Gender and poverty in South African rural areas
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Abstract: In this article, we elicit the effects of gender on poverty reduction efforts in South Africa. Gender plays a huge role in the household decision-making process, as a result, it can determine if whether the household falls into a poverty trap or falls out of poverty. Utilizing a recently Community Survey (2016) we employ a Categorical Principal Component Analysis (CATPCA) to identify potential poverty indicators in South Africa. We then regress the identified components (indicators) using the Ordinary Least Square (OLS) and the Weighted Ordinary Least Square (WOLS) methods to identify the influence they have on non-income poverty. The findings of the study reveal a negative but significant relationship between females residing in traditional (rural) areas and poverty. Furthermore, it was found that females residing in rural and farm areas were most likely to be in poverty compared to their male counterparts. These findings suggest the importance of culture in shaping geographic location of gender in relation to poverty incidences.

Keywords: culture; deprivation; ordinary least square; principal component analysis; weighted ordinary least square

Subjects: Sociology & Social Policy; Economics; History of Economic Thought

1. Introduction
In 2012, the World Bank estimated that the number of the poor declined in every region for the first time since it began monitoring extreme poverty in 1981. Using the 2008 data, the World Bank stated that 1.29 billion people lived below $1.25 a day compared to the 1.94 billion people in 1981.

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PUBLIC INTEREST STATEMENT
According to Statistics South Africa (2017) Vulnerability Report, it is estimated that, of the majority of South Africans living in poverty, women are the most vulnerable to poverty. This is worsened by embedded cultural beliefs and values, which excludes women in various decisions-making, in many cases were their voice needs to be heard. This work focus on gendered poverty in South Africa. The study finds that women residing in farm areas and rural areas seem to be more exposed to poverty compared to their urban areas counterparts. As demonstrated in this study, culture or patriarchal values may be the leading cause of women exclusion, leading to more poverty incidences. This study is worth noting due to the fact that it tries to delve deeper in the poverty discourse given that a number of policies in South Africa support women empowerment.
Furthermore, it was pointed that the Millennium Development Goal of halving extreme poverty by 2015 was achieved because the $1.25 a day poverty rate had declined by 2010. This was based on small samples that were extrapolated, and the entire drop of the people who live below the $1.25 was accounted by China—where extreme poverty fell by 662 million. However, in actuality the number of poor people outside China rose by 13 million, and most people who fell into poverty during that period were from South Asia and in sub-Saharan Africa. Chandy and Kharas (2012) noted methodological issues from the World Bank estimates for the period of 1981–2008, where the populations in India, sub-Saharan Africa and China accounted to over three quarters of the world poor. The issues identified included insufficient survey data, faulty purchasing parity conversion and flawed surveys. Given that South Africa is one of the countries in the sub-Saharan Africa, it is worthwhile to consider its poverty trends.

Statistics South Africa (2017) noted that the standard of living has been not uniform around the country and is accompanied by rising inequality. The Gini coefficient for South Africa in 2015 was 0.59 (World Bank, 2015). Meanwhile, Leibbrandt, Finn and Woolard (2012) claimed that 85% of income inequality is caused by labour market income, with unemployment being the driver to inequality. Given the racial divisions in South Africa, it is expected that income disparities show a racial footprint, and inequality remains high among racial groups. Adato et al., (2006) investigated asset changes in South Africa, and found evidence that racial discrimination of apartheid may have left behind a legacy of poverty after its abolishment. They found there was institutional social exclusion on non-white citizens from mainstream opportunities. Similarly, Daniels, Partridge, Kekana, and Musundwa (2013) and Klasen (2000) found that disparities in urban and rural locations of South Africa mirror the spatial policies of the apartheid regime. While these studies have shaped the poverty discourse in South Africa, our empirical work explicitly investigates the influence of gender in determining poverty profiles of both individuals and households.

South Africa recorded an impressive growth during the 2000s, and social security played a key role in it. As a result, poverty declined gradually. However, there is a concern that while poverty has continued to decline, inequality has increased abruptly in the past years. New challenges are emerging which need a review of policy priorities and a sharper focus in new methods of fighting poverty. Intuitively poverty trends have been less impressive, with empirical illustrations revealing little in terms of what is driving poverty at micro level. Irregularities in households surveys especially in places where there are chronic poverty and potential poverty traps have contributed to policies paying little attention on interactions between poverty determinants and local contexts. Specifically, a shift of emphasis is made from static indicators of poverty to dynamic indicators that target various groups and policy regime changes. The emphasis on this shift is justified on the basis that static poverty indicators have contributed to unclear poverty reduction strategies or policies and the ever-rising inequality in South Africa. This study is motivated by this concern.

