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Pro-Poorness of Child's Multidimensional Welfare in South Africa Using the Alkire-Foster and Fuzzy Sets Approaches

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Abstract: The multidimensional notion of poverty has been widely emphasized in development economic literature. However, very little is known on the pro-poorness of children's multidimensional welfare in South Africa. This study therefore analyzed the multidimensional welfare indicators of South African children and their pro-poorness. The data were the General Household Survey (GHS) for 2017, 2018 and 2019. Child's poverty indicators were computed with Alkire-Foster and fuzzy set approaches. These were transformed into multidimensional wealth indicators (MWIs) and analyzed using the pro-poor growth index (PPGI) and poverty equivalent growth rate (PEGR). The results revealed that the fuzzy MWIs were pro-poor between 2017 and 2018 with PPGI of 1.33, 1.84 and 2.56 for poverty incidence, depth and severity, respectively, but only pro-poor for poverty incidence in 2018/2019 with PPGI of 1.714. The fuzzy MWIs were largely pro-poor among Black/African, White, and those who resided in traditional areas between 2017 and 2019. It was concluded that although interventions to reduce poverty in South Africa had shown some level of pro-poorness, multidimensional poverty is still high among children. Also, analysis of pro-poor growth with multidimensional approach is highly sensitive to the adopted welfare computation approach.

Keywords: Multidimensional Pro-Poor Growth; Child; PEGR; PPGI

JEL Classifications: D63; I32; O49

1. Introduction

Child's poverty remains one of the major development challenges in the world. Available statistics reveal that although children constitute about one-third of global population, they account for half of those living below the international poverty line of $1.9 per day (United Nations Children's Fund (UNICEF), undated). Welfare

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deprivation among children is even worse when poverty is considered from the multidimensional perspective. Specifically, about one billion children are globally multidimensionally poor, lacking adequate access to healthcare facilities, nutritious food, clean energy, improved sanitation, improved water and a generally conducive dwelling environment for physical and social development (UNICEF, undated).

Before the COVID-19 pandemic, Sub-Saharan Africa (SSA) was the hotspot of child poverty, accounting for about two-thirds of the 356 million children that were globally living in poverty (World Bank, 2020). Currently, child poverty may have worsened due to the economic impacts of the COVID-19 pandemic. Some statistics have shown that households with children suffered more economic losses due to the pandemic (World Bank & UNICEF, 2021). Specifically, it had been reported that during the pandemic, income losses were reported by 55% of households without children as against 76% for those with many children (World Bank and UNICEF, 2021). Therefore, COVID-19 seems to have aggravated global poverty, and it will hinder achievement of some Sustainable Development Goals (SDGs).

It should be emphasized that poverty among children is detrimental to their development, thereby promoting intergenerational vulnerability. UNICEF (2005) submitted that children who live in poverty not only experience economic resources' deprivations, but also faced some emotional shocks. These deprivations prevent them from attaining their educational potentials, and hinder their physical, cognitive, and emotional development (UNICEF, 2005). This underscores the importance of child's welfare, since malnourished and illiterate children often grow up to become illiterate and poor adults (UNICEF, 2000). More importantly, Bird (2013) noted that being affected by poverty at the childhood stage can promote intergenerational poverty.

In South Africa, child poverty is one of the major economic development challenges, requiring some urgent policy interventions. In 2015, about 70% of the children were multidimensionally poor (Statistics South Africa, 2018). It had also been shown that children from provinces that were dominated by rural areas recorded the highest levels of multidimensional poverty with 82.8% for Limpopo, 78.7% for Eastern Cape and 75.8% for KwaZulu-Natal (Statistics South Africa, 2015). Child's multidimensional poverty in South Africa is largely promoted by several factors. These include increase in unemployment, low attainment of formal education, high cost of clean energy, low quality housing, hunger and malnutrition, poor sanitation, and low access to healthcare services (Omotoso & Koch, 2017).

It is imperative to analyse poverty from the multidimensional approach because it is now widely accepted that several economic deprivations contribute to individual's welfare. This study therefore constructed indicators of children's multidimensional poverty index (MPI) using the Alkire-Foster and fuzzy set approaches and examined their pro-poorness. Welfare indicators such as education, health, standard of living,

and ownership of selected assets were included. The study applied two acceptable approaches to analyse pro-poor growth using the Pro-Poor Growth Index (PPGI) that was proposed by Kakwani and Pernia (2000), and Poverty Equivalent Growth Rate (PEGR) that was proposed by Kakwani and Son (2003). This study contributes to the existing knowledge on child's multidimensional welfare and pro-poor growth in South Africa by comparing the results obtained from Alkire-Foster and fuzzy set approaches. This is the first study to adapt multidimensional poverty indicators for empirical investigation of pro-poor growth in South Africa. The study is further justified by making some vital contributions to poverty literature through some empirical insights on the growth patterns of non-income poverty among South African children between 2017 and 2019.

