.0. Because of the complex survey design of the FIES, the survey mean is not the arithmetic mean of the observations but rather the mean of per capita income or per capita expenditure weighted by the raising factor of each observation.*

of labor, thus exacerbating the problem of urban unemployment and rural underemployment" (p. 19).

Also, following Jao et al. (2000), in line with the three considerations in evaluating living standards, we contextualize in Table 4 the characteristics of these regions based on the survey mean expenditure estimates from FIES. Although this is a simple method, it can illustrate the existing regional welfare that will prohibit us from equating inequality with welfare when indices and reality do not agree. It is striking to see a general increase in per capita consumption from 2000 to 2015 but at different paces among regions. It is also prominent that there are urban (NCR, Central Luzon, CALABARZON) and rural regions (CAR) that posted mean per capita consumption that is much more than the national mean. However, it is also evident that, although there are other regions that have disparity relative to other regions, it can be seen that the Autonomous Region in Muslim Mindanao (ARMM) has been considerably lagging behind. This illustrates the assiduous welfare disparity among regions that exacerbates inequality.

In fulfillment of our second research objective, contained in Table 5 and Table 6 are our estimates of axiomatic inequality and poverty indices, respectively. For a narrative of specific characterizations of the various regions in the Philippines, refer to Jao et al. (2000); Aliping, Pizarro, Reyes, and Rivera (2016); and Rivera (2020).

Inequality Indices

We can see from Table 5 that the Theil *T*, Theil *L*, Piesch, Mehran, and GE(2) indices unanimously revealed that inequality in the Philippines and its regions has been improving from 2000 to 2015, albeit at a leisurely rate, as indicated by the decreasing values of the indices. Also, disparities between and among regions are also evidently widening, which can be due to governance, sociopolitical stability, rapid population growth, exposure to calamities, and differences in economic performance, among others.

Specifically, NCR in earlier survey periods has the highest level of inequality, but improvements were seen in succeeding survey periods. Together with other metropolitan regions (i.e., Central Visayas, Davao), NCR has demonstrated steep improvements towards more equality. This can be attributed to government expenditures on infrastructure and social services in the region (Senate Economic Planning Office, 2006; Corong, Dacuycuy, Reyes, & Taningco, 2013).

Meanwhile, agricultural and emerging agritourism regions in Luzon (with emphasis on CAR) and Visayas (with emphasis on Western Visayas) have also exhibited steep improvements towards more equality. This can be ascribed to some attention given to agriculture through the years (Rivas, 2019) and the emergence of tourism as a complementary source of livelihood (Goldsmith, 2018; Ocampo, 2019). However, these regions can do better if more emphasis is given to improving agricultural productivity. In fact, as cited by Rivas (2019), NEDA is pushing for farm diversification and integration of small farmers into larger enterprises that will help them produce products with market viability.

Although the rapidly industrializing agricultural regions of Central Luzon (Flora, 2017) and CALABARZON (Mojares, 2013) have the highest mean per capita consumption and are relatively more equitably distributed among other regions, they have not shown significant improvements through the years. We can imply that while the state of inequality in these regions is better than in other regions, the trickle-down effect of economic benefits is approximately the same for all segments of the population. To improve inequality, the government has been investing more on infrastructure and social services throughout the country (Rivas, 2019).

On the other hand, it is interesting to note that ARMM, on the basis of per capita consumption, is the most equal among the regions while regions in Visayas and Mindanao have higher levels of inequality compared to regions in Luzon. This may sound incongruous because ARMM is deemed as the poorest region in the country (Gavilan, 2017; PSA, 2019; Rivas, 2019) and has the lowest mean per capita consumption among all regions as per Table 4. We can construe that while inequality in ARMM is low, it is possible that most of its population are equally poor, as it has the lowest mean per capita consumption. To improve inequality, more public investment programs will be allocated to ARMM (Rivas, 2019).

We can imply from these findings that, consistent with Jao et al. (2000), national inequality is not principally due to the variations in mean per capita consumption between and among regions but more to the distribution of average living standard within a region. That is, even though there are regions that have high or low mean per capita consumption, it is not necessary that they have the same level of living.

