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The role of fiscal policy on poverty reduction in South Africa

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Abstract

This paper presents the results of ridge regression analysis of the relationship between government spending in emancipation programmes and multidimensional poverty, focusing on South Africa. Through the Principal Component analysis, we retained three variables of this relationship, affected by a range of factors, to determine the size and direction of the relationship. Besides health, we find no clear evidence that government spending on housing and social security significantly reduces multidimensional poverty. Co-production in housing, healthcare delivery, and social security should be encouraged.

Keywords Government expenditure, Fiscal policy, Poverty reduction, South Africa

Introduction

The United Nations (2021) posit that poverty lacks resources necessary for long-term survival, such as food, health, and education. Hunger and malnutrition are examples of poverty, including social prejudice, marginalisation, and a lack of involvement in decision-making. Around 11 million South Africans (18.9%) live on less than US\$1.90 (R27.66) daily or R800 per month. Of this population, about 4 million live in multidimensional poverty, which includes poor health, hunger, a lack of clean water, insufficient access to healthcare, and substandard housing [49, 50].

According to [5] p. 6, "Poverty is a challenge that developing countries can overcome through, among others, good economic and social policies, innovative and efficient use of resources, investments in technological advancement, good governance, and visionary leadership with the political will to prioritise the needs of the poor". These factors enable providing schools, clinics, roads, power, and drinking water, which are essential for human

dignity, good health, and economic prosperity ([5] p. 6 and Sachs [41]). Heshmati et al. [18] found that targeted transfers to low-income, vulnerable, and disadvantaged populations were effective for inclusive growth and poverty reduction in OECD nations.

Structural fiscal reforms can help the poor by promoting the efficient and focused use of government resources in areas like budgeting and treasury management, governance, transparency, accountability, and public administration (World Bank 2022, [31] p. 4). Of prominence is fiscal policy, which is the focus of this study [11, 19, 21, 26, 42, 51, 52]. Farayibi et al. [15] p. 4 define fiscal policy administration as the mechanisms of government expenditure to alleviate poverty, increase per capita income, and ultimately result in economic growth and development.

Musgrave's [30] theory of public expenditure growth centres on government spending patterns. It postulates that economic growth and development are due to substantial public sector investment. The public sector oversees road construction, transportation, sanitation, law and order, health, education, and housing. This spending is necessary to grow, sustain, and reduce poverty. As the economy grows, public spending will shift from infrastructure to education, health, and welfare. Thus,

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government spending will rise to provide equal opportunities for all.

The Peacock and Wiseman [38] model predicts that during times of war or other economic shocks, there will be an increase in government spending offset by higher taxes. The government will spend more on health care, education, safe drinking water, and sanitation due to more tax money. This will help people get out of poverty and reach other development goals.

Fiscal policy affects poverty by increasing revenue through progressive taxes, targeted transfers and programs, and quality spending to support the poor. Both personal and corporate income taxes, fairly and equitably, benefit the rich, while public expenditure is reallocated to help the poor and marginalised groups towards alleviating poverty [34] p. 8. Public spending can help fight poverty by increasing the disposable income of low-income households and indirectly improving their nutrition, health, and education [2].

Public spending on education, health, safety nets, subsidies, grants, social benefits, infrastructure development, economic affairs, and agricultural expenditures might significantly alleviate poverty [7, 4, 25] posits that the share of total income committed to social spending reflects the government's commitment to aligning opportunities and alleviating poverty and social exclusion. Enami, Lustig, and Aranda [14] postulate that a country's redistributive potential is determined by the scales, content, and financing of government spending and the progressivity of all taxes and spending combined.

According to the Department of Social Development (DSD) [12], in terms of social services, the government has created a comprehensive social protection system that includes unconditional cash transfers, the bulk of which are intended to reduce the high rate of poverty afflicting vulnerable low-income groups. The South African government enacted a programme of action to improve public services, expenditures, and poverty. The programme focuses on infrastructure development, the allocation of resources to rural areas, housing subsidies, social protection, economic affairs, health, education, and safety and security. These programmes contribute to the battle against poverty in South Africa [7].