2. Method of Data Analysis

2.1. The Data

This study used the 2017, 2018, and 2019 General Household Survey (GHS) datasets. These datasets were collected by the Statistics South Africa (Stats SA) to inform economic progress and challenges in South Africa. GHS utilized a Master Sample (MS) structure that was created in 2013 as a general-purpose sampling structure to be utilized for all Stats SA's household-based surveys. The master sample framework comprises of detail areas that were found within some primary sampling units (PSUs). The sampling frame takes cognizance of the geographic location of the households (urban, traditional, or farm). Stratified two-stage sample design was used to select the households. There are 3,324 PSUs in the Master Sample, with an anticipated sample of approximately 33000 dwelling units. After data were sorted and merged, a total of 25915, 25224, and 20083 children were respectively selected in the 2017, 2018, and 2019 datasets.

2.2. Selection of Welfare Indicators

The first step in the construction of multidimensional poverty indicators (MPIs) is the selection of welfare dimensions and their associated attributes. Four welfare dimensions were identified which are: standard of living; health; education; and perceived happiness. In all, there were ninety-one (91) welfare attributes of which seventy-six (76) belonged to the standard of living category, eleven (11) belonged to health, two (2) belonged to education, and two (2) belonged to perceived happiness. The standard of living was broken into six (6) classes, while health was broken into two (2). Computation of welfare indicator begins with proper definition of poverty cutoff for identifying the children that were multidimensionally poor. Each of the

selected attributes was coded as 1 for the deprived children and 0 for the non-deprived.

Out of the ninety-one (91) selected welfare attributes, there are twenty two (22) asset ownership variables which were coded as one (1) if a child was residing in household that lacked each of motor vehicle, radio, television, swimming pool, DVD player, TV subscription (M-Net/DSTV/Top), air conditioner, computer/desktop/laptop, vacuum cleaner/floor polisher dish washing machine, washing machine, tumble dryer, deep freezer, free standing refrigerator or combined fridge freezer, electric stove, microwave oven; built-in kitchen sink, home security service, home theatre system, geyser providing hot running water, solar hot water geyser, and solar electrical panel. The seven telecommunication attributes are a child resides in households with no internet connection, no internet in a library or community hall, no internet for students at a school/university/college, no internet at place of work, no internet Cafe less or within 2 km distance, no internet Cafe, and no telephone. The six (6) waste removal attributes are child resides in a household with irregular or no waste removal, littering, water pollution, outdoor/indoor air pollution, land degradation, and excessive noise.

The selected housing attributes are ten (10) and comprised of a child resides in a house classified as shack/caravan, without bricks or cement for walls, without materials such as tile, corrugated iron, asbestos, and others for roof, with unimproved floor materials, more than two persons per room, using unimproved drinking water, distance of water source from the dwelling more than 30 minutes, using unimproved toilet facilities, and sharing toilet facilities. The ten (10) safety attributes are involvement in motor vehicle injury, bicycle related injury, gun shots wounds, severe trauma due to violence, assault, beating, crime-related injury, fire or burn, accidental poisoning, intentional poisoning, sports related injuries, and other injuries. The energy attributes are twenty-one (21) and are child's household lacked access to electricity, used paraffin for lighting, used candles for lighting, used no energy source for lighting, used other unclean sources for cooking, uses paraffin for cooking, uses wood for cooking, uses coal for cooking, and uses animal dung for cooking.

The health/nutrition attributes are eight (8) and are run out of money to buy food, run out of money five or more days in the past 30 days, cut the size of meal or skip any meals, cut size of meals five or more days in the past 30 days, skipped meals, skipped meals five or more days in the past 30 days, smaller variety of food, and smaller meals five or more days in the past 30 days. The three health attributes are a child is not covered by medical aid, a child resides in a place that takes more than 30 minutes to reach the health facility, a child has a fair or poor rated health status. The two attributes for education are a child of 0-59 months is not attending any ECD centre, and a child who is old enough to attend school (6-18 years) does not attend

any school/education institution. Finally, the perceived happiness dimensions were two (2) and are a child resides in a household where the head says they are poor, and a child resides in a household where the head is not happy.

2.3. Computation of Welfare Indicator Using the Alkire-Foster Method

After coding the selected attributes as either 0 or 1, the Alkire and Foster (2011) method was used to compute the multidimensional welfare indicator. This method begins with definition of the poverty cut-off, which identifies whether a child is multidimensionally poor based on his or her total weighted deprivation. In this study, the ninety-one attributes were equally weighted, and a child is considered poor if the deprivation score (c_j) is equal or greater than the poverty cut-off (p). We used the one-third poverty cut off which was recommended by Alkire and Foster (2011). Therefore, based on the ninety-one attributes, a cut-off of 30.33 was set. A child was multidimensionally poor if he/she had a deprivation score higher than or equal to 30. Those children with a deprivation score that is below the poverty cut-off, even if it is non-zero, were replaced by zero '0' as the censoring requirement proposed by Alkire-Foster (2011).

