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**South Africa Milestones to Achieving the Sustainable Development  
Goals on Poverty and Hunger**

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## ABSTRACT

South Africa has signed the Sustainable Development Goals (SDGs) and placed poverty and inequality reduction at the forefront of its National Development Plan. This study links a nonparametric income distribution (micro) simulation model and an economywide general equilibrium (macro) model to define the milestones South Africa must meet to halve poverty and end hunger by 2030 as targeted by the SDGs. The current economic growth of 2.0 percent on average annually must be accelerated to 4.5 percent between 2015 and 2030 to achieve the SDGs on poverty and hunger. Although an income growth strategy is important to reduce hunger, an income redistribution strategy of expanding social assistance to cover 10 percent of the population—that is, nearly 7 million persons—appears to be a key to ending hunger by 2030. Rural areas should be targeted for intervention to reduce income inequality. Skilled and high-skilled labor markets offer better employment and earning opportunities in these geographic areas than do the markets for other skill levels. Thus, skill development programs in these areas are likely to contribute to meeting the SDGs on poverty and hunger by 2030.

**Keywords:** SDGs; poverty; hunger; growth; inequality; modeling.

## 1. INTRODUCTION

The Sustainable Development Goals (SDGs) replaced the Millennium Development Goals (MDGs), which ended in 2015, with the objective of producing a set of common goals that meet urgent global environmental, economic, and political challenges by 2030. The MDGs started a global effort in 2000 to tackle the indignity of poverty. The MDGs established measurable, universally agreed-upon objectives for tackling extreme poverty and hunger, preventing deadly diseases, and expanding primary education to all children, among other development priorities.

South Africa has made significant achievements in dealing with the scourge of all forms of extreme poverty, but many challenges remain, especially persistent poverty levels among vulnerable groups, including women and children. Inequality remains high, partly due to high unemployment levels and low labor force participation rates (Statistics South Africa, 2015). South Africa's National Development Plan 2030 (NDP) offers a medium- and long-term perspective on inequality reduction and poverty elimination. The NDP is broadly aligned to the SDGs, with the two frameworks converging on matters related to the "five Ps": people, prosperity, peace, planet, and partnerships (Dhlamini, 2017).

South Africa has struggled with the treble challenges of unemployment, poverty, and inequality over the past two decades (Statistics South Africa, 2015). Progress has been made in reducing some categories of poverty. For example, multidimensional poverty declined from 18 percent in 2001 to 7 percent in 2016 (Statistics South Africa, 2017). This decline is attributed to the impact of the social wage, which includes social grants; free basic electricity, sanitation, and water for poor households; reconstruction and development program housing; no-fee schools; and free primary healthcare (Statistics South Africa, 2017). However, despite the decline in multidimensional poverty, individual money-metric poverty worsened between 2011 and 2015 for a combination of reasons, including rising unemployment levels, stagnant economic growth, rising prices (Statistics South Africa, 2017), and an unstable policy environment. Poverty as measured by the upper-bound poverty line of 992 rand (R) per person per month (in 2015 prices) declined from 66.6 percent in 2006 to 53.2 percent in 2011, before rising to 55.5 percent in 2015 (Statistics South Africa, 2017). Poverty as measured by the food poverty line has been fluctuating. It increased from 28.4 percent in 2006 to 33.5 percent in 2009, and declined to 21.4 percent in 2011 before rising again to 25.4 percent in 2015 (Statistics South Africa, 2017).

The country's unemployment problem is the major challenge to realizing universal poverty reduction (Statistics South Africa, 2015). With the country's attainment of only three of the nine MDG indicators of progress toward achieving poverty and hunger reduction, and with the worsening of poverty between 2011 and 2015, it is difficult to see how South Africa will achieve SDG1 (reducing poverty) and

SDG2 (ending hunger). Thus, more evidence to guide South Africa's pursuit of inclusive growth is needed. This study contributes by generating such evidence for informed decision making.

We begin by setting the scene and rationale for the study. A description of the modeling framework follows in Section 2. Section 3 presents and discusses the results, and finally, Section 4 concludes the paper.