Stats SA (2021) [45] reported an increased distribution of money to other organisations, most notably in the form of cash transfers (social grants) to provincial governments, extra-budgetary accounts and funds, as well as capital transfers to public businesses, which drove a 12 percent increase in government spending. Social benefits were estimated to account for 11% of total national government spending. A 17% increase over 2018/19 was primarily attributed to increased social grant payments to households. According to the estimates, safety and

security spending dominated government wage expenditures, followed by the defence sector with 18 percent. "The public service, economic, and community development programmes are the fastest-growing over the medium term, and most spending will be distributed to education and culture (R402.9 billion), social development (R335.2 billion), and health (R248.8 billion) in the 2021/22 financial year" [31]. Although the government spends large amounts on social services to reduce poverty, the rate of poverty remains high in South Africa at 55.5% [45]. Furthermore, the trend has been on a trajectory since 2011–2021.

Moreover, despite government expenditure on targeted policy interventions for poverty reduction, most South Africans live in poverty. These conditions are worsened by COVID-19 and corruption, which is rife in all government sectors. Government officials and stakeholders must practise the principles of good governance in disseminating their duties and administering social assistance programmes geared towards poverty reduction.

Therefore, this study analyses the relationship between fiscal policy and poverty reduction in South Africa on the hypothesis that government expenditure has a negative effect on poverty reduction in South Africa—this drawing from high incidences of poverty is mirrored by governance challenges in the administration of fiscal instruments.

Binger [6] p. 2 posits that it is only through economic growth that widespread poverty can be reduced because "in generalised poverty (as in most developing nations), available resources in the economy, even if fairly divided, are hardly sufficient to supply the fundamental requirements of the people on a sustainable basis". According to the ILO (2021) [20], the poorest in developing countries, particularly in Sub-Saharan Africa, Asian countries, and some Latin American countries, lacks access to necessities and socioeconomic services. Poverty reduction strategies are vital to improving access to essential services.

The relationship between government expenditure and income poverty is subjective and varies for various reasons. First, the type of spending is likely to be determined. Government transfers and subsidies can directly decrease poverty by raising impoverished households' actual disposable ("post-fiscal") income [3, 36]. It can also indirectly improve poor households' nutrition, health, and education, leading to "pre-fiscal" income. Government expenditure on essential health and education services, as well as some types of infrastructure (e.g. rural roads, water and sanitation, and housing), is usually thought to relieve poverty by raising impoverished households' productivity and earning capacity [37], Nuru and Gereziher [32]. These forms of government spending

are most likely to alleviate income poverty and are frequently called "pro-poor". Heitger [17].

The paper makes methodological contributions utilising the principal components analysis and ridge regression against the multidimensional poverty index and government—expenditure on health, housing, social protection, and education.

The rest of the paper is presented as follows: After the introduction, the literature review is followed by the materials and methods, discussion conclusions, and policy recommendations.

Methods

This section presents the materials and methods of the study. First, a discussion of the data and variables used, followed by the operationalisation of the empirical models used in estimation.

Data

The South African government spends an estimated R2 trillion annually, most of which is allocated to government expenditure [31]. Government expenditure for the period 2010–2021 was used, with a focus on social protection, education, health, housing, and community amenities as variables to be tested to determine whether these measures have been effective in poverty reduction in South Africa [45], Quantec Easy View data, 2021.

The Global Multidimensional Poverty Index (MPI), Headcount Ratio, and Intensity of Deprivation comprise various elements that contribute to a poor person's experience of deprivation, such as poor health, a lack of education, and poor living standards. The MPI is composed of two components: The headcount ratio (H) (% of people) and the intensity or rate of poverty (A). The headcount ratio is the proportion of the poor population based on the weights and the poverty cutoff. The intensity of poverty is defined as the proportion of weighted deprivation indicators; it is measured in percentage values [35]. The level of deprivation among people experiencing poverty can change over time. This is called "dimensional monotonicity", and it means that if a low-income family is deprived in another way, the intensity of their poverty goes up (Ismail et al. 2015:7). This study's poverty data are drawn from the OPHI Global MPI from 1995 to 2021.

Empirical model

For this study, a quantitative correlational design based on the PCA, a data reduction technique and ridge regression were used to determine the impact of fiscal policy (Government expenditure) on poverty reduction in South Africa.

The PCA model

The PCA was used as a data reduction technique in selecting variables for the multiple linear regression techniques. According to Li et al. [24], principal component analysis is an estimate that transforms data into a new coordinate system based upon orthogonal linear transformation to minimise variance. The PCA process converts observations of potentially correlated variables into a set of linearly uncorrelated variables called principal components using an orthogonal transformation [23:191].