Using the notation $c_j(z)$ for the censored deprivation, such that when $c_j \geq z$, then $c_j\,(z) = c_j$, but if $c_j < z$, then $c_j(z) = 0$. Therefore, $c_j(z)$ is the deprivation score of those who are poor. Like with the weights, the choice of poverty cut-off is also flexible in the Alkire-Foster method, depending on a particular context. The child's MPI, therefore, is the combination of the incidence of children who experience multiple deprivations as well as the intensity of their deprivations. The first component is called the child multidimensional headcount ratio (H) which is expressed as:

$$H = \frac{m}{N} \tag{1}$$

Where m is the number of children who are multi-dimensionally poor, and N is the total population of children. The second component refers to the intensity of poverty (A). It is the average deprivation score of the multi-dimensionally poor children, expressed as:

$$A = \frac{\sum_{j=1}^{n} c_j(z)}{m} \tag{2}$$

Where $c_j(z)$ is the censored deprivation score of children j. Mathematically, a child's MPI is the product of H and A. This means that MPI = (H∗A).

2.4. Child's Welfare Indicator Computation Using the Fuzzy Set

Fuzzy set approach had been highlighted by Dagum and Costa (2004) as a highly efficient and rigorous method for performing a multidimensional analysis of poverty. Although the fuzzy set methodology is characterized by a class of continuous membership grade, the 0 and 1, the coding method for Alkire-Foster was used. The multidimensional poverty ratio ($\mu_B(a_i)$) which highlights the level of welfare deprivation and membership to set B is defined as the weighted average of X_{ij},

$$\mu_B(a_i) = \sum_{j=1}^{m} X_{ij} w_j / \sum_{j=1}^{m} w_j \quad (3)$$

Where w_j is the weight attached to the jth attribute. The intensity of deprivation with respect to X_j is measured by the weight w_j. It is an inverse function of the degree of deprivation and the smaller the number of households and the amount of their deprivation, the bigger the weight. In practice, a weight that justifies this was proposed by Cerioli and Zani (1990). This can be expressed as:

$$w_j = \left[log \sum_{i=1}^{n} g\,(a_i) / \sum_{i=1}^{n} X_{ij}\, g(a_i) \right] \geq 0 \quad (4)$$

First, $g\,(a_i)/\sum_{i=1}^{n} g\,(a_i) > 0$ and $g\,(a_i)/\sum_{i=1}^{n} g\,(a_i)$ is the relative frequency represented by the sample observation a_i, in the total population. Therefore when $\sum_{i=1}^{n} X_{ij} = 0$, the welfare characteristic is to be removed. The poverty ratio of the population μ_B is obtained as a weighted average of the poverty ratio of the ith household ($\mu_B(a_i)$)

$$\mu_B = \sum_{i=1}^{n} \mu_B\,(a_i) g(a_i) / \sum_{i=1}^{n} g\,(a_i) \quad (5)$$

2.5. Poverty Equivalent Growth Rate (PEGR) and Pro-Poor Growth Index (PPGI)

Computation of PPGI and PEGR requires specification of a poverty line. Therefore, the computed MPIs from the Alkire-Foster and fuzzy set were transformed into multidimensional wealth index (MWI) by deducting each of the percentile average values from one (1). Conventionally, a poverty line of one was used for AF welfare indicator, while 0.90797 was used for fuzzy set. The 0.90797 was obtained by deducting the average fuzzy MPI for all the respondents from one. The PEGR is the growth rate γ* that can result in the same proportional change in poverty like the current growth rate γ when the growth process is not perfected by any change in relative inequality. This suggests that everyone in the society obtains the same proportional benefits of growth. Hence, the definite proportional change in poverty is given by δγ where δ is the growth elasticity of poverty. Once inequality does not change, then the growth rate (γ*) can experience a proportional change in poverty

equal to ηγ* which should be equal to δγ. Therefore, PEGR represented by γ* is given by:

$$\gamma^* = \left(\frac{\delta}{n}\right)\gamma = \varphi\gamma \qquad 6$$

The higher the PEGR, the greater the reduction in poverty (Kakwani & Son, 2008). For that reason, PEGR is the effective and relevant measure of pro-poor growth. Kakwani and Pernia (2000) proposed the pro-poor growth index (φ), which is greater than one when growth is pro-poor. This index is expressed as the ratio of poverty elasticities, which ought to be positive when a growth condition is pro-poor. There are two factors which poverty reduction basically depends on. The first one is the degree of economic growth rate implying that the larger the economic growth rate, the larger the reduction of poverty. Growth is complemented by variations in inequality and an increase in inequality decreases the effect of growth on poverty reduction.