Table 5. *Axiomatic Regional Inequality Indices*

Index	Theil *T* also GE(1)						Theil *L* also GE(0)						Piesch					
Region	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**
1	0.25639	0.22342	0.23624	0.20606	0.25312	0.22474	0.23122	0.20026	0.21444	0.19431	0.23517	0.21069	0.32102	0.29454	0.30563	0.28900	0.31600	0.29940
CAR	0.28882	0.25963	0.32940	0.29810	0.27577	0.23058	0.28042	0.24936	0.29582	0.27758	0.26768	0.22548	0.34597	0.32687	0.35955	0.34089	0.33837	0.30614
2	0.28661	0.28520	0.27571	0.27566	0.20925	0.21002	0.25334	0.23581	0.23882	0.23950	0.19811	0.19782	0.34035	0.32607	0.32866	0.32533	0.29224	0.28749
3	0.20583	0.19080	0.23633	0.20456	0.21579	0.21792	0.18999	0.18297	0.22068	0.19225	0.20016	0.20057	0.28729	0.27857	0.30571	0.28350	0.29012	0.29137
NCR	0.41437	0.27092	0.25473	0.25879	0.25024	0.22453	0.32093	0.23496	0.23102	0.23486	0.22869	0.20842	0.38410	0.32564	0.31939	0.32247	0.31732	0.29965
4A	0.26839	0.23840	0.25476	0.23605	0.25878	0.23884	0.24136	0.23029	0.24630	0.22885	0.24721	0.23001	0.32399	0.30885	0.32035	0.30940	0.32226	0.30899
4B	0.35039	0.29120	0.24142	0.25035	0.29329	0.27665	0.29802	0.25155	0.22189	0.22476	0.26435	0.25507	0.37323	0.33597	0.31052	0.31310	0.34096	0.33371
5	0.43774	0.32871	0.28716	0.26910	0.26633	0.22322	0.33383	0.28159	0.25046	0.23134	0.23089	0.20243	0.39603	0.35854	0.33621	0.31993	0.32036	0.29565
6	0.38836	0.29064	0.28765	0.27254	0.31319	0.24519	0.33355	0.25766	0.26283	0.25086	0.28863	0.22489	0.39391	0.34088	0.34406	0.33215	0.35812	0.31317
7	0.34209	0.36691	0.35145	0.32336	0.31369	0.29481	0.31414	0.34567	0.33323	0.30958	0.30086	0.28775	0.37315	0.38634	0.37739	0.36434	0.35745	0.34982
8	0.36205	0.32198	0.34385	0.31142	0.33846	0.32630	0.31369	0.28027	0.30554	0.27612	0.29372	0.27515	0.38218	0.35948	0.37360	0.35346	0.36795	0.35507
9	0.33870	0.39883	0.40028	0.35532	0.34131	0.32286	0.30804	0.35609	0.34778	0.30874	0.29568	0.28582	0.36933	0.40059	0.39711	0.37333	0.36553	0.35321
10	0.34970	0.36152	0.36189	0.33391	0.35869	0.32074	0.31605	0.32579	0.32612	0.30783	0.31396	0.29181	0.37716	0.38477	0.38501	0.37182	0.38013	0.36317
11	0.29317	0.33277	0.26881	0.27583	0.24491	0.27527	0.27746	0.30042	0.24983	0.25496	0.22984	0.25176	0.35157	0.36434	0.33105	0.33102	0.31395	0.33160
12	0.32412	0.27813	0.22676	0.28548	0.26395	0.29408	0.27953	0.24139	0.20543	0.24880	0.24911	0.25415	0.35918	0.32904	0.29964	0.33405	0.32984	0.33348
13	0.32032	0.26980	0.27412	0.30724	0.26400	0.27276	0.27448	0.24550	0.24836	0.26266	0.24084	0.24602	0.35430	0.33276	0.33210	0.34512	0.32578	0.32889
ARMM	0.14864	0.16732	0.10118	0.11143	0.10438	0.09929	0.12634	0.14281	0.09244	0.09712	0.09223	0.08509	0.23359	0.24946	0.19576	0.20306	0.19552	0.18689
PHL	0.40150	0.34146	0.33638	0.31739	0.31465	0.29216	0.34416	0.31340	0.31006	0.29133	0.29143	0.27127	0.39225	0.37047	0.36906	0.35707	0.35674	0.34346

Table 5 (Continued)

Index	Mehran						GE(2)						Kakwani					
Region	2000	2003	2006	2009	2012	2015	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**
1	0.49042	0.45721	0.47010	0.45488	0.48959	0.46957	0.37229	0.34220	0.34269	0.27043	0.36548	0.31219	0.12463	0.10809	0.11498	0.10481	0.12295	0.11194
CAR	0.53862	0.50763	0.54264	0.52817	0.52401	0.48628	0.39525	0.34856	0.62860	0.51676	0.36617	0.30242	0.14473	0.13015	0.15245	0.14092	0.13838	0.11735
2	0.50661	0.48334	0.48791	0.49012	0.45556	0.45326	0.42965	0.53682	0.46145	0.47976	0.27065	0.28546	0.13667	0.12727	0.12886	0.12753	0.10657	0.10483
3	0.45170	0.44531	0.48024	0.45341	0.45844	0.45735	0.28315	0.24089	0.34117	0.28069	0.30557	0.31136	0.10347	0.09883	0.11636	0.10271	0.10652	0.10697
NCR	0.54735	0.48689	0.48773	0.49024	0.48494	0.46844	0.99326	0.43020	0.37534	0.37331	0.35391	0.31221	0.16747	0.12697	0.12365	0.12559	0.12234	0.11166
4A	0.49805	0.49007	0.50474	0.49023	0.50415	0.49010	0.44564	0.32511	0.35353	0.31081	0.36231	0.32606	0.12754	0.11944	0.12697	0.11946	0.12783	0.11950
4B	0.53618	0.49890	0.47656	0.47841	0.51231	0.50891	0.57478	0.47194	0.34014	0.38525	0.44817	0.39831	0.15922	0.13422	0.11826	0.11990	0.13859	0.13399
5	0.55886	0.52380	0.49762	0.47960	0.47949	0.45562	1.45999	0.57950	0.44300	0.47565	0.42705	0.32003	0.17551	0.14944	0.13419	0.12385	0.12399	0.10887
6	0.56551	0.50551	0.51442	0.50434	0.53638	0.48056	0.67500	0.44573	0.40789	0.39342	0.46617	0.35066	0.17479	0.13741	0.13985	0.13245	0.15053	0.11990
7	0.55776	0.57703	0.56997	0.55321	0.54699	0.53853	0.52688	0.58077	0.54834	0.46301	0.45241	0.40024	0.16185	0.17255	0.16649	0.15660	0.15208	0.14666
8	0.55078	0.51959	0.54391	0.52124	0.53152	0.51526	0.58997	0.49826	0.54143	0.47840	0.53955	0.57058	0.16600	0.14980	0.16051	0.14618	0.15598	0.14674
9	0.55138	0.57882	0.57391	0.54496	0.53069	0.52983	0.52438	0.66146	0.73672	0.62674	0.56631	0.57050	0.15887	0.18107	0.17824	0.16053	0.15474	0.14742
10	0.55808	0.56174	0.56205	0.55106	0.54880	0.53716	0.55563	0.56239	0.55940	0.48845	0.56818	0.47011	0.16405	0.16916	0.16923	0.16015	0.16485	0.15342
11	0.53237	0.54380	0.50702	0.50959	0.48875	0.50674	0.39360	0.52941	0.38168	0.41895	0.34309	0.41141	0.14619	0.15509	0.13204	0.13280	0.12127	0.13252
12	0.52522	0.49193	0.46162	0.49805	0.50527	0.50368	0.53198	0.45812	0.32746	0.45958	0.24911	0.53558	0.14948	0.12957	0.11093	0.13289	0.13126	0.13360
13	0.51915	0.50032	0.50135	0.50696	0.49566	0.49582	0.52536	0.38247	0.41298	0.52218	0.38794	0.41017	0.14631	0.13201	0.13209	0.14009	0.12809	0.13013
ARMM	0.36334	0.38753	0.31908	0.32050	0.31764	0.29606	0.22167	0.25418	0.12602	0.14922	0.14343	0.13679	0.07199	0.08077	0.05314	0.05641	0.05311	0.04959
PHL	0.57449	0.55499	0.55310	0.53829	0.53856	0.52328	0.89011	0.55067	0.53092	0.49396	0.47426	0.43442	0.17527	0.16009	0.15897	0.15032	0.15018	0.14093