In the standard exploratory data analysis tool context, PCA requires a dataset with observations on p numerical variables for each n dataset. These data values define an $n \times p$ data matrix X , whose j th column represents the vector x_j of observations on the j th variable, is defined by these data value p n -dimensional vectors x_1, \dots, x_p [22]. These linear combinations can be expressed as follows:

$$Xa_k = \sum_{j=1}^p a_{jk}x_j \quad (1)$$

Equation (1) indicates how to maximise variance step-by-step while considering uncorrelation with earlier linear combinations. Since the covariance in two such combinations is zero, these are uncorrelated, X_{a_k} and $X_{a_{k'}}$ is given by $a_{k'}'S_{a_k} = \lambda_k a_{k'}'a_k = 0$ if $k' \neq k$. X_{a_k} This is given by the principal components represented in linear combinations.

$$(n-1)S = X * X^* \quad (2)$$

Using Eq. (2), the Eigen composition of the covariance matrix S can be linked to the singular value decomposition of the data matrix X^* and any actual matrix Y of dimension $n \times p$ and rank r (necessarily, $r \leq \min\{n, p\}$) can be written as [22] p. 3:

$$Y = ULA' \quad (3)$$

Equation (3) U, A represent matrices between $n \times r$ and $p \times r$ with orthonormal columns ($U'U = I_r = A'A$, where I_r is the identity matrix; $r \times r$), and L is a diagonal matrix $r \times r$. The right singular vectors of Y are found in column A , and the eigenvectors $p \times p$ matrix $Y'Y$ is linked to nonzero eigenvalues. Columns U will represent the left singular vectors of Y and the eigenvectors of $n \times n$ matrix YY' , which is equivalent to the nonzero eigenvalues. (The eigenvectors are the key components extracted from the correlation matrix calculated on standardised variables).

$$Y_q = U_q L_q A'_q \quad (4)$$

A matrix Y of rank r size $n \times p$, is that matrix Y_q of the same size and rank $q < r$, minimise the sum of squared

differences with the corresponding elements of Y . $Lq = q \times q$ diagonal matrix with the first q and diagonal elements of L and Uq , Aq are presented by $n \times q$ and $p \times q$ matrices, by retaining columns U and A , which corresponds to q . A scatterplot of n points in an r -dimensional subspace is determined by the number of rows- n rows, rank r and column-centred data matrix X^* [22] p. 3.

The PCA allows for translating government expenditure on education, social protection, education, health, and housing into new predictor variables known as principal components (PCs), while retaining as much precision as possible.

Ridge regression model

This section presents the ridge regression model. The ridge regression modelling (RRM) technique was utilised in analysing the relationship between MPI and government expenditure in housing, health, and social protection. The RRM technique is a statistical method used to analyse a single response variable with two or more multicollinear variables [46]. This would likely be the case with the governance indicators, which are all related.

Ridge regression lowers conventional faults by adding a degree of bias to the regression estimates. Ridge regression estimations are based on standardised variables. Standardisation is done by subtracting the means of variables (both dependent and independent, and dividing by their standard deviations) [28, 46]. The ridge regression is drawn from the estimated ordinary least squares regression coefficients, shown as:

$$\tilde{B} = (\bar{X}'\bar{X})^{-1}\bar{X}'\bar{Y}$$

The analysis assumes standardisation of variables; as such, $X'X=R$, where R is the correlation matrix of the independent variables. The estimates are unbiased and could relate to the population.

The RRM implicit model function is presented as follows:

$$Y_t = \beta_0 + \beta_1 X_1 + e$$

where Y_t =MPI, β_1 =Parameter estimate, X_1 =Government Expenditure (Housing, Education, Health, and Social Security).

Results

This section presents the study’s findings. First, the principal component analysis (PCA), a data reduction technique for multicollinear variables, is discussed, followed by a multiple linear regression analysis to infer the relationship between the study variables.

Principle component-analysis

This subsection presents the PCA findings, the diagnostic tests, and the results.

Diagnostic tests

Bartlett’s test of sphericity was conducted to determine the suitability of the data for PCA analysis. Bartlett’s test of sphericity compares an observed correlation matrix to the identity matrix. The test’s null hypothesis is that the variables are orthogonal, i.e. not correlated, and is a prerequisite for factor analysis [48]. Table 1 below presents Bartlett’s test results.