## 2. MODELING FRAMEWORK

A micro-macro framework is developed to set the goals and milestones necessary to halve poverty and end hunger by 2030 in South Africa. The framework consists of layered micro and macro models linked in a top-down fashion. The micro model builds upon the nonparametric technique of modeling income distribution across the population. The model assesses changes in the aggregate income level and its distribution across the population (income inequality) needed to achieve the SDGs on poverty and hunger. The macro model builds upon the economywide general equilibrium technique to capture economic growth and investment targets related to the achievement of the SDGs on poverty and hunger. The micro and macro models are further discussed successively in the next sections.

The micro model enables direct measurement of poverty and inequality levels. Poverty and inequality measures are assessed at the individual level and rely on micro information. A given poverty level is associated with an income or consumption expenditure level and its distribution across the population (Ravallion, 2004, 2007). The novelty of the study is the use of a nonparametric microsimulation model to assess targets for the aggregate consumption expenditure level (growth) and its distribution to achieve the SDG targets on poverty and hunger.

Microsimulation models can differ along various dimensions. The most important areas are the inclusion of agents' behavior, the time horizon of their decisions, and whether general equilibrium effects are considered (Bourguignon and Spadaro, 2003; Spadaro, 2007). One can separate microsimulation models into two categories: accounting (or arithmetic) models and behavioral models. Accounting models reproduce the institutional framework without simulating the behavioral responses of agents. They are limited to reproducing the budget constraint to which the agents are subject, and thus they evaluate only first-order effects (Spadaro, 2007). Compared with accounting models, behavioral models have the advantage of integrating second-order effects through a detailed representation of the economic decision-making process of individuals. The latter use mathematical functions to mimic the behavior of individuals and evaluate the effects of public policies. In their application, the mathematical functions make use of predetermined parameters, hence the name "parametric model." However, the main criticism of parametric models (known as the "Lucas criticism"; Lucas 1976) remains the structural dimension introduced by the parameters. Thus, nonparametric microsimulation models seek to overcome this disadvantage. The development of the nonparametric technique has been limited to the reweighting approach. One of the pioneers in applying this approach is Meagher (1993). Later applications of this approach include the work of Devarajan and Go (2001) and of Agénor, Izquierdo, and Foffack (2002) in poverty analysis. Other applications have been made to modeling the labor market (Ferreira and Horridge, 2006; Buddelmeyer et al., 2008; Hérault, 2010).

The SDG micro model applied in this paper is built upon the nonparametric technique. The model is based on a probability distribution of individuals' consumption expenditure within a given population. Changes in probabilities associated with individual consumption levels induced by changes in mean (per capita) consumption expenditure are captured through a “generalized entropy” measure (Lee and Judge, 1996). Thus, changes in consumption behavior occur within the population through changes in the probability distribution across individual consumption expenditure levels in response to (macro) policies.

The model minimizes the Kullback-Leibler cross-entropy measure of the distance between the posterior ( $w$ ) and the prior ( $v$ ) probability distributions of consumption expenditure ( $i$ ),

$$\text{Min } \Omega = \sum_i w_i \cdot \ln \frac{w_i}{v_i}, \quad (1)$$

with  $\sum_i w_i = 1$  and given aggregate data on population growth and urbanization.  $\theta$  is the urbanization rate;  $u$  is the proportion of rural population in the total population ( $u \subset i$ ),

$$\sum_u w_u = \theta, \quad (2)$$

on mean per capita consumption expenditure ( $Y$ );  $y_i$  is individual ( $i$ ) consumption expenditure,

$$\bar{Y} = \sum_i w_i \cdot \bar{y}_i, \quad (3)$$

on poverty headcount ratio ( $P_z$ ), by national and food poverty lines ( $z$ ); and  $p_{i,z}$  is individual ( $i$ ) poverty status according to a specific poverty line ( $z$ ),

$$\bar{P}_z = \sum_i w_i \cdot \overline{p_{i,z}} \cdot i(\bar{y}_i < z). \quad (4)$$