3. Results and Discussion

3.1. Relative Measures of Pro-Poor Growth between 2017 and 2019

Table 1. PPGI and PEGRs Multidimensional Wealth Index Growth Rates across the Years

Pro-poor indices	Growth Rate	PPGI	PEGR	Growth Rate	PPGI	PEGR
2017-2018	Alkire-Foster MWI			Fuzzy MWI		
Incidence	0.008	8801162.000	73959.350	0.005	1.333	0.007
Depth	0.008	1.154	0.010	0.005	1.843	0.009
Severity	0.008	0.833	0.007	0.005	2.563	0.013
2018-2019						
Incidence	0.123	0.667	0.082	0.021	1.714	0.037
Depth	0.123	0.654	0.080	0.021	0.003	0.000
Severity	0.123	0.376	0.046	0.021	0.928	0.020

Source: Own Computation

Table 1 shows the relative measures of pro-poor growth using some indices of multidimensional wealth computed with the Alkire-Foster (AF) and fuzzy set approaches between 2017 and 2019. The Table shows that the AF PPGI for incidence, depth and severity were 8801162.00, 1.154, and 0.833, respectively for 2017-2018, while those for fuzzy set were 1.333, 1.843 and 2.563. These results imply that growth was pro-poor for multidimensional poverty incidence and depth in the two approaches because the computed PPGI are greater than one. Moreover, based on PPGI for poverty severity in AF approach was not pro-poor, while that for fuzzy set was pro-poor. The results presented in Table 1 also showed the AF and

fuzzy set child's Poverty Equivalent Growth Rates (PEGRs) over the period of 2017-2018. The AF multidimensional wealth growth rate was 0.008 for 2017-2018, while that for

fuzzy set was 0.005. The AF PEGRs over the period of 2017-2018 for poverty incidence, depth and severity were 73959.350, 0.010 and 0.007, respectively, while those for fuzzy set were 0.007, 0.009 and 0.013. These results imply that AF and fuzzy set MWIs were pro-poor for poverty incidence and depth, while fuzzy set MPI showed pro-poorness for poverty severity.

The Table further showed that over the period of 2018-2019, the AF PPGIs were 0.667, 0.654 and 0.376 for poverty incidence, depth, and severity, respectively, which can be compared with 1.714, 0.003 and 0.928 for fuzzy set. These results imply that with AF and fuzzy set approaches, growth was not pro-poor over the period based on poverty depth and severity. However, the results imply that the poverty incidence shows pro-poorness under the fuzzy set approach. The AF multidimensional wealth growth rate was 0.123 for 2018-2019, while that for fuzzy set was 0.021. The results also showed that over the period of 2018-2019 the AF PEGRs were 0.082, 0.080 and 0.046 for incidence, depth, and severity wealth index, respectively, while fuzzy set had 0.037, 0.000 and 0.020. These results also imply the same conclusion as given above for PPGI with poverty incidence under fuzzy set, being pro-poor in 2018-2019.

3.2. Relative Measures of Pro-poor Growth across Geography Type

3.2.1. Multidimensional pro-poor growth in urban areas

Table 2. PPGI and PEGRs Multidimensional Wealth Index Growth Rates in Urban Areas

Pro-poor indices	**Growth Rate**	**PPGI**	**PEGR**	**Growth Rate**	**PPGI**	**PEGR**
2017-2018	Alkire-Foster MWI			Fuzzy MWI		
Incidence	0.006	5835553.280	36002.180	0.004	1.500	0.006
Depth	0.006	1.680	0.010	0.004	2.711	0.010
Severity	0.006	1.080	0.007	0.004	4.825	0.018
2018-2019						
Incidence	0.188	0.750	0.141	0.032	1.450	0.047
Depth	0.188	0.661	0.124	0.032	0.296	0.010
Severity	0.188	0.427	0.080	0.032	0.463	0.015

Source: Own Computation

Table 2 shows the relative measures of pro-poor growth using some indices of multidimensional wealth computed with the AF and fuzzy set approaches between 2017 and 2019. The Tables shows that the AF PPGIs for poverty incidence, depth