The PCA results from Bartlett’s test of sphericity indicate that the variables are correlated (29)=112.50 $p < 0.001$). This implies that the PCA analysis can be used.

Estimated PCA findings

This section presents the results obtained using PCA as a data reduction technique. The PCA method extracted three components with eigenvalues greater than 1. Eigenvalues are the coefficients linked to eigenvectors (principal components) sorted in descending order of their eigenvalues to determine the components’ importance. The eigenvalues measure the covariance of the data [53].

The eigenvalues after varimax rotation retained four components with two components with a total variation of 97.51, as shown in Table 2. This implies that the

Table 1 Bartlett’s test Source: Authors’

Kaiser–Meyer–Olkin Measure of Sampling Adequacy	.730	
Bartlett’s test of Sphericity	Approximately Chi-square	112.50
	df	6
	Sig	.0001

Table 2 PCA Extraction Source: Authors’ NCSS iterations

Eigenvalues after Varimax Rotation				
No.	Eigenvalue	Individual Percent	Cumulative Percent	Scree Plot
1	1,970,620	49,27	49,27	
2	1,929,747	48,24	97,51	
3	0,094096	2,35	99,86	
4	0,005537	0,14	100,00	

Rotation Method: Varimax

Table 3 PCA Factor Loadings Source: Authors' NCSS iterations

Factor Loadings after Varimax Rotation				
Variables	Factors			
	Factor1	Factor2	Factor3	Factor4
Housing	-0.208950	0.974148	-0.085167	0.011081
Health	-0.887624	0.453418	0.048003	0.065055
Education	-0.981226	0.183215	0.049483	-0.034345
Social Protection	-0.419857	0.861178	0.286513	0.001486

PCA explained about 97 percent of the South African government expenditure variables as determinants of poverty.

The recommended threshold for meaningful interpretation of loadings on chosen components' analysis is 0.4 [47]. Using this, Factor 2 successfully loaded on housing, health, and social protection (0.974, 0.453, and 0.086, respectively; see Table 3), and these variables were utilised in the ridge regression.

Ridge regression

This section presents the ridge regression findings based on the NCSS software. The first section presents the diagnostic tests, followed by the ridge regression findings in the second section.

Diagnostic tests

The diagnostic tests are significant at 5%. An F static of 4.953, and an R squared of 0.4977, show that model is robust. Table 4 shows the diagnostic tests.

Estimated ridge regression findings

Following Singh et al. [43], recommendations, principal components and ridge regression can improve the robustness of the model. Consequently, Anderson et al. [3] meta-analysis on education, social services, and health, against poverty lines, as a proxy for poverty.

In this study, the dependent variable MPI is regressed against the independent variables, housing, health, and social protection.

Table 5 shows the ridge regression findings. There is a negative relationship between housing expenditure and poverty. A 1-unit change in housing expenditure worsens the poverty status of households by 25%.

There is a positive relationship between health expenditure and poverty. A 1-unit change in health expenditure will cause a 38% reduction in poverty.

There is a negative relationship between social services expenditure and poverty. A 1-unit change in social services expenditure worsens poverty by 76%.

A VIF of 8 for social protection indicates a moderate correlation, while a VIF of 4 for housing, and 3 for health, indicate a low correlation with MPI. These conditions validate the use of ridge regression.

Table 4 Diagnostic tests-Ridge Source: Authors' NCSS iterations

Analysis of variance section for $k = 0.005000$					
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Intercept	1	0.07378189	0.07378189		
Model	3	0.02008324	0.006694413	4.9532	0.003826
Error	15	0.02027287	0.001351524		
Total (Adjusted)	18	0.04035611	0.002242006		
Mean of dependent			0.06231579		
Root-mean-square error			0.03676309		
R-Squared			0.4977		
Coefficient of variation			0.5899482		

Table 5 Ridge Regression Source: Authors' NCSS iterations

Ridge regression coefficient section for $k = 0.0050$				
Independent variable	Regression coefficient	Standard error	Stand'zed regression coefficient	VIF
Intercept	0.09584			
Housing	-5.43533	8.25010	-0.2514	4.3521
Health	1.02042	9.70083	0.3801	3.9022
Social protection	-5.35588	3.76216	-0.7631	8.5874

Discussion

This section discusses the results of the impact of government spending on poverty reduction in South Africa. The first section used a principal component analysis (PCA) to find the correct set of disaggregated government spending variables to put into the ridge regression model.