Note. Computation of inequality indices is facilitated by Stata 13.0's inequal7 module developed by Van Kerm (2007). CAR = Cordillera Administrative Region; NCR = National Capital Region; ARMM = Autonomous Region in Muslim Mindanao; PHL = Philippines.

In terms of the Kakwani index, it indicated that the Philippines has been demonstrating regressive distribution effects on consumption as shown by the decreasing values of the index through the years. This is not surprising as "the Philippine tax system is mildly progressive, and even borderline regressive – in many instances, poor Filipinos effectively pay a larger fraction of their income in taxes" (Punongbayan, 2017, par. 16). However, according to Carter (2012), because the distribution of disposable incomes depends on both taxes and benefits, regressive taxes fall on consumption that makes up a larger share of the budgets of the poor relative to the nonpoor. However, it can be progressive if these are offset by other tax and income-related benefits that increase the disposable income of poorer households vis-à-vis reduced tax rates.

Poverty Indices

We can see from Table 6 that the Watts, Sen, Takayama, and CHU indices also consistently indicated an improving poverty severity situation in the Philippines as indicated by the decreasing estimated values from 2000 to 2015. It also revealed a stark disparity in the improvement of poverty among different regions in the country. Some regions are improving faster than the others, there are also regions that reported almost no improvements, and there are regions that showed worsening poverty.

We explicate the estimated poverty threshold (i.e., poverty line) that served as input to the various poverty indices. We can see that the urban regions of Central Luzon, NCR, and CALABARZON as well as the rural regions of Ilocos and CAR have poverty thresholds that are considerably larger than the national through the years. On the other hand, ARMM has the lowest poverty threshold among all regions. Meanwhile, the rest of the regions have a poverty threshold slightly less than the national poverty threshold. We can also see that the poverty threshold has been moving upwards through the years indicating that household heads would need to earn more to finance the minimum required household consumption.

Case in point: in 2015, the estimated national annual per capita poverty threshold, based on consumption, in NCR, is PHP 22,631.21. This increases to PHP 113,156.05 for a household with five members. Hence, the household head must earn at least PHP 9,429.67 per month to meet the minimum required consumption. Otherwise, the household is considered poor.[3] Meanwhile, in Eastern Visayas, a household head must earn at least PHP 3,756.15 per month to meet the minimum required household consumption to be deemed nonpoor.

In monetary terms, these findings indicate that specific regions have their respective necessities in purchasing bundles of basic goods (Balisacan, 2001) and have different standards to maintain a minimum standard of well-being (Albert, 2019). Results also show that it is most expensive to live in NCR and least expensive to live in ARMM (Fiestada et al., 2018).

Meanwhile, from the Watts index, we can construe two situations. First, we assume that per capita consumption among the poor is constant. Since the Watts index has been declining through the years, from Morduch (1998), we can conclude that poor households need a shorter time to get out of poverty. Second, we assume that per capita consumption grows at a constant rate. Given that the Watts index has been declining, following Morduch (1998), we can conclude that poor households need much lesser time to get out of poverty. On a regional basis, it can be implied that it takes the least time to get out of poverty in ARMM followed by NCR and Eastern Visayas. On the other hand, all other agricultural regions' Watts indices have shown that households are subjected to more time to get out of poverty. Despite the improving poverty situation, the time for households to exit poverty has lengthened.