and severity in urban areas were 5835553.28, 1.680 and 1.080, respectively, while those of the fuzzy set were 1.500, 2.711 and 4.825. These results imply that growth was pro-poor for poverty incidence, depth and severity in the two approaches (PPGI>1). The results presented in Table 2 also showed the AF and fuzzy set child's PEGRs over the period of 2017-2018. The AF multidimensional wealth growth rate was 0.006 for 2017-2018 while that of the fuzzy set was 0.004. The AF PEGRs for 2017-2018 were 36002.180, 0.010 and 0.007 for poverty incidence, depth and severity, respectively, while those of the fuzzy set were 0.006, 0.010 and 0.018. These results imply that growth was pro-poor for poverty incidence, depth and severity in the AF and fuzzy set approaches over the period of 2017-2018. Table 2 further showed that over the period of 2018-2019, the AF PPGIs were 0.750, 0.661 and 0.427 for poverty incidence, depth and severity, respectively, while those of the fuzzy set were 1.450, 0.296, and 0.463. These results imply that growth was not pro-poor for poverty depth and severity in the two approaches. Moreover, based on PPGI for poverty incidence in AF approach, growth was not pro-poor, while those for fuzzy set was pro-poor in 2018-2019. The AF multidimensional wealth growth rate in urban areas was 0.188 for 2018-2019, while that of the fuzzy set was 0.032. The results also show that over the 2018-2019 period, the AF PEGRs were 0.141, 0.124 and 0.080 for poverty incidence, depth, and severity, respectively, while those of the fuzzy set were 0.047, 0.010 and 0.015. These results also imply the same conclusion as given earlier for PPGI with poverty incidence under fuzzy set being pro-poor in 2018-2019.

3.2.2. Multidimensional Pro-poor Growth in Traditional Areas

Table 3. PPGI and PEGRs Multidimensional Wealth Index Growth Rates in Traditional areas

Pro-poor indices	Growth Rate	PPGI	PEGR	Growth Rate	PPGI	PEGR
2017-2018	Alkire-Foster MWI			Fuzzy MWI		
Incidence	0.013	3273603.103	43153.804	0.007	1.200	0.009
Depth	0.013	0.794	0.010	0.007	1.426	0.010
Severity	0.013	0.637	0.008	0.007	1.658	0.012
2018-2019						
Incidence	0.033	0.412	0.014	0.008	3.000	0.025
Depth	0.033	0.643	0.021	0.008	0.878	0.007
Severity	0.033	0.228	0.008	0.008	2.992	0.025

Source: Own Computation

Table 3 shows the relative measures of pro-poor growth using some indices of multidimensional wealth computed with the AF and fuzzy set approaches between 2017 and 2019. The table shows that the AF PPGIs for poverty incidence, depth and severity for traditional areas were 3273603.103, 0.794 and 0.637, respectively, for

2017-2018, while those of the fuzzy set were 1.200, 1.426 and 1.658. These results imply that growth was pro-poor for poverty incidence in the AF approach and poverty incidence, depth and severity in the fuzzy set approach. Moreover, based on the PPGI for poverty depth and severity in the AF approach, growth was not pro-poor (PPGI<1). The results presented in Table 3 also showed the AF and fuzzy set child's PEGRs over the period of 2017-2018. The AF multidimensional wealth growth rate for 2017-2018 in traditional areas was 0.013, while that for fuzzy set was 0.007. The AF PEGRs for poverty incidence, depth and severity were 43153.804, 0.010 and 0.008 for 2017-2018, respectively, which can be compared to 0.009, 0.010 and 0.012 for fuzzy set. These results imply the same conclusion given above for PPGI with poverty incidence under the AF approach and poverty incidence, depth and severity under the fuzzy set approach being pro-poor in 2017-2018. Table 3 further show that over the 2018-2019 period the AF PPGIs in traditional areas were 0.412, 0.643 and 0.228 for poverty incidence, depth and severity, respectively, while those for the fuzzy set were 3.000, 0.878 and 2.992 for fuzzy set. These results imply that growth was not pro-poor for poverty incidence, depth and severity in the AF approach. These results also imply that based on PPGI for poverty depth in fuzzy set, growth was not pro-poor, while poverty incidence and severity under fuzzy set was pro-poor. The multidimensional wealth growth rate in traditional areas was 0.033 over the period of 2018-2019, while that of fuzzy set was 0.008. The AF PEGRs over the period of 2018-2019 in traditional areas were 0.014, 0.021 and 0.008 for poverty incidence, depth and severity, respectively, while those for the fuzzy set were 0.025, 0.007 and 0.024. These results imply the same conclusion as given earlier for PPGI with poverty incidence and severity under the fuzzy set being pro-poor in 2018-2019 in traditional areas.

3.2.3. Multidimensional pro-poor Growth in Farms

Table 4. PPGI and PEGRs Multidimensional Wealth Index Growth Rates in Farms

Pro-poor	Growth	PPGI	PEGR	Growth	PPGI	PEGR
2017-2018	Alkire-Foster MWI			Fuzzy MWI		
Incidence	0.006	0.000	0.000	-	-	-
Depth	0.006	0.873	0.005	-	-	-
Severity	0.006	0.867	0.005	-	-	-
2018-2019						
Incidence	0.068	0.652	0.044	0.012	5.000	0.058
Depth	0.068	0.625	0.042	0.012	0.585	0.007
Severity	0.068	0.190	0.013	0.012	1.872	0.022