Our poverty assessment uses the Foster-Greer-Thorbecke family of poverty measures. We measure poverty by the proportion of the population with incomes lower than the upper-bound poverty line, and hunger by the proportion of the population with incomes lower than the food poverty line. The standard technique of measuring hunger is to compare the number of calories eaten by a person with the number of calories needed. Constructing the poverty line requires specifying a consumption bundle considered adequate for basic food and nonfood consumption needs, and then estimating its cost. Statistics South Africa defines the food poverty line as “the rand value below which individuals are unable to purchase or consume enough food to supply them with the minimum per-capita-per-day energy requirement for adequate health” (Statistics South Africa, 2017, p. 7). The food poverty index estimates the percentage of persons vulnerable to hunger and, therefore, facilitates the measurement of hunger (Statistics South Africa, 2017). The poverty line calculation adds basic nonfood items to the food poverty line calculation to measure the minimum amount of money needed to satisfy basic food and nonfood needs. Based on this sum, Statistics South Africa defines a lower-bound poverty line (LBPL) and an upper-bound poverty line (UBPL). “Individuals at the LBPL do not have command over enough resources to purchase or consume both adequate food and nonfood items and are therefore forced to

sacrifice food to obtain essential nonfood items. Meanwhile, individuals at the UBPL can purchase both adequate levels of food and nonfood items” (Statistics South Africa, 2017, p. 7).

The 2010/2011 Income and Expenditure Survey (South Africa, 2011) is used to validate the micro model. The validation process implies the calibration of the growth elasticity of poverty (Bourguignon, 2003) such that the consumption expenditure distribution across the population replicates the 2015 overall poverty and food poverty measures (Table 1). The validation process also implies respecting Engel’s law, which associates a decrease in the percentage of income or expenditure allocated to food purchases with an increase in total income or consumption expenditure. The model is validated with a truncated probability distribution—that is, a conditional distribution derived from restricting the probability at the upper tail of the distribution—such that South Africa’s income inequality level is replicated (Table 2).

**Table 1: Poverty and hunger goals and targets (percentages)**

	Survey year 2011	Base year 2015	Change 2011–2015
Upper-bound poverty line	53.2	55.5	4.3
Food poverty line	21.4	25.2	17.8

Source: Statistics South Africa (2017).

Note: Poverty line = 992 rand per person per month in 2015 prices (upper-bound poverty line). Food poverty line = 441 rand per person per month in 2015 prices.

**Table 2: Income inequality, trend 2006–2011**

Year	Gini index (%)	Income share held by lowest 20%	Income share held by highest 20%
2006	64.79	2.58	71.06
2008	63.01	2.60	68.68
2011	63.38	2.47	68.94

Source: World Bank (2017).

The macro model is grounded in the Walrasian small open economy equilibrium framework. Profit-maximizing producers and utility-maximizing consumers respond to relative prices by determining the quantities supplied and the quantities demanded that clear all markets simultaneously. The economy is a price taker in the world markets for both exports and imports. An SDGs-focused computable general equilibrium (CGE) model is built to assess SDG goals and milestones for South Africa.<sup>1</sup> The specifications of the model from the standard CGE framework are presented next.

<sup>1</sup> The standard features of the model build upon on the dynamic computable general equilibrium model of the Partnership for Economic Policy (Decaluwé et al., 2012).



The model features 90 categories of worker and labor markets, distinguished by province,<sup>2</sup> settlement type,<sup>3</sup> and skill category.<sup>4</sup> Data from South Africa demonstrate that high-skilled labor markets show lower unemployment rates and pay higher wages and salaries, and the unemployment rate is higher in rural areas than in urban areas (Table 3). Rural household groups rely heavily on unskilled and low-skilled labor income in all regions (Table 4).

**Table 3: Unemployment rates by skill category**

Category	Urban	Rural	South Africa
Unskilled (no schooling to less than grade 1)	29.0	29.5	29.3
Low-skilled (grades 1 to 9)	36.5	42.5	38.5
Medium-skilled (grade 10)	28.0	42.7	30.6
Skilled (certificate or diploma)	15.1	31.6	17.9
High-skilled (degree or postgraduate diploma)	5.6	8.7	5.8
All skill categories	28.3	40.2	31.4

Source: Authors' calculations from the Quarterly Labor Force Survey 2013, Quarter 4 (South Africa, 2013).

Note: Unemployment includes discouraged job seekers.