The PCA extracted four components, with two components explaining 95% of the variance. Based on the interpretation of Tabachnick and Fidell [47] and the rotation criteria of Varimax, factor loadings were included in the ridge regression model: Housing, health, and social protection/ social security.

The findings are discussed in detail below, with references to the literature.

First, government expenditure on housing development, under the category of housing expenditure, showed a negative relationship with poverty. The findings contradict literature, which purports a positive contribution of housing and amenities expenditure towards poverty reduction. Permanent housing can relieve economic stress and reduce rates of domestic violence and alcohol dependence. For many people, having a place to call home means staying with their families and avoiding lifelong poverty [16]. Nevertheless, the literature suggests poor households in developing countries do not receive government transfers and subsidies due to poor targeting [3].

In the South African context, the targeted housing development programmes, such as the Reconstruction Development Programme (RDP), provide beneficiaries with a fully built house that is free of charge by the Government. Department of Human Settlements [13], since 1994, the government has contributed R19 billion to just 1.5 million low-cost and free houses for people experiencing poverty, providing shelter, secure property, running water, sanitation, and electricity to over 6 million people [31]. The contribution is minimal, citing an estimated 12 million South African households without proper housing, as slums, informal settlements, and inadequate housing remain the visible manifestations of poverty and inequality in cities [27]. Corruption is pervasive within the government, where officials are not held responsible for their actions and decisions. This allows for unethical dealings with private companies, state funds, and asset embezzlement. Moreover, some employees' corrupt practices result in housing opportunities being allocated to unqualified individuals [27].

Second, health expenditure is positively related to poverty reduction. The magnitude is small, supporting the findings of [9]. The results attest to the nature of public health funding, though non-exclusionary, but has been improper targeting of healthcare, with access limited on numerous grounds. These findings are

supported by Pillai et al. [39], Abaeria et al. [1], Mukwena and Manyisa [29], and Nyashanu, Simbanegavi, and Gibson [33], who found that healthcare satisfaction is directly linked to healthcare facilities healthcare proximity, health care services (lack of personnel), overcrowding, lengthy waiting times, lack of medication, and infrastructure, which negatively impact health. Further highlights indicate that South Africa's health care system is viewed as highly unequal, reflecting poverty and lifestyle factors within different households [29].

Commensurate with the positive findings, government expenditure can help fight poverty by increasing the disposable income of low-income households and indirectly improving their nutrition, health, and education [2]. Higher government health expenditures would suggest more health facilities, provision of necessary medical equipment, and higher standards of hospitals. Therefore, these facilities are likely to improve the health of the citizens [4]. Healthcare expenditure can result in better provision of health opportunities, strengthening human capital and improving productivity, thereby contributing to economic performance. Therefore, investing carefully in various healthcare aspects would boost income, GDP, and productivity and alleviate poverty [40].

Finally, government expenditure on social protection is negatively related to poverty. As Andersen et al. posit the impact of spending on transfers and other "pro-poor" sectors varies among nations and relies on how effectively the spending reaches impoverished households. However, transfers and subsidies may also have unintended consequences, such as changes in household labour supply or private transfer receipts, which can negate their impact on poverty reduction. Therefore, even when appropriately targeted, the overall effect of transfers and subsidies on income poverty remains uncertain [8, 3]. These findings hold for South Africa, where the government earmarked billions for social security payments. It is now considered meagre as it falls below the upper-bound poverty income of about R1600 in an economy faced with high unemployment [27].

The social protection services sector is under the custodianship of SASSA in South Africa, which has recently been plagued by rampant corruption and service delivery issues. (SASSA) [44]. Social insurance makes up 88% of the budget for the social protection services sector, with social assistance and services accounting for 8% and investments for 4%. Social security funds support older people, children, war veterans, disabled individuals, and children [13].

Conclusions

The study investigated the effect of fiscal policy, as proxied by government expenditure aggregates, on alleviating poverty in South Africa. A quantitative correlation design was used, which included principal component analysis (PCA) and ridge linear regression analysis, based on the Oxford, the multidimensional poverty index (MPI), and Statistics South Africa (government expenditure) time series annual data from 1995 to 2021. The retained components of the PCA explained around 97% of South African government spending variables as poverty drivers, retaining four factors (housing, social protection, and health), which entered the ridge regression model as independent variables.