Although our indices reflected diminutive improvements in the Philippine poverty situation, these warrant a sense of hopefulness that poverty can be eased. Following Warwick (2018), this can be ascribed to gradual consequences of robust economic growth from 2006 to 2015, as per PSA. Likewise, credit can also be given to certain factors that progressively facilitated households to escape poverty such as job expansion beyond agriculture, remittances from migrant workers, and government transfers through conditional cash transfers (i.e., the *Pantawid Pamilyang Pilipino Program* or *4Ps*). Reforms in education and healthcare, improvement in access to clean water and electricity, and expansion of social safety nets to cover most of the poor, among others, have contributed to improvements reflected by the indices. However, as Warwick (2018) emphasized, "the Philippines needs to do more to end poverty" (par. 6). From the axiomatic indices, addressing poverty at the regional level is key to bringing down poverty in the entire country, with emphasis on regions vulnerable

Table 6. *Axiomatic Regional Poverty Indices*

Index	Watts						Sen						Takayama						Thon					
Region	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**
1	2.188	2.380	2.823	2.650	4.482	3.532	2.601	2.629	3.107	2.988	4.786	3.841	1.772	1.811	2.123	2.016	3.237	2.636	3.590	3.641	4.272	4.058	6.506	5.305
CAR	4.504	4.008	4.151	5.941	4.762	4.543	5.048	4.366	4.511	6.133	5.056	4.810	3.410	2.907	3.017	4.178	3.436	3.241	6.932	5.848	6.078	8.389	6.912	6.502
2	1.913	2.097	2.270	2.963	2.831	3.639	2.280	2.379	2.490	3.279	2.978	3.774	1.562	1.638	1.709	2.216	2.062	2.631	3.158	3.297	3.431	4.457	4.137	5.278
3	2.051	2.704	3.784	3.336	3.464	3.242	2.392	3.068	4.080	3.757	3.814	3.531	1.632	2.078	2.799	2.548	2.575	2.408	3.296	4.190	5.646	5.143	5.185	4.843
NCR	3.209	2.194	2.695	2.815	2.918	2.967	3.668	2.546	3.051	3.144	3.255	3.298	2.489	1.728	2.053	2.128	2.197	2.260	5.039	3.488	4.134	4.285	4.421	4.558
4A	3.429	4.755	5.374	4.611	5.102	4.880	3.860	5.020	5.752	4.983	5.427	5.205	2.612	3.418	3.865	3.378	3.667	3.541	5.277	6.870	7.801	6.812	7.387	7.139
4B	2.342	2.871	3.377	3.149	4.165	4.090	2.712	3.177	3.615	3.387	4.542	4.595	1.878	2.164	2.496	2.373	3.072	3.066	3.810	4.356	5.019	4.774	6.193	6.196
5	1.998	2.886	2.774	2.891	2.822	3.016	2.383	3.181	3.012	3.160	3.103	3.222	1.633	2.191	2.094	2.150	2.130	2.251	3.308	4.409	4.213	4.321	4.284	4.524
6	2.622	2.954	3.030	3.558	3.888	3.256	3.060	3.238	3.343	3.787	4.215	3.535	2.098	2.186	2.290	2.629	2.873	2.423	4.258	4.396	4.610	5.285	5.781	4.876
7	4.341	6.851	6.936	6.042	6.391	5.717	4.907	6.946	7.105	6.299	6.507	5.885	3.269	4.726	4.834	4.220	4.468	4.036	6.632	9.496	9.728	8.478	8.980	8.112
8	2.406	2.588	3.211	3.204	2.986	2.728	2.836	2.807	3.437	3.560	3.260	3.037	1.916	1.904	2.394	2.411	2.247	2.070	3.875	3.825	4.811	4.856	4.524	4.164
9	4.399	5.339	4.353	4.052	3.852	4.767	4.844	5.521	4.628	4.337	4.049	4.988	3.314	3.794	3.217	2.987	2.747	3.434	6.714	7.633	6.483	6.015	5.501	6.908
10	3.721	3.912	3.571	3.864	3.415	3.353	4.223	4.342	3.977	4.233	3.773	3.713	2.855	2.924	2.658	2.869	2.568	2.531	5.785	5.906	5.351	5.779	5.174	5.100
11	3.261	4.476	3.451	4.364	3.670	3.661	3.682	4.959	3.921	4.734	4.040	4.087	2.543	3.286	2.625	3.202	2.725	2.751	5.146	6.626	5.308	6.444	5.489	5.556
12	2.105	2.688	2.502	2.670	3.688	3.725	2.471	3.106	2.752	2.955	3.994	4.093	1.680	2.076	1.880	2.010	2.728	2.769	3.395	4.188	3.780	4.043	5.491	5.578
13	2.672	2.492	3.167	2.739	3.120	3.552	3.128	2.862	3.531	3.053	3.466	3.827	2.074	1.943	2.375	2.061	2.360	2.590	4.185	3.919	4.777	4.144	4.758	5.197
ARMM	0.645	0.747	0.565	0.334	0.434	0.320	0.773	0.925	0.685	0.409	0.534	0.385	0.544	0.644	0.477	0.290	0.370	0.269	1.093	1.298	0.957	0.582	0.742	0.540
PHL	**4.758**	**4.970**	**4.662**	**4.549**	**4.664**	**4.295**	**5.283**	**5.309**	**5.030**	**4.899**	**4.978**	**4.603**	**3.553**	**3.584**	**3.378**	**3.302**	**3.370**	**3.131**	**7.210**	**7.225**	**6.808**	**6.652**	**6.786**	**6.303**

Table 6 (Continued)