Source: Own Computation

Table 4 shows the relative measures of pro-poor growth using some indices of multidimensional wealth computed with the AF and fuzzy set approaches for 2017-2018 and 2018-2019. The table shows that that the child's AF PPGIs for poverty

incidence, depth and severity in farms were 0.000, 0.087 and 0.867, respectively, in 2017-2018, while those of the fuzzy set had no observations. These results imply that growth was not pro-poor for poverty incidence, depth, and severity in the AF approach. The results presented in Table 4 also showed the child's PEGRs for 2017-2018. The AF multidimensional wealth growth rate in farms was 0.006, while those for the fuzzy set had no observations. The results also indicated that the AF PEGRs for poverty incidence, depth and severity were 0.000, 0.005 and 0.005, respectively. These results imply that poverty incidence, depth, and severity were not pro-poor under the AF approach. The Table further showed over the period of 2018-2019, the AF PPGIs in farms were 0.652, 0.625 and 0.190 for poverty incidence, depth, and severity, respectively, while those of the fuzzy set were 5.000, 0.585 and 1.887. These results imply that growth was not pro-poor for poverty incidence, depth, and severity under the AF approach. Moreover, based on PPGI for poverty depth, growth was not pro-poor under fuzzy set, while for poverty incidence and severity growth was pro-poor.

The AF multidimensional wealth growth rate was 0.069 for 2018-2019 while that of the fuzzy set was 0.012. The AF child's PEGRs for poverty incidence, depth and severity were 0.044, 0.042 and 0.013, respectively, while those of the fuzzy set were 0.058, 0.007 and 0.022. These results imply the same conclusion as given above for PPGI with poverty incidence and severity under the fuzzy set being pro-poor in 2018-2019.

3.3. Relative Measures of Pro-Poor Growth across Child's Population Groups

3.3.1. Multidimensional pro-poor growth among Black/African children

Table 5. PPGI and PEGRs Multidimensional Wealth Index Growth Rates for Blacks/Africans

Pro-poor indices	Growth Rate	PPGI	PEGR	Growth Rate	PPGI	PEGR
2017-	Alkire-Foster MWI			Fuzzy MWI		
Incidence	0.010	89478482.667	871005.079	0.006	1.333	0.008
Depth	0.010	1.041	0.010	0.006	1.670	0.010
Severity	0.010	0.781	0.008	0.006	2.267	0.013
2018-						
Incidence	0.105	0.645	0.068	0.018	1.833	0.033
Depth	0.105	0.649	0.068	0.018	0.125	0.002
Severity	0.105	0.359	0.038	0.018	1.214	0.022

Source: Own Computation

Table 5 shows the relative measures of pro-poor growth using some indices of multidimensional wealth computed with the AF and fuzzy set approaches between

2017 and 2019 for black/African children. The Table shows that over the period of 2017-2018, the AF PPGIs for Black/African children 89478482.667, 1.041 and 0.781 for poverty incidence, depth and severity, respectively, while those of the fuzzy set were 1.333, 1.670 and 2.267. These results imply that growth was pro-poor for poverty incidence and depth for the two approaches. However, based on the PPGI for poverty severity in the AF approach, growth was not pro-poor, while that of the fuzzy set was pro-poor.

The results presented in Table 5 also showed the AF and fuzzy set Black/African child's PEGRs over the period of 2017-2018. The AF multidimensional wealth growth that for Black/African children was 0.010 for 2017-2018 while that of the fuzzy set was 0.006. The PEGRs for Black/African children were 871005.079, 0.010 and 0.008 for poverty incidence, depth, and severity, respectively, over the 2017-2018 period while those of fuzzy set were 0.033, 0.002 and 0.022. These results imply the poverty incidence and depth for the two approaches were pro-poor and poverty severity under fuzzy set was pro-poor in 2017-2018, while that of the AF approach was not pro-poor. The Table further showed that over the period of 2018-2019, the AF PPGIs for Black/African children were 0.642, 0.649 and 0.359 for poverty incidence, depth, and severity, respectively while those of the fuzzy set were 1.833, 0.125 and 1.214. These results imply that growth was not pro-poor for poverty incidence, depth, and severity under the AF approach. Moreover, based on the PPGI for poverty depth in the fuzzy set approach, growth was not pro-poor, while PPGI for poverty incidence and severity were pro-poor in 2018-2019. The table also showed the child's AF and fuzzy set PEGRs over the period of 2018-2019. The AF multidimensional wealth growth rate was 0.105 in 2018-2019 while that of the fuzzy set was 0.018. The child's AF PEGRs were 0.068, 0.068 and 0.038 for poverty incidence, depth, and severity, respectively, while those of the fuzzy set were 0.033, 0.002 and 0.022. These results also imply the same conclusion as given earlier for PPGI with poverty incidence and severity under fuzzy set being pro-poor in 2018-2019.