The results of this study from the ridge regression showed a positive relationship between health expenditure and poverty. Consequently, a negative relationship between housing expenditure and social services spending to poverty. Justification for the findings was supported by literature and the South African economic conditions, including incidences of corruption and unemployment, which to a large extent, has implicated targeted government spending.

First, the findings emphasise the need for government involvement in social protection policies, as social assistance alone cannot alleviate multidimensional poverty. New or enlarged social assistance programmes may be introduced. Through an institutionalised social policy, NGOs, the media, political parties, and the public and commercial sectors may contribute to poverty reduction. Long-term ways to fight poverty are education, building people's skills, redistribution of land, economic growth and job creation, housing, water, sanitation, power, and schools and clinics. Independent, institutionalised, and comprehensive social policies are developed, implemented, monitored, and coordinated. All social and economic development concerns would be coordinated through social policy.

Implications of the research for practice

Efforts should be made to expand social protection programmes and ensure their effective implementation, with a particular focus on the most vulnerable populations. This includes providing financial support, social welfare services, and safety nets to assist individuals and families in overcoming poverty.

Co-production should be encouraged in health care and housing. In health, this will involve people who use health and care services, carers, and communities in equal partnership; and engages groups of people at the earliest stages of service design, development, and

evaluation. A memorandum of understanding should frame dialogue between community and state actors and facilitate the co-production of housing and infrastructure in a low-income settlement.

Government subsidies and policies can help with the housing problem, including rental housing for lower-income groups, bond subsidies for middle-income groups, and inclusionary housing policies. Through the Housing Development Agency, the government needs to engage the private sector, state-owned enterprises, provinces, and municipalities to unlock strategic parcels of land suitable for human settlements development, which provision, especially for low-income groups, should be at subsidised rates.

Improving healthcare infrastructure, increasing medical resource availability, and ensuring affordable healthcare for all are essential. Patients should not receive better treatment based on their ability to pay and access to medical schemes should not neglect public healthcare. The high remuneration of private care adversely affects public healthcare, with most doctors focusing on the private sector. These two markets are interconnected, and failure to reduce personal healthcare costs will lead to increased costs for everyone. Investing in mobile clinics and partnering with ambulatory surgical centres for low-acuity surgeries is necessary to enhance healthcare access. Investment in security should also be considered.

Limitations of the study

The paper focussed on four factors drawing from previous literature. Future studies might consider using other methodologies to capture the salient government expenditure factors with a poverty implication. More so, future studies could consider mixed methods, also exploring the views of deprived households.

Abbreviations

DPME	Department of Planning and Evaluation
DSD	Department of Social Development
NCSS	Number Cruncher Statistical Software
PCA	Principal Component Analysis
RDP	Reconstruction Development Programme
SASSA	South African Social Security Agency
StatsSA	Statistics South Africa
UN	United Nations
UNHDR	United Nations Human Development Report

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Competing interests

The authors declare that they have no competing interests.