**Table 4: Distribution of labor earnings by level of education, region, and area (percentages)**

Level of education	Western Cape		Eastern Cape		Northern Cape		Free State		KwaZulu-Natal	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Unskilled (no schooling to less than grade 1)	1.3	7.5	1.7	7.5	3.4	10.1	2.8	3.5	1.7	7.5
Low-skilled (grades 1 to 9)	40.8	60.7	47.8	67.4	41.8	65.3	44.4	68.1	37.7	58.5
Medium-skilled (grade 10)	36.9	23.9	32.3	16.2	36.6	13.8	32.6	16.8	41.4	24.9
Skilled (certificate or diploma)	9.2	3.8	10.2	5.9	8.7	6.4	11.0	6.8	10.5	6.8
High-skilled (degree or postgraduate diploma)	11.8	4.0	8.1	3.0	9.5	4.5	9.2	4.8	8.6	2.3
All skill categories	100	100	100	100	100	100	100	100	100	100

Source: Authors' calculations from the 2010/2011 Income and Expenditure Survey (South Africa, 2011).

The treatment of the labor markets reflects South African empirical evidence demonstrated in Table 2 and advanced by Kingdon and Knight (2004, 2007). Thus, an imperfect labor market is assumed for unskilled, low-skilled, medium-skilled, and skilled labor markets. This is implemented through a wage curve specification (Blanchflower and Oswald, 1995). A competitive market-clearance rule applies for

<sup>2</sup> South Africa consists of nine provinces: Western Cape, Eastern Cape, Northern Cape, Free State, KwaZulu-Natal, North West, Gauteng, Mpumalanga, and Limpopo.

<sup>3</sup> Urban (formal and informal settlements) and rural (traditional and rural settlements).

<sup>4</sup> Five skill categories are included, based on the highest education level achieved: unskilled (no schooling to less than grade 1), lower-skilled (grades 1 to 9), medium-skilled (grades 10), skilled (certificate or diploma), and high-skilled (degree or postgraduate diploma).

high-skilled labor markets—that is, full employment. For each skill category, workers are perfectly mobile across industries within each of the nine provinces and two settlement types (urban and rural).

When it comes to rural-urban migration and remittances, the model specifies an exogenous setting of labor mobility between rural and urban areas as well as across provinces for each skill category. Also, the shares of labor income spent in the location of origin (internal remittances) and in the location of destination are set exogenously. As labor migrates from the location of origin to the location of destination, labor remittances flow from the location of destination to the location of origin. With this exogenous setting, we assume that urban-rural migration and remittances are affected by both economic and noneconomic drivers. A sensitivity analysis is carried out on the rates of internal remittances.

Capital markets follow the neoclassical market-clearance rule, with the real interest rate equilibrating aggregate savings and aggregate demand for investments. Savings are driven by investments. Finally, the external current account is equilibrated through a flexible exchange rate, and the government fiscal balance is a fixed share of gross domestic product (GDP).

The CGE model is calibrated using a social accounting matrix built from the 2013 supply and use table (Statistics South Africa, 2017), the 2010/2011 Income and Expenditure Survey, and the Quarterly Labour Force Survey 2013.

### 3. SIMULATION SCENARIOS AND RESULTS

The micro-macro framework is used to implement two simulation scenarios: the business-as-usual (BaU) scenario and the SDGs scenario. The BaU scenario is built upon the recent trend of the per capita final consumption expenditure and income distribution (inequality), and the changes in urban and rural demographic and urbanization patterns. The SDGs scenario upholds the demographic and urbanization targets and uses the SDGs on poverty and hunger to assess the implied changes in expenditure growth and income inequality. “Income” and “consumption expenditure” are used interchangeably from now on.

Urban and rural demographic and urbanization patterns are captured by the micro model. South Africa’s total population is estimated at 55.0 million individuals in 2015 and projected at 69.3 million individuals by 2030 (Table 5).<sup>5</sup> Between 2015 and 2030, the population will therefore increase by 26.0 percent—that is, an annual rate of 1.6 percent. The urban population will increase more than the rural population—that is, 39.1 percent (an annual rate of 2.3 percent) and 1.8 percent (an annual rate of 0.1 percent), respectively. Consequently, the urbanization rate increases from 65 percent in 2015 to 72 percent by 2030—that is, an increase of 9.9 percent between 2015 and 2030.