Theoretical, our contribution rests on the family behaviour model, were we conceptualise a patriarchy and misogynist society. Our point of departure being that a number of customary laws exclude women, although affirmative action has addressed the plight of women. Ignoring this component has contributed to numerous studies on gendered poverty failing to explain how females fall into poverty compared to males. Rogan (2016) explored multidimensional gendered poverty in South Africa, and found that female poverty is high due to disadvantages faced by women in the labour market. We extend on this analysis by imposing that gendered poverty is caused by a patriarchal society that views females as unequal. As a result, the labour markets wage differences between males and females is an outcome of a deep cultural system that view female as less than males. While our focus is beyond gendered poverty, we note that once gendered poverty is addressed, it becomes easy to eradicate poverty.

In the following session, we provide a brief discussion on issues surrounding the creation of poverty. This is followed by the methodology in section three. Then in section four results and discussions are provided, and lastly, section five concludes and offers recommendations.
2. Literature review

The discovery of mass poverty in Africa, Asia and Latin America post World War II brought changes in the global culture and political economy. Milbank Memorial Fund (1948) declared that genuine prosperity could not last in one part of the world, while the rest lives in poverty. This was the ushering of the new poverty discourse that was totally different to the treatment of poverty before the 1940s (Sachs, 1990). During the colonial times, the “natives” were seen as less economically developed by their colonizers, as a result, the view was that their capacity for science and technology was nil (Adas, 1989). Vernacular societies had developed ways of dealing with poverty in a way that accommodated their vision of community, and frugality (Escobar, 1995). Whatever ways there were, it was quite clear that poverty became an issue once modernization came into picture and when the market economy was born. Rahnema (1991) points that poverty was ushered with the emergence of capitalism in Europe and the development of the Third World. Therefore, modernization spelled doom for vernacular cultures and at the same time placing new mechanisms of control. As pointed by Escobar (1995), the treatment of poverty allowed the creation of consumers and transformation of societies by treating the poor into objects of knowledge and management. Procacci (1991) state that the management of poverty came with interventions in health, education, employment and so on. The outcome was the creation of “the social” (Burchell, Gordon, & Miller, 1991). The social was prominent through the nineteenth century and later on consolidated to a welfare state.

Thus, poverty, health, education, and employment was then constructed as social problems needed social planning (Escobar, 1992). As the government of the social was established, a separate class of the poor was created (William, 1973). The most significant outcome was the creation of apparatuses of knowledge and power, which optimised life under scientific (modern) conditions. In 1945, two-thirds of the world were classified as poor. The poor by then were defined as lacking in terms of material possession and money in relation to the standard of wealth of more economically advanced nations (Escobar, 1995). This later on brought the economic competition of poverty in form of per capita income. As put by Sachs (1990), the concept of poverty was then a result of comparative statistical operation. In 1948, two third were classified by the World Bank as poor with an annual income of less than $100 (Escobar, 1995). In Foucault (1986) words, poverty becomes an organised concept and the object of problematizing. Therefore, the solution to poverty was then seen as economic growth and development, and this became a universally accepted truth.

There was a belief that the only way for modernization to come into being, was through the destruction of the superstitions and relations in social, cultural and political ways. Urbanization and industrialization were inevitable seen as necessary routes to modernization. Escobar (1995) points that capital investment was seen as an important ingredient to achieve economic growth and modernization. Therefore, poor countries were suppose to rely on capital from abroad since there were said to be in a vicious poverty circle. Capital formation was then composed of various factors that included population and resources, technology, monetary and fiscal policies, commerce and trade and industrialization. Education was furthered to cater for modern cultural values. Moreover, various institutions were then created to carry out this complex task, namely, the World Bank and the International Monetary Fund.