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References

1. Abaerei A, Ncayiyana J, Levin J (2017) Health-care utilisation and associated factors in Gauteng province South Africa. *Glob Health Action* 10(1):1305765
2. Anderson E, Duvendack M, Esposito L (2017) Does government spending affect income poverty? A meta-regression analysis. *J Econ Surv* 31(4):961–981
3. Anderson E (2018) Does government spending affect income poverty? A meta-regression analysis. *World Dev* 103:60–71
4. Anwar A, Hyder S, Mohamed NN, Younis M (2023) Government health expenditures and health outcome nexus: a study on OECD countries. *Front Pub Health*. <https://doi.org/10.3389/fpubh.2023.1123759>
5. Ayoo C (2022) Poverty reduction strategies in developing countries in rural development. De Salvo & Pineiro. Available at <https://doi.org/10.5772/intechopen.91068>. Accessed on 16 August 2022
6. Binger A (2020) The poverty reduction challenge in LDCs. CDP Background Paper No. 3. United Nations, Department of Economics and Social Affairs. Available at <https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/CDP-bp-2004-3.pdf>. Accessed on 17 August 2022
7. Bundy C (2020) Poverty and inequality in South Africa: A History. Available at: <https://doi.org/10.1093/acrefore/9780190277734.013.659>. Accessed on 02 July 2022
8. Cox D, Hansen D, Jimenez E (2004) How responsive are private transfers to income? Evidence from a laissez-faire economy. *J Public Econ* 88(9–10):2193–2219
9. Deon F, Lant P (1999) The impact of public spending on health: does money matter? *Soc Sci Med* 49(10):1309–1323. [https://doi.org/10.1016/S0277-9536\(99\)00150-1](https://doi.org/10.1016/S0277-9536(99)00150-1)
10. Department of Planning, Monitoring and Evaluation (2021) Governance and Administration. Pretoria, South Africa. Available at: <https://www.dpme.gov.za/publications/20%20Years%20Review/20%20Year%20Review%20Documents/20YR%20Chapter%202%20Governance%20and%20Administration.pdf>. Accessed 22 Sept 2022
11. Department of Planning, Monitoring and Evaluation (2018) Annual Report 2017/2018. <https://www.gov.za/documents/department-planning-monitoring-and-evaluation-annual-report-20172018-1-oct-2018-0000>. Accessed 23 Sept 2022
12. Department of Social Development (2021) Social development: Reducing Poverty and Inequality. South Africa. Available at <https://www.gov.za/about-sa/social-development>. Accessed 23 Sept 2023
13. Department of Social Development (DSD) (2022) Vote 19, Annual Report, 2022. Available at: <https://www.dsd.gov.za/index.php/documents?task=download.send&id=457&catid=28&m=0> Accessed 19 September 2022
14. Enami A, Lustig N Aranda R (2018) Commitment to Equity Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty. CEQ Institute, Tulane University
15. Farayibi F, Owuru J (2016) Linkage between fiscal policy and poverty reduction in Nigeria. MPRA Paper No. 74678. Available at <https://mpra.ub.uni-muenchen.de/74678/> Accessed on 19 August 2022
16. Habitat (2021) Why housing is the solution to end poverty. <https://habitat.org.au/why-housing-is-the-solution-to-end-poverty/>.
17. Heitger B (2018) The Scope of Government and Its Impact on Economic Growth in OECD Countries. *J Econ Literature* 22:38–39
18. Heshmati A, Kim J, Park D (2019) Fiscal Policy and Inclusive Growth in Advanced Countries. ADB Economics Working Paper Series 422, Asia Development Bank
19. Inchauste G, Lustig N, Maboshe M, Purfield C, Woolard I (2015) The Distributional Impact of Fiscal Policy in South Africa. Policy Research Working Paper 7194. World Bank Group
20. International Labour Organisation (2021) Access and Poverty Reduction. United Nations. Available at https://www.ilo.org/asia/projects/WCMS_099614/lang--en/index.htm. Accessed on 19 August 2022
21. International Monetary Fund (IMF) (2015) Fiscal Policy and Income Inequality. International Monetary Fund, Washington, D.C.
22. Jolliffe IT, Cadima J (2016) Principal component analysis: a review and recent developments. *Royal Soc Publish*. <https://doi.org/10.1098/rsta.2015.0202>
23. Lenka K (2015) Social Situation and Poverty of Roma. *Creative and Knowledge Society* 5(1):16–35. <https://doi.org/10.1515/cks-2015-0003>
24. Li T, Sun J, Wang L (2021) An intelligent optimisation method of motion management system based on BP neural network. *Neural Comput Appl* 33:707–722
25. Lustig N (2018) Fiscal Policy, Income Redistribution, and Poverty Reduction in Low- and Middle-Income Countries. Available at <https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2018/06/4-1.pdf>. Accessed 20 August 2022
26. Makanza CS, Dunne JP (2015) Fiscal consolidation, fiscal policy transmission, and current account dynamics in South Africa. *Economic Research Southern Africa (ERSA)*, South Africa. Available at: https://econrsa.org/wp-content/uploads/2022/06/working_paper_565.pdf. Accessed 23 June 2023
27. Marutlulle NK (2021) A critical analysis of housing inadequacy in South Africa and its ramifications. *Africa's Public Service Deliv Perf Rev* 9(1):a372. <https://doi.org/10.4102/apsdpr.v9i1.372>
28. Mazenda A (2021) Food policy, governance, and the South African food security. *J Glob Policy Govern* 10(2):119–138. <https://doi.org/10.14666/2194-7759-10-2-007>
29. Mukwena NV, Manyisa ZM (2022) Factors influencing the preparedness for implementing the national health insurance scheme at a selected Gauteng Province, South Africa hospital. *BMC Health Serv Res* 22(1):1–13
30. Musgrave R (1959) *The theory of public finance*. New York: McGraw Hill
31. National Treasury (2021) Budget 2021: Budget Review: Republic of South Africa, Pretoria
32. Nuru NY, Gereziher HY (2021) The effect of fiscal policy on economic growth in South Africa: A nonlinear ARDL model analysis. *J Eco Admin Sci* 38:229–245
33. Nyashanu M, Simbanegavi P, Gibson L (2020) Exploring the impact of the COVID-19 pandemic lockdown on informal settlements in Tshwane Gauteng Province South Africa. *Glob Public Health* 15(10):1443–1453
34. Odusola A (2020) Fiscal Space, poverty and inequality in Africa. United Nations Development Programmes Africa Economics Working Papers 268726. DOI: <https://doi.org/10.22004/agecon.268726>
35. Oxford Poverty and Human Development Initiative (OPHDI) (2021) Global MPI Databank 2021. Available at: <https://ophi.org.uk/multidimensional-poverty-index/global-comparisons/>. Accessed 20. September 2022
36. Pamba D (2021) The Effectiveness of Fiscal Policy on Economic Growth in South Africa: An Empirical Analysis. Ph.D. thesis, University of KwaZulu-Natal, Beria, South Africa
37. Paternostro S, Rajaram A, Tiongson E (2007) How does the composition of public expenditure matter? *Oxf Dev Stud* 35(1):47–82
38. Peacock AT, Wiseman J (1961) *The growth of public expenditure in the United Kingdom*. London: National Bureau of Economic Research
39. Pillai RG, Krishnakumar S (2019) Elucidating the emotional and relational aspects of gift giving. *J Bus Res* 194–202. <https://doi.org/10.1016/j.jbusres.2019.03.037>
40. Raghupathi V, Raghupathi W (2020) Healthcare expenditure and economic performance: insights from the United States data frontiers in public health <https://doi.org/10.3389/fpubh.2020.00156>
41. Sachs J (2019) *The end of poverty: economic possibilities for our time*. New York: Penguin