Index	CHU (β = 0.10)						CHU (β = 0.90)						Poverty Threshold (in PHP, ½ of Median Value)					
Region	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**
1	2.150	2.317	2.746	2.581	4.344	3.435	1.881	1.907	2.246	2.131	3.468	2.807	8,640.67	6,627.83	7,789.42	9,943.25	10,266.54	11,833.25
CAR	4.404	3.885	4.026	5.746	4.617	4.394	3.720	3.107	3.236	4.518	3.694	3.463	8,871.87	7,472.50	8,206.13	10,504.42	11,166.88	13,034.50
2	1.880	2.048	2.206	2.880	2.739	3.523	1.648	1.722	1.794	2.346	2.175	2.792	8,084.50	6,040.25	7,014.67	8,653.83	9,009.33	10,700.17
3	2.008	2.638	3.675	3.256	3.367	3.150	1.722	2.202	2.997	2.720	2.743	2.556	10,740.83	9,297.00	11,063.13	12,699.83	14,115.63	15,585.67
NCR	3.139	2.146	2.625	2.740	2.839	2.892	2.666	1.825	2.171	2.254	2.326	2.402	17,970.00	14,099.92	16,143.00	19,271.08	20,229.92	22,631.21
4A	3.346	4.607	5.213	4.481	4.946	4.737	2.794	3.668	4.196	3.640	3.961	3.822	13,053.11	10,225.42	11,822.58	13,639.33	14,656.83	17,196.67
4B	2.299	2.794	3.279	3.066	4.049	3.986	2.002	2.292	2.652	2.517	3.298	3.302	6,761.08	5,055.08	5,903.17	7,554.58	8,227.08	9,746.17
5	1.965	2.812	2.699	2.807	2.746	2.931	1.730	2.320	2.214	2.274	2.252	2.382	6,225.17	5,397.88	6,594.21	8,491.29	8,813.58	10,428.42
6	2.575	2.867	2.950	3.456	3.778	3.164	2.244	2.315	2.428	2.795	3.067	2.574	7,722.19	5,838.83	6,827.17	8,653.25	9,326.58	11,037.25
7	4.238	6.613	6.710	5.838	6.180	5.531	3.550	5.149	5.284	4.570	4.855	4.364	6,808.00	5,756.67	6,987.83	8,764.00	9,537.33	11,312.50
8	2.359	2.507	3.121	3.119	2.905	2.657	2.034	2.008	2.537	2.563	2.383	2.187	5,890.26	4,763.25	5,665.50	7,442.04	7,440.71	9,014.75
9	4.294	5.167	4.234	3.938	3.723	4.621	3.592	4.098	3.456	3.198	2.913	3.691	5,953.00	4,038.54	5,211.58	6,572.25	7,029.25	8,612.25
10	3.638	3.810	3.473	3.758	3.325	3.267	3.077	3.141	2.833	3.067	2.737	2.695	6,238.90	4,930.79	6,248.04	7,732.42	7,633.96	8,829.33
11	3.193	4.350	3.368	4.240	3.568	3.566	2.724	3.537	2.813	3.433	2.910	2.948	7,332.94	5,729.21	6,872.50	8,456.75	9,572.08	11,261.88
12	2.062	2.625	2.432	2.597	3.583	3.623	1.776	2.202	1.983	2.123	2.910	2.958	6,617.61	5,198.25	6,159.42	7,644.25	8,274.33	9,844.29
13	2.611	2.435	3.081	2.664	3.039	3.443	2.200	2.056	2.519	2.177	2.511	2.747	6,365.27	4,704.58	6,076.92	7,278.54	8,691.58	9,649.29
ARMM	0.634	0.737	0.556	0.330	0.427	0.314	0.560	0.666	0.490	0.297	0.379	0.276	5,208.71	4,624.79	5,514.75	7,066.38	8,269.67	8,051.79
PHL	**4.642**	**4.820**	**4.522**	4.414	4.522	4.168	3.872	3.871	3.638	3.550	3.624	3.356	8,524.83	6,557.21	7,891.58	9,737.21	10,374.17	11,863.67

Note. Computation of poverty indices is facilitated by Stata 13.0's apoverty module developed by Azevedo (2007). CAR = Cordillera Administrative Region; NCR = National Capital Region; ARMM = Autonomous Region in Muslim Mindanao; PHL = Philippines.

to calamities and/or affected by conflicts. With the devastating effects of COVID-19 on the poor, much more work has to be done to recoup the gains eroded by the pandemic.

CONCLUSION AND RECOMMENDATIONS

In understanding where the Philippines stands in poverty alleviation, we traced the various axiomatic inequality and poverty indices both at the national and at the regional levels. We argue that having such estimates can aid in national and regional anti-poverty policy evaluation and planning. Of equal importance is that it also facilitated interregional comparisons. Our methodology differs from conventional practices such that we made use of consumption expenditure rather than income as welfare measure, as argued by Balisacan (2001).

In addressing our first objective, we saw from existing literature that despite availability of data, there is still a lack of information and analysis about inequality and poverty situation in the country particularly at regional levels. Indeed, there is still much work to be done in understanding the causes of poverty to craft policies geared towards shared prosperity and sustainable growth.

In addressing our second objective, we estimated several axiomatic inequality and poverty indices. Other than the usual indices being reported by PSA and being featured in existing studies, we were able to generate estimates of other indices that emphasized a different facet of inequality and poverty both at the national and at the regional levels. Although there is no single best measure, the indices agree that the Philippines demonstrated gradual improvements in inequality and poverty brought about by government-initiated reforms and programs, supported by robust economic growth, that are targeted towards enabling the poor uplift themselves.

In addressing our third objective, we set the following recommendations. Policies aimed to alleviate poverty must be hinged on a systematic understanding of the poverty situation by rethinking the concept (Wagle, 2018) through people-focused theory of change (Serrat, 2017) and collaborative governance (Florini & Pauli, 2018).