Objects of development varied with cultural attitudes and value, racial, religion, ethnic factors being seen as representing backwardness. Then elements emerged from numerous sources including the new institutions, government offices in abroad capital, university and research in developing countries. Escobar (1995) claimed that development created abnormalities such as “the underdeveloped”, “small farmers” or “landless peasants”, “illiterate” and the “malnourished”. Consequently, these objects were then linked to instruments of control and power. Specification was the prime goal that led to problems being given levels such as “local or regional”. Put simply by Escobar (1995), the specification of the problems involved detailed observations of villages, regions and countries in the Third World. For instance, they were numerous strategies like the agrarian reform, green
revolution and rural development, which were constructed based on “hunger”. While these instruments have remained unchanged in the twenty-first century, they allow the discourse to adapt to new conditions. The outcome being a discourse confined to the same discursive space.

In the same vein, the historical discourse has influenced the representations of poverty. Patriarchy and ethnocentrism had an influence in the development of the poverty discourse. Indigenous population were forced to modernise by the white minority. Consequently, their cultures were then thrown in the drain and industrialization era took stage. The old barter economy was replaced by a market-based economy that quantified resources and assets. In the process, anyone who did not have such resources was classified as poor.

Vetterlein (2012) contend that the World Bank is an instrument of powerful industrialised countries that impose western norms on developing countries, and it has contributed to the worsening of poverty through the policies adopted. In addition, Barnett and Martha (2004) posit that the bank organises information and knowledge, and therefore shapes world politics. In 1990, the World Bank claimed that attacking poverty was not primarily the task of focused anti-poverty projects; however, it was the task of economic policy. This led to the shift in attacking poverty to be based on income-earning assets of the poor. According to the World Bank (1991) this strategy was designed to ensure that the poor both gain from and contribute to growth. Vetterlein (2012) points that poverty was viewed as multidimensional problem that is not only affected by income. However, based on the interviews that were conducted in 60 developing countries, it was pointed that the poor themselves prefer local knowledge to be put into practice and also have an input on how policies are designed. Therefore, even while it is clear that poverty is multidimensional, actionable knowledge is subject to quantification. Yet, the problem needs to be qualitatively addressed. Vetterlein (2012) argues that there is a need to break the economization and quantification of the Bank practice by treating economic growth and poverty reduction separately. This allows for the introduction of redistribution or social policies that are political detected, but based on societal values.

This study investigates the effect of gender on poverty reduction efforts in South Africa. By so doing, the study aims to challenge two critiques against poverty reduction efforts in South Africa.

First, against the claims that poverty in South Africa is wholly driven by the apartheid era, the study notes that while apartheid created a parallel state, the current poverty policies are in the new dispensation. Meaning, the current policies for fighting poverty are mainly adopted from institutions like the World Bank and International Monetary Funds. This leads to the assumption that poverty in South Africa just like in every Third World country is likely driven by the construct to which poverty was created. The underlying causes of poverty may be ecocentric or structural. Our view is that, poverty is mainly pronounced in predominantly rural areas compared to urban areas, where gender plays a huge role in household decision-making. As pointed by Lamont and Small (2008), numerous scholars have neglected the cultural impact on poverty, largely because much work is conducted by social scientists who are not part of the community working on poverty and policy. Consequently, quantitative social scientists always dismiss the qualitative work as non-empirical.

Secondly, the study argues that unless indigenous knowledge is considered in poverty eradication, it will be hard for any country to fight poverty in rural areas due to the deep norms and cultural values. The current policies are more ecocentric in nature despite changes to more inclusive poverty policies. The study contends that South African poverty policies are plagued with bureaucracies and the economization trap that does not fit into spaces where poverty is rife. The main instruments that have been used recently to fight poverty are economic growth and government social grants. While these tools can moderate the impact of poverty, they do not address the major source of poverty. Therefore, it is essential to understand the cultural and social mechanisms that affect ethnic and racial differences in poverty eradication.
2.1. Analytical framework

Poverty is usually measured individual or at a household level. Therefore, considering that this study aims to introduce a gender component in understanding poverty and provide determinants of poverty, we introduce the family behaviour model. Numerous models of family behaviour focus on the husband and wife as two decision-makers, with children customarily excluded on the set of decision-making agents. Although they are recognised as consumers of goods chosen and provided by the family. Unitary models provide a theoretical understanding of family behaviour like the Samuelson (1956) consensus model. Samuelson (1956) point that income distribution within a family is a result of optimizing choice than arbitrarily determined.