42. Sachs M (2021) Fiscal Dimensions of South Africa's Crisis. Public Economic Project SCIS Working Paper No. 15. Available at <https://www.wits.ac.za/media/wits-university/faculties-and-schools/commerce-law-and-management/research%20entities/scis/documents/Sachs-2021%20Fiscal%20dimensions%20Working%20Paper%2015.pdf>. Accessed on 20 January 2023
43. Singh B, Olds T, Curtis R, (2023) Effectiveness of physical activity interventions for improving depression, anxiety and distress: an overview of systematic reviews. *British Journal of Sports Medicine* Published Online First: 16 February 2023. <https://doi.org/10.1136/bjsports-2022-106195>
44. South African Social Security Agency (SASSA) (2021) Annual Performance Report 2020/2023. Pretoria, South Africa
45. Statistics South Africa (2021) National Poverty Lines. Pretoria, South Africa.
46. Sunil R (2015) 7 Regression techniques you should know. Retrieved from www.analyticsvidhya.com. Accessed on 04 Aug 2019
47. Tabachnick BG, Fidell LS (2001) Using multivariate statistics. Needham Heights, MA: Allyn & Bacon
48. Tobias S, Carlson JE (1969) Brief report: Bartlett's test of sphericity and chance findings in factor analysis. *Multivar Behav Res* 4(3):375–77
49. United Nations (2021) One in Five South Africans Now Lives on Less than R28 a Day, the UN finds. Available at <https://www.businessinsider.co.za/heres-how-many-south-africans-live-on-less-than-r28-a-day-and-why-its-getting-worse-2020-12>. Accessed on 06 June 2021
50. United Nations (2021) Transforming Our World: The 2030 Agenda for Sustainable Development
51. United Nations International Children's Emergency Fund (UNICEF) (2017) Fiscal Space Profiles of Countries in Eastern and Southern Africa: Case Study – South Africa Fiscal Space Analysis. UNICEF, South Africa
52. Weinstock LR (2021) Fiscal policy: economic effects. congressional research service. Available at <https://sgp.fas.org/crs/misc/R45723.pdf>. Accessed on 20 January 2023
53. Yang L (2015) An application of principal component analysis to stock portfolio management. A Master's thesis. University of Canterbury. Available at <https://core.ac.uk/download/35472132.pdf>. Accessed 21 August 2022

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