First, although agricultural regions are experiencing inequality and poverty, they are slowly catching up indicative of their potential to improve income distribution and reduce poverty. Nonetheless, poverty in the country has been a largely rural phenomenon despite rapid urbanization in recent years. Hence, following Sharma (2019), policy makers must urge government to funnel funds for massive infrastructure and technological investment in agriculture to make it more economically viable. We also echo Rivas (2019) in calling the government to continuously increase efforts in pushing for regional and rural development. We need to improve connectivity across regions and enhance the efficiency of transport, communications, and overall logistics network—all of which make lives convenient. Agriculture, together with fisheries and forestry (AFF), has to be seen as important as manufacturing and services in the Philippines for it to undergo rapid transformation that will significantly reduce internal migration, decongest cities, reduce the pressure on creating more jobs in cities, and redistribute income opportunities across the country. This will improve agricultural productivity, efficiency, and income particularly for small subsistence farmers. With the advent of technology, small farmers are able to create linkages, strengthen their value chain, increase their competitiveness, and enable them to hedge against systematic and unsystematic risks. By expanding economic opportunities in AFF, the country is able to provide poor farmers, foresters, and fishermen prospects of uplifting themselves out of poverty. Consequently, as emphasized by NEDA (2017), advancing the AFF sector and ensuring the sustainability of its resource base allow the Philippines to achieve food security, to stimulate more inclusive growth and development, and to capture markets for high-value AFF output in international trade. To do this, policy makers need to revisit and prioritize key policy reforms and programs projects designed by NEDA (2017, p. 5–7) to accelerate the economic development and poverty reduction potential of the AFF sector.

Second, we have seen that most regions in Mindanao are poor. There is a need to unlock Mindanao's potential in agriculture, manufacturing, and tourism. However, this is reliant on promoting peace and sociopolitical stability in the area. Unless security can be assured in Mindanao, their critical role in bringing down poverty in the entire country will not be realized. We are hopeful that the Bangsamoro Autonomous Region in Muslim Mindanao can jumpstart the peace that Mindanao has long worked for. To do this, it is essential that policymakers understand the issues in Mindanao's

economy. For instance, the discussions compiled by Lara and Schoofs (2016) argued that informal and unregulated economic activities characterize Mindanao's economy and have been overlooked in the analysis of its conflict dynamics. Hence, little is understood about the informal economy's impact on armed violence, development, and governance.

Third, although tax reforms have been recently implemented in the country (i.e., the *Tax Reform for Acceleration and Inclusion* or *TRAIN Law*), there is still a need to strike a balance between progressive and regressive taxation—a comprehensive tax reform. We echo Punongbayan (2017) in using taxes to make society more equitable and simultaneously allow the economy to grow. Future studies may investigate how exactly can this be designed and implemented.

Fourth, for anti-poverty policies to be impactful particularly to the poorest, these should be region or province specific rather than across the board. There should be alignment with the national overarching goal. Hence, coordination between the national and local governments is key to create new value together that would not have been possible without the synergy. In combatting poverty, together with the national and local governments, nongovernment organizations, people's organizations, the academe, and the private sector must seek convergence points through personal interactions or joint assessments with the poor through formal or informal dialogues. There is also a need to capacitate poor areas through empowering organizations such as civil society organizations and through the private sector's corporate social responsibility. The benefits may be significant because those at the grassroots level certainly have a better understanding and assessment of the local poverty situation.

Therefore, with collaborative governance supported by a robust and data-driven understanding of the inequality and poverty situation, appropriate policies can be formulated for the Philippines to overcome poverty. However, it does not end with this study, as we have to recover from the impacts of COVID-19. Future studies may continue tracking inequality and poverty with a more novel approach given future developments in poverty studies and availability of more recent FIES and APIS data. Regional profiling remains to be relevant as the absence of updated living standard metrics at the subnational level limits the focus and effectiveness of anti-poverty policies.

Note

[1] According to Garcia, Francisco, and Caboverde (2016), "the notion of shared prosperity subsumes the concept of inclusive growth, which primarily focuses on involving marginalized sectors like the poor in the economic growth process. Like inclusive growth, shared prosperity is an alternative to the lingering obsession with economic growth, especially in relation to national competitiveness. Shared prosperity takes inclusive growth one step further, envisioning rising standards of living for all citizens. Realizing this depends on the equitable distribution of economic opportunities and benefits among the population" (p. 2). That is, shared prosperity is a way to trickle down the economic growth of the Philippines to all, including those in the margins of society (Remo, 2016).

[2] Following Pyatt (1987), since "poverty measure is then defined in terms of the level and distribution of basic incomes across the whole population" (p. 459). That is, poverty is rooted from unequal and inequitable income distribution (Todaro & Smith, 2015). Hence, we use living standard and welfare jointly. Our measure of welfare is the basis of estimating inequality and poverty. Note also that we also use measure, estimate, indicator, index, and metric interchangeably.

[3] The PSA clusters those who cannot earn or raise the minimum income to meet the basic food and nonfood requirements as poor—citizens living below the poverty threshold (Fiestada et al., 2018).

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Appendix 1. *Selected Welfare, Inequality, and Poverty Measures Through the Years*