3.3.2. Multidimensional Pro-Poor Growth among Coloured Children

Table 6. PPGI and PEGRs Multidimensional Wealth Index Growth Rates for Coloureds Children

Pro-poor indices	**Growth Rate**	**PPGI**	**PEGR**	**Growth Rate**	**PPGI**	**PEGR**
2017-2018	Alkire-Foster MWI			Fuzzy MWI		
Incidence	0.008	13421773.55	2105489.47	0.001	0.000	0.000
Depth	0.008	2.168	0.017	0.001	9.229	0.005
Severity	0.008	0.917	0.007	0.001	14.38	0.007
2018-2019						

Incidence	0.230	0.806	0.185	0.043	1.409	0.060
Depth	0.230	0.658	0.151	0.043	0.555	0.024
Severity	0.230	0.436	0.100	0.043	0.064	0.003

Source: Own Computation

Table 6 shows the relative measures of pro-poor growth using some indices of multidimensional wealth computed with the AF and fuzzy set and approached between 2017 and 2019 for coloured children. The Table shows that the AF PPGIs for poverty incidence, depth and severity were 13421773.555, 2.168 and 0.917 for 2017-2018, respectively, while those of the fuzzy set were 0.000, 9.230 and 14.386. These results imply that growth was pro-poor for poverty depth in the two approaches. Based on the PPGI for poverty incidence under fuzzy set approach, growth was not pro-poor, while that for AF was pro-poor. Moreover, the PPGI for poverty severity was not pro-poor in the AF approach, while that of the fuzzy set was pro-poor. Table 6 also showed the AF and fuzzy set child's PEGRs for coloured children over the period of 2017-2018. The AF multidimensional wealth growth rate was 0.008 while that of the fuzzy set was 0.001. The AF PEGRs for poverty incidence, depth and severity were 2105489.477, 0.017 and 0.007, respectively, while those of the fuzzy set were 0.000, 0.005 and 0.007. These results also imply the same conclusion as given above for PPGI with poverty incidence and depth under the AF approach and poverty depth and severity under fuzzy set being pro-poor in 2017-2018. The table further showed that over the period of 2018-2019, the AF PPGIs for coloured children were 0.806, 0.658 and 0.436 for poverty incidence, depth and severity, respectively, for 2018-2019 while those of the fuzzy set were 1.410, 0.555 and 0.064. These results imply that growth was not pro-poor for poverty depth and severity in the two approaches. Based on the PPGI for poverty incidence under the AF approach, growth was not pro-poor while under the fuzzy set was pro-poor. The AF multidimensional wealth growth rate was 0.230 in 2018-2019 while that of the fuzzy set was 0.043 for coloured children. The AF PEGRs for poverty incidence, depth and severity were 0.185, 0.151 and 0.100, respectively, for 2018-2019 while those of the fuzzy set were 0.060, 0.024 and 0.003. These results imply that the AF and fuzzy set MWIs were not pro-poor for poverty depth and severity and the fuzzy set MWI was pro-poor for poverty incidence while the AF MWI was not.

3.3.3. Multidimensional pro-poor growth among White children

Table 7. PPGI and PEGRs Multidimensional Wealth Index Growth Rates for Whites

Pro-poor indices	**Growth Rate**	**PPGI**	**PEGR**	**Growth Rate**	**PPGI**	**PEGR**
2017-2018	Alkire-Foster MWI			Fuzzy MWI		
Incidence	-	-	-	0.003	0.000	0.000
Depth	0.012	24.657	0.300	0.003	30.379	0.095
Severity	0.012	13.018	0.159	0.003	27.827	0.087

2018-2019						
Incidence	-	-	-	0.061	1.111	0.068
Depth	0.301	0.696	0.210	0.066	1.333	0.081
Severity	0.301	0.604	0.182	0.061	1.320	0.807

Source: Own Computation

Table 7 shows the relative measures of pro-poor growth using some indices of multidimensional wealth computed with the AF and fuzzy set approaches over the period of 2017-2018 and 2018-2019. The Table shows that the AF PPGIs for poverty depth and severity for White children were 24.657 and 13.018 for 2017-2018, respectively, while those for the fuzzy set were 0.000, 30.379 and 27.827. These results imply that growth was pro-poor for multidimensional poverty incidence and depth in the two approaches (PPGI>1). The results also indicate that there were no AF MPI observations, the fuzzy set child's PPGI for poverty incidence was not pro-poor. The results presented in Table 7 also showed the AF and fuzzy set child's PEGRs over the 2017-2018 periods. The AF multidimensional wealth growth rate was 0.012 for 2017-2018 while that of the fuzzy set was 0.003. The AF PEGRs for poverty incidence, depth and severity were no observations, 0.300 and 0.159, respectively, which can be compared to 0.000, 0.095 and 0.687 for fuzzy set. These results imply that on PEGR for poverty incidence, depth and severity, growth was pro-poor in the two approaches. The table further showed that over the period of 2018-2019, the AF PPGIs were no observations, 0.696 and 0.604 for poverty incidence, depth and severity, respectively for 2018-2019, while those of the fuzzy set were 1.111, 1.333 and 132. These results imply that in 2018-2019, the AF PPGIs for poverty incidence, depth and severity were not pro-poor while those of the fuzzy set were pro-poor. The AF multidimensional wealth growth rate was 0.301448 in 2018-2019 while that of the fuzzy set was 0.061. The AF PEGRs for poverty incidence, depth and severity were no observations, 0.210 and 0.182, respectively in 2018-2019, while those of the fuzzy set were 0.068, 0.081 and 0.807. These results also imply the same conclusion as given above for PPGI with poverty incidence, depth and severity under fuzzy set being pro-poor in 2018-2019.