**Table 5: Population growth and urbanization**

Year	Total population			Proportion of population in urban areas
	South Africa	Urban	Rural	
2015	55,011,977	35,648,311	19,363,666	0.648
2030	69,288,037	49,573,849	19,714,188	0.715
Change (%)	26.0	39.1	1.8	9.9

Source: United Nations (2017).

Data from Statistics South Africa (Table 6) show a stagnation of the per capita final consumption expenditure between 2011 and 2016. Income inequality has not changed significantly between 2010 and 2015, with Gini indexes of 0.70 and 0.68, respectively (Statistics South Africa, 2017). Thus, the BaU scenario projects this current trend of the economy, in terms of expenditure growth and income inequality as well as the change in urbanization, to assess the poverty and hunger outcomes.

<sup>5</sup> The urban and rural population growth rates used and the urbanization rate used are informed by the world population prospects and the world urbanization prospects of the United Nations Department of Economic and Social Affairs.

**Table 6: Percentage change in gross domestic product and final consumption expenditure, 2012–2016**

Year	Gross domestic product growth	Household final consumption expenditure	Per capita final consumption expenditure
2012	2.5	3.7	2.3
2013	2.8	2.0	0.5
2014	1.5	0.7	-0.9
2015	1.2	1.7	0.1
2016	0.5	0.8	-0.7
<b>Average 2012–2016</b>	<b>1.7</b>	<b>1.8</b>	<b>0.2</b>

Source: Computations based on Statistics South Africa (2017).

Under the BaU scenario, the proportion of the population below the poverty line of R 992 per month is projected to increase slightly, from 55.2 percent in 2015 to 56.1 percent by 2030 (Table 7). The absolute number of poor people is expected to increase substantially between 2015 and 2030 with population growth. Thus, the goal of halving poverty between 2015 and 2030 will not be met under the current trend of the economy as captured in the BaU scenario. In the same vein, extreme poverty and hunger will not be eliminated by 2030 because 23.6 percent of the population will still be living below the income threshold of R 441 per month.

**Table 7: Poverty and hunger results, business-as-usual scenario**

	Year 2015	Year 2030	Percentage change
Per capita expenditure (in South African rand)	30,565	31,723	3.8
Gini index	0.673	0.683	1.5
Poverty index	0.552	0.561	1.6
Hunger index	0.231	0.236	2.2

Source: Statistics South Africa (2017) and authors from the simulation results.

Note: Poverty line = 992 rand per person per month in 2015 prices (upper-bound poverty line). Food poverty line = 441 rand per person per month in 2015 prices.

Table 8 presents the initial poverty and hunger measures and the SDG targets for South Africa. As discussed earlier, the poverty head-count ratio is estimated at 55.5 percent in 2015 (Statistics South Africa, 2017). By 2030, the proportion of poor—that is, the proportion of the population below the income threshold of R 992 per month—should be less than 27.7 percent. The proportion of the population below the food poverty line of R 441 per month is estimated at 25.2 percent (Statistics South Africa, 2017). By 2030, South Africa should have lifted almost everyone out of hunger.

**Table 8: Poverty and hunger goals and targets**

	Base year 2015	SDGs target 2030	Change (%)
Poverty line	0.555	0.277	-50.0
Food poverty line	0.252	0.013	-95.0

Source: Statistics South Africa (2017).

Note: Poverty line = 992 rand per person per month in 2015 prices (upper-bound poverty line). Food poverty line = 441 rand per person per month in 2015 prices.

The SDGs on poverty and hunger are achieved with an increase in per capita final consumption expenditure of 46.5 percent between 2015 and 2030 (Table 9). This implies an annual increase of 2.6 percent in per capita consumption expenditure. When population growth is accounted for, the household final consumption expenditure target is set at 4.2 percent on average annually.

**Table 9: Income growth and inequality reduction targets, Sustainable Development Goals scenario**

	Year 2015	Year 2030	Percentage change
Poverty index	55.2	27.5	-50.0
Hunger index	23.1	0.0	-100.0
Income (in South African rand)	30,565	44,778	46.5
Gini index	67.3	51.3	-23.8

Source: Authors, based on model simulation results.