Approach	Measure	Equation	Legend	Remarks
Measures of social welfare	*Sen Welfare Index* (Sen, 1973, 1976, 1984)	$S = \sum_{i=1}^{n} x_i v_i(x)$ $S = \mu(1 - G)$	n = sample size; x_i = welfare measure of individual i; $v_i(x)$ = weight given to i. μ = mean income of society; G = Gini index	• Satisfies nondecreasing in x_i, anonymity, and Pigou–Dalton principle of transfers (Dalton, 1920) • Satisfies axioms of relative equity, monotonic welfare, rank order, and normalization (Jao et al., 2000)
	Kakwani Welfare Index (Kakwani, 1980, 1981)	$K_\lambda = \frac{\mu(1 - G + \lambda G)}{1 + \lambda G}$	λ = constant with values ranging from 0 to 1	• When $\lambda = 0$, the sense of relative deprivation depends only on the number of persons who are better off than person i. • When $\lambda = 1$, the sense of relative deprivation depends only on the actual welfare measure enjoyed by these persons. • Best to choose between 0 and 1 for λ to incorporate both aspects of relative deprivation.
Social welfare approach of measuring inequality	*Dalton inequality measure* (Dalton, 1920)	$D = \frac{log(\mu) + c}{log(\gamma) + c}$	μ = mean income; γ = geometric mean income	• Given by the proportional loss in welfare resulting from having the actual, rather than a perfectly equal welfare distribution (Jao et al., 2000)
	Atkinson inequality measure (Atkinson, 1970)	$A_\epsilon(y_1, \dots, y_n) = \begin{cases} 1 - \frac{1}{\mu}\left(\frac{1}{n}\sum_{i=1}^{n} y_i^{1-\varepsilon}\right)^{1/(1-\varepsilon)} for\ 0 \le \varepsilon \ne 1 \\ 1 - \frac{1}{\mu}\left(\prod_{i=1}^{n} y_i\right)^{1/n} for\ \varepsilon = 1 \end{cases}$	ε = inequality aversion level; y_i = individual income; μ = mean income; n = sample size	• Given by the possible reduction in aggregate individual welfare measure that would cause social welfare to be the same (Jao et al., 2000) • Useful in determining which end of the distribution contributed most to inequality (Atkinson, 1970) • Becomes more sensitive to changes at the lower end of the income distribution as ε approaches 1 • Becomes more sensitive to changes in the upper end of the income distribution as ε approaches 0
Axiomatic approach of measuring inequality	*Lorenz curves** (Lorenz, 1905)	See discussions of "Inequality" (1986); Jao et al. (2000); Aliping, Pizarro, Reyes, and Rivera (2016); and Rivera (2020).		
	*Gini coefficient** (Gini, 1921)	See discussions of "Inequality" (1986), Jao et al. (2000), and Rivera (2020).		

Relative mean deviation (Bresciani-Turroni, 1939)	$I_{RMD} = \frac{1}{2\bar{y}n}\sum_{i=1}^{n}\lvert y_i - \bar{y}\rvert$	y_i = individual income; *y*-bar = mean income; *n* = sample size	• Indicates the average degree to which individual incomes in the population differ from the mean. • Can be interpreted as the proportion of total income needed to be transferred from those above mean income to those below to achieve equality ("Inequality," 1986, p. 279).
Coefficient of variation	$I_{CV} = \frac{1}{\bar{y}}\sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \bar{y})^2}$	y_i = individual income; *y*-bar = mean income; *n* = sample size	• Because I_{RMD} does not satisfy the Pigou–Dalton principle of transfers, it is transformed into the coefficient of variation ("Inequality," 1986, p. 279).
Standard deviation of logs	$I_{SDL} = \frac{1}{n}\sum_{i=1}^{n}(logy_i - log\bar{y}_G)^2$	y_i = individual income; *y*-bar$_G$ = geometric mean income; *n* = sample size	• Used to capture weight transfers at the lower end of the distribution than those higher up (Foster & Shorrocks, 1985; "Inequality," 1986, p. 280)
Kernel densities * (Rosenblatt, 1956)	See discussions of Jao et al. (2000), Sala-i-Martin (2006), Aliping, Pizarro, Reyes, and Rivera (2016).		
Theil T inequality index Theil (1967, 1972)	$I_{TH} = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}}log\frac{y_i}{\bar{y}}$	y_i = individual income; *y*-bar = mean income; *n* = sample size	• Theil *L* index—an index of entropy that transforms population shares into income shares and gives most weight to extreme incomes • Theil *T* index (mean logarithmic deviation) gives most weight to low incomes. • Both satisfy most desirable criteria for inequality measures—relative-invariant indices, lying in the range from zero to plus infinity, and income transfers have greater effect among the poor than the rich ("Inequality," 1986).
Theil L inequality index (mean log deviation) Theil (1967, 1972)	$I_{MLD} = \frac{1}{n}\sum_{i=1}^{n}log\frac{\bar{y}}{y_i}$	y_i = individual income; *y*-bar = mean income; *n* = sample size	
Piesch inequality measure (Piesch, 1975)	$I_{PIE} = \frac{3}{2n^3\bar{y}}\sum_{i=1}^{n}i(1-1)\,(y_i - \bar{y})$	y_i = individual income; *y*-bar = mean income; *n* = sample size	• Give greatest weight to high incomes, suggesting that inequality is best indicated by the affluence of the few (Giaccardi, 1950)
Mehran inequality measure (Mehran, 1976)	$I_{MEH} = \frac{3}{n^3\bar{y}}\sum_{i=1}^{n}i(2n+1-1)(y_i - \bar{y})$	y_i = individual income; *y*-bar = mean income; *n* = sample size	• Concentrate on low incomes—inequality is the existence of individuals with incomes much below those of others (Nygard & Sandstrom, 1981).