3.4. Discussion of Results

Although there are many economic policies that could have promoted pro-poor growth or its absence, the South African case can be viewed from different perspectives. The results can be related to the growth rates of 1.3% and 1.4% that were recorded in South Africa in the 2017 and 2018 fiscal years, respectively (Statistics South Africa, 2018).

In some previous studies, the drivers of economic growth in South Africa were found to be government expenditures (Leshoro, 2017), money supply (Dingela & Khobai, 2017), renewable energy consumption (Shakouri & Yazdi, 2017; Sunde, 2018),

expansionary fiscal policies to stimulate gross capital formation and employment opportunities (Pasara & Garidzirai, 2020). The role of the informal sector in promoting pro-poor growth can also be emphasized. This is a critical issue given that government's operational modality and economic policies can affect households' welfare through the performance of the informal sector. More importantly, therefore, an economy with strong linkage between the formal and informal sectors can witness significant growth among the poorest segment of the population. Specifically, the poor people who are resident in slums and those affected by survival shocks due to rural-urban migration depend on the informal economy (Mahadea & Zogli, 2018). Also, the informal sector bridges the gaps between the formal economic policies' inability to promote employment opportunities, safety nets and social protection, adequate capital inflows, and human capital formation and development (Etim & Daramola, 2020).

Furthermore, the South African government had been international applauded for the design and implementation of functioning social protection programmes for children and other vulnerable groups. Therefore, in many provinces, social grants constitute a significant portion of households' income. Specifically, in Eastern Cape, social grants remain the most effective poverty reduction instrument that has been used by government (Ngumbela, 2021). However, although development of community tourism holds some prospects for poverty alleviation in Eastern Cape and some other provinces (Setokoe, 2021), this aspect of rural livelihood is yet to be fully developed.

At the national level, the number of grant holders have increased from 11.312 million as at the end of April in 2020 to 11.450 million at the end of March in 2021 (Parliament, 2021). At the provincial level, the number of grant holders increased from 2655831 in 2012 (Ngumbela, 2021) to about 2801000 in 2019 in Eastern Cape (Statista, 2022). Moreover, between April 2020 and March 2021, Gauteng, Limpopo and Kwa-Zulu Natal had the highest increase in the number of social grant recipients with 40961, 30554, and 22038 people respectively.

It should also be emphasized that some other poverty reduction measures in some provinces include promotion of employment opportunities, quality education, entrepreneurial skill development, health care services, and social capital development (Ngumbela, 2021). In addition, the role of agriculture in poverty reduction in some province cannot be over-emphasized. In a study by Ndhleve et al. (2017) emphasized the positive impacts of agricultural spending and investment promotion for poverty alleviation in the Eastern Cape province. Similarly, provinces like the North West, Limpopo, and Mpumalanga have significant agricultural production potentials, which if utilized can promote pro-poor growth.

4. Conclusion

South Africa officially and legislatively subscribes to the SDGs. Therefore, a proper understanding of the dimensions of poverty is a fundamental prerequisite to register progress in achieving many of the SDGs. This paper has highlighted the dimensions of multidimensional deprivation among South African children using the Alkire-Foster and fuzzy set approaches. The growing concern on the role of economic growth on poverty alleviation through a drastic reduction in inequality remains a policy related issue on which this study is built. The results have shown that between 2017 and 2018, growth in multidimensional wealth was largely pro-poor, but largely non-pro-poor between 2018 and 2019. There are also some critical highlights on racial and geographical type differences on the children's pro-poor growth. Given the obvious vulnerability of children to welfare shocks and the need to adopt multidimensional welfare approach in evaluating economic progress that is being made in South Africa, the findings have clearly underscored the need to monitor some welfare attributes and ensure steady progress in child's welfare from time to time. Therefore, there is the need to refocus development programmes on health, education, social development, housing, sanitation, with child's welfare in mind. The results also underscore a fundamental methodological contribution, given the sensitivity of obtained results to the selected measure of multidimensional poverty indicator.

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