The expenditure increase by 4.2 percent on average annually will not be sufficient to lift almost everybody above the income threshold of R 441 per month by 2030 (to end hunger by 2030) unless accompanied by measures to expand social assistance to cover 10 percent of the population—that is, nearly 7 million persons (Table 10). The Gini index declines to 0.513 by 2030 from an estimated value of 0.673 in 2015. Although the income growth strategy is important to reduce hunger, income redistribution appears to be a key component of an inequality reduction and hunger elimination strategy. Both rural and urban areas are targeted for the social assistance, with a focus on the following six areas: rural Limpopo, rural and urban KwaZulu-Natal, rural and urban Eastern Cape, and urban Gauteng.

**Table 10: Number of assisted persons, Sustainable Development Goals scenario**

<b>Provinces</b>	<b>Urban</b>	<b>Rural</b>	<b>All</b>
Western Cape	253,771	64,100	317,871
Eastern Cape	491,462	894,376	1,385,838
Northern Cape	119,063	10,347	129,410
Free State	281,061	69,460	350,521
Kwazulu-Natal	524,597	1,357,482	1,882,079
North West	181,638	386,901	568,539
Gauteng	614,971	3,259	618,230
Mpumalanga	162,578	333,409	495,987
Limpopo	66,614	1,120,113	1,186,727
<b>South Africa</b>	<b>2,695,755</b>	<b>4,239,447</b>	<b>6,935,202</b>

Source: Authors, based on model simulation results.

An annual economywide growth rate of 4.5 percent on average is required to meet the SDGs consumption expenditure target (Table 11). In other words, current growth performance of 2.0 percent must more than double between 2015 and 2030 to achieve the SDGs on poverty and hunger. There are several routes that South Africa can take to meet the economic growth target. Here, we investigate the private investment level required to support the growth rates required by the SDGs. The target for private investment growth needs to be set at 5.7 percent annually, nearly twice the growth rate under the BaU scenario (Table 11).

**Table 11: Gross domestic product and investment targets, mean annual change (percentage)**

	<b>BaU</b>	<b>SDGs</b>
Gross domestic product	2.0	4.5
Investment	3.0	5.7

Source: Authors, based on model simulation results.

Note: BaU = business-as-usual scenario; SDGs = Sustainable Development Goals scenario.

The income inequality target is investigated through the spatial perspective of income growth and distribution. Table 12 displays changes in expenditure between the SDGs and BaU scenarios for the nine provinces by residential area, urban or rural. It shows the need for more emphasis to be put on rural areas to achieve the SDGs on poverty and hunger. Thus, we refer to the following five geographical areas as SDGs-focused areas: rural Eastern Cape, rural Limpopo, rural Mpumalanga, rural KwaZulu-Natal, and rural Northern Cape.

**Table 12: Consumption expenditure by province, percentage change, Sustainable Development Goals scenario versus business-as-usual scenario**

<b>Provinces</b>	<b>Urban</b>	<b>Rural</b>
Western Cape	21.2	48.1
Eastern Cape	66.6	148.5
Northern Cape	69.5	90.9
Free State	62.4	37.0
KwaZulu-Natal	42.3	105.2
North West	58.0	49.2
Gauteng	14.2	-12.0
Mpumalanga	39.1	110.0
Limpopo	34.1	129.1

Source: Authors, based on model simulation results.

We pay attention to the relationship between expenditure growth, on the one hand, and employment and earning opportunities by skill category, on the other hand, in the SDGs-focused areas. Changes in expected wage rates are computed and compared for the five skill categories of labor covered by the study. The results show that labor markets for skilled workers (those with a certificate or diploma) and high-skilled workers (those with a degree or postgraduate diploma) offer better employment and earning opportunities than do the markets for other skill levels in all SDGs-focused areas except rural Northern Cape (Table 13).