	Generalized entropy inequality index (Shorrocks, 1980)	$GE(\alpha) = \begin{cases} \frac{1}{n\alpha(\alpha-1)}\sum_{i=1}^{n}\left[\left(\frac{y_i}{\bar{y}}\right)^{\alpha}-1\right], \alpha \neq 0,1 \\ \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}}ln\frac{y_i}{\bar{y}}, \alpha = 1 \\ -\frac{1}{n}\sum_{i=1}^{n}ln\frac{y_i}{\bar{y}}, \alpha = 0 \end{cases}$	α = parameter that regulates the weight given to distances between incomes at different parts of the income distribution; y_i = individual income; *y*-bar = mean income; n = sample size	• Derived from information theory as a measure of redundancy in data • When $\alpha = 0$, *GE* is the *mean log deviation*; when $\alpha = 1$, *GE* is *Theil T*; and when $\alpha = 2$, *GE* is half the squared *coefficient of variation* (Shorrocks, 1980).
	Kakwani inequality measure (Kakwani, 1980, 1981)	$I_{KAK} = \frac{1}{2-\sqrt{2}}\left[\left(\frac{1}{n\bar{y}}\sum_{i=1}^{n}\sqrt{y_i^2+\bar{y}^2}\right)-\sqrt{2}\right]$	y_i = individual income; *y*-bar = mean income; n = sample size	• Since the Gini coefficient is most sensitive to income transfers near to average income, measures based on the length of the Lorenz curve is more sensitive at lower income levels ("Inequality," 1986).
Axiomatic approach of measuring poverty	*Headcount ratio*	$HCR = \frac{1}{n}\sum_{i=1}^{n}1(x_i \leq z)$	x_i = welfare measure; z = poverty threshold; n = sample size	• Defined as the fraction of population below the poverty line (Todaro & Smith, 2015) • Insensitive to the degree of poverty and income distribution among the poor (Saisana, 2014)
	Poverty gap ratio	$PGR = \frac{1}{n}\sum_{I=1}^{q}\left(\frac{z-x_i}{z}\right)$	x_i = welfare measure; z = poverty threshold; q = number of individuals with $x_i \leq z$; n = sample size	• Addresses the shortcomings of the *headcount ratio* by accounting for how far below the poverty line is the welfare measure of the poor • Reflects poverty depth/intensity • Insensitive to income distribution among the poor and ignores the effect of inequality among the poor (Saisana, 2014)
	Income gap ratio	$IGR = \frac{\sum_{i=1}^{HC}(z-y_i)}{zHC}$	*HC* = headcount; z = income poverty threshold; $(z - y_i)$ = income shortfall of the poor	• Ratio of the income shortfall of the poor and the minimum total income if all poor were brought out of poverty (Todaro & Smith, 2015)
	Watts poverty index (Watts, 1964)	$P_{WTS} = \frac{1}{n}\sum_{i=1}^{q}ln\left(\frac{z}{y_i}\right)$	n = individuals in the population indexed in ascending order of welfare; y_i = welfare measure; q = individuals whose welfare falls	• Distribution-sensitive poverty measure that satisfies the focus, monotonicity, transfer, and decomposability axioms • Allows for the generating of poverty incidence curve (Saisana, 2014)

		below poverty threshold; z = poverty threshold	
Sen poverty index (Sen, 1976)	$P_{SEN} = HCR \times G_z + PGR \times (1 - G_z)$	*HCR* = headcount ratio; G_z = income Gini coefficient of individuals below the poverty line; *PGR* = poverty gap ratio	• Because the *headcount ratio* fails to satisfy monotonicity and transfer axioms and the *income gap ratio* violates transfer axiom (Shorrocks, 1995), Sen (1976) combined the effects of number of the poor, depth of poverty, and within-group poverty distribution. • Derived from axioms and is sensitive to income distribution among the poor (Saisana, 2014) • Cannot be used to decompose poverty into contributions from different subgroups due to its dependence on the Gini coefficient (Deaton, 1997)
Takayama poverty index (Takayama, 1979)	$P_{TKY} = HCR[(1 - \phi)PGR + \phi G_z]$	*HCR* = headcount ratio; *PGR* = poverty gap ratio; G_z = Gini coefficient of the poor; ϕ = sum of weights on aggregated poverty and income gaps	• Decomposed the Gini coefficient of the censored income distribution into *headcount ratio*, *poverty gap ratio* and *Gini coefficient* • Allows for an intensive study of poverty because the factors governing changes in poverty is determined (Takayama, 1979) • Can assess the impact of policies against poverty through changes in *headcount ratio*, *poverty gap ratio*, or *Gini coefficient*
CHU poverty index (Clark et al., 1981)	$P_{CHU} = 1 - \left\{\frac{q}{n}\left[\frac{y^*_{EDE\,P}}{z}\right]^{\beta} + \left(1 - \frac{q}{n}\right)\right\}^{1/\beta}$	q = individuals whose welfare measure falls below z = poverty threshold; n = sample size; $y^*_{EDE\,P}$ = equally distributed equivalent income; β = poor's sensitivity to regressive income transfers	• Based on a social welfare function, defined over the truncated population • Addition of a poor person to the population increases the poverty index if the income of the additional poor person is lower than the equally distributed equivalent of the censored income distribution, and vice-versa (Hagenaars, 1987).
Thon poverty index (Thon, 1981, 1982, 1983)	$P_{THN} = \frac{2}{n(n+1)z}\sum_{i=1}^{q}(n + 1 - i)(z - y_i)$	y_i = welfare measure; q = individuals whose welfare measure falls below poverty threshold; z = poverty threshold; n = sample size	• Weighs the income gap of the poor with their rank order in the total income distribution (Hagenaars, 1987) • Alternative to poverty measures that do not satisfy the transfer axiom
FGT poverty indices * (Foster, Greer, & Thorbecke, 1984)	To overcome shortcomings of HCR and PGR, FGT indices are used (Foster et al., 1984). See discussions of Jao et al. (2000); and Rivera (2020)		

**We did not detail out Lorenz curves, Gini coefficients, Kernel densities, and FGT indices as extensive Philippine studies have been done estimating these.*