**Table 13: Annual change in expected wage rate, Sustainable Development Goals scenario (percentages)**

<b>SDGs-focused area</b>	<b>Unskilled</b>	<b>Lower-skilled</b>	<b>Medium-skilled</b>	<b>Skilled</b>	<b>High-skilled</b>
Rural Eastern Cape	6.1	6.2	6.1	7.4	7.4
Rural Northern Cape	14.2	15.5	16.5	14.7	17.8
Rural KwaZulu-Natal	2.5	2.7	2.8	4.0	4.4
Rural Mpumalanga	4.2	3.8	4.2	5.5	6.3
Rural Limpopo	3.6	3.9	3.8	4.7	5.5

Source: Authors, from the simulation results.

Note: Unskilled = no schooling to less than grade 1; lower-skilled = grades 1 to 7; medium-skilled = grades 8 to 12; skilled = certificate or diploma; high-skilled = degree or postgraduate diploma.

Households in the SDGs-focused areas rely primarily on unskilled, low-skilled, and medium-skilled labor employment and earning (Table 14). Thus, skill development programs across the SDGs-focused areas are likely to contribute to meeting the income inequality target.

**Table 14: Distribution of income by category of production factor, rural areas (percentages)**

Region	Unskilled, low-skilled, and medium-skilled labor	Skilled and high-skilled labor	Capital and transfers	Total
Western Cape	59	34	7	100
Eastern Cape	54	31	15	100
Northern Cape	46	45	9	100
Free State	33	23	44	100
KwaZulu-Natal	55	28	17	100
North West	56	17	26	100
Gauteng	40	45	15	100
Mpumalanga	60	29	11	100
Limpopo	58	32	9	100

Source: Authors' calculations from the 2010/2011 Income and Expenditure Survey (Statistics South Africa, 2011).



## 4. CONCLUSION

Poverty is much higher in South Africa than one would expect in a country with its level of per capita GDP. Moreover, the country is among the most unequal in the world. The high degree of inequality has its origins in the apartheid policies of the past. Despite special measures taken by the government in providing grants to reduce the extent of poverty, most poor people are in households that are weakly linked to the labor market. The government has recognized that policy reforms play a vital role in the quest for sustained development.

Internationally, South Africa has signed the SDGs and placed poverty and inequality reduction at the forefront of its National Development Plan 2030. The plan is a medium-term strategic framework to address the socioeconomic challenges the country is facing.

This study links a nonparametric income distribution (micro) simulation model and an economywide general equilibrium (macro) model to define the milestones South Africa must meet to halve poverty and end hunger by 2030 as set forth by the SDGs. On the analytical front, the novelty of the study is the use of the nonparametric microsimulation model to assess targets for income growth and income distribution across the population for achieving the SDG targets on poverty and hunger. Although some details are specific to the South African economy, the analysis can also be applied to middle-income and developing countries to address similar issues.

The micro-macro framework is used to implement two simulation scenarios: BaU and SDGs. Under the BaU scenario, the poverty head-count index increases from 55.2 percent in 2015 to 56.1 percent by 2030. The increase in the absolute number of poor is more important with population growth. Thus, the goal of halving poverty between 2015 and 2030 will not be met under the BaU scenario. In the same vein, hunger will not be eliminated by 2030 because 23.6 percent of the population will still live below the food poverty threshold under the BaU scenario. The SDGs on poverty and hunger are achieved with an average annual increase in per capita final consumption expenditure of 2.6 percent. The consumption expenditure growth target must be accompanied by a decline in income inequality, achieved, for example, by expanding social assistance to cover 10 percent of the population in order to eliminate hunger by 2030.

The current GDP growth of 2.0 percent must be accelerated to 4.5 percent between 2015 and 2030 to achieve the SDGs on poverty and hunger. An increase in domestic and private investment of 5.7 percent on average annually is required to meet the economic growth target. Five rural areas (SDGs-focused areas) are identified for intervention to reduce income inequality in South Africa: rural Eastern Cape, rural Limpopo, rural Mpumalanga, rural KwaZulu-Natal, and rural Northern Cape. The analysis shows that the skilled and high-skilled labor markets offer better employment and earning opportunities

than do the markets for other skill levels in the SDGs-focused areas. Thus, skill development programs in these areas are likely to contribute toward meeting the SDGs on poverty and hunger by 2030.

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