For the sake of this study, suppose we have a dictator who holds a utility function of the form \( W(U_1(x_1, y) \ldots \ldots \ldots U_n(x_n, y)) \) whose allocation \( (x_1^*, \ldots \ldots \ldots x_n^*, y^*) \). The allocation maximises \( W(U_1(x_1, y) \ldots \ldots \ldots U_n(x_n, y)) \) subject to \( p \sum_{i=1}^{n} x_i + p_y y \leq W \) and implement this outcome by providing the family with the vector \( y^* \) of public goods and giving the family income of \( px_i^* \), which \( i \) would be used to purchase \( x_i^* \). If we assumed that the function \( V(x, y) \) to be the maximum of \( W(U_1(x_1, y) \ldots \ldots \ldots U_n(x_n, y)) \) subject to \( \sum x_i = x \), then it follows that the aggregate demand in this family is always chosen to maximise \( V(x, y) \) subject to a budget constraint. Samuelson goes further by suggesting that if the family has no dictatorship, it might be that preferences of the different members are integrated by a “consensus” or “social welfare function” which takes into account ethical worth of consumption levels of each family members. Leading to the family acting as if there are maximizing their joint welfare function in form of \( W(U_1(x_1, y) \ldots \ldots \ldots U_n(x_n, y)) \). Where \( W \) represents the increasing function of each member of the family utility. Samuelson stresses that, if welfare is determined jointly, it becomes impossible using data on total family consumption to distinguish the behaviour of a family that maximise their social welfare function from the behaviour of a rational consumer. However, if \( W \) is a concave function of \( x_i \)'s, then the consumption of each family member can be uniquely determined by aggregate family income.

Gender relations or relations of power between men and women is a complex concept, although these relations influence economic outcomes in many ways. Numerous economists have criticized the unitary model on the basis that it treats a household as a single entity in terms of consumption and production. It also assumes that household resources are pooled and allocated by an altruistic household head, who represents the households' preferences and tastes, and seeks to maximise the household utility. In the majority of rural areas and traditional areas, males are usually regarded as the household head cultural. This means that household decision-making rests on the male figure. In the sub-Saharan region, poverty seems to be more of a generation-manufactured problem because of certain household decisions made by males. Put simple, males migrate to urban areas to work leaving behind a wife/wives and children in rural areas. This means it is easy to control household consumption and expenditure since the male is the main source of income.

Culture and social norms that are imposed on women in patriarchal societies have made this acceptable. Social norms often define the principles governing households. This means they determine what type of food may be shared or bought. Food norms determine who eat first and how much quantity one can eat. Even the criteria of contributions to family income or well-being. Therefore, social norms weaken women by restricting their growth possibilities and earning potential by discouraging them from working out of the house, and institutionalised lower wages for women than male restrict their access to markets. Equally, they affect how one’s voice within a household. In numerous occasion, norms affect their economic situation, property rights, and group strength. This means that in this case, poverty is driven by a cultural system.

Customary laws also contribute to poverty because they allow males to have polygamous families. Various studies by the United Nations and other Non-Governmental Organizations found evidence that cultural arrangements contribute to child and female poverty. Apart from
poverty, a male usually pays dowry in form of livestock, effectively buying ownership rights from the women family. This practice contributes to the weakening of females in decision-making. Thus, poverty is created by a system of repeated decisions making that harms the household likelihood of escaping poverty. Polygamous families have large number of children, this put excessive pressure on the male, leading to some children failing to get education. For instance, Ethiopia has been suffering from extreme famine for decades, however, women in rural drought-stricken areas have children who later on die of hunger. This practice is driven by culture, where the woman is a child bearer in a household and a male is for security and protection.

In simplicity, when culture has more influence on household decision-making, government policies not addressing this problem would not solve poverty. This leads to a generation of kids born in poverty, who later spend their lives striving to be out of poverty in a system that keeps them in poverty. As a result, poverty in the sub-Saharan region has remained stubbornly high for numerous years because policies are addressing the outcomes of a patriarchal system, instead of the system itself. In this study, we hold this view that households are led by an altruistic household head, who chooses how family members ought to live.

3. Methodology

Traditionally, poverty has been measured using the income or consumption expenditure of a household over a period. The major advantage of this approach is that it allows poverty to be measured across time. We begin by applying a principal component analysis methodology to identify factors that are linked to deprivation. A principal component is defined as a linear combination of optimally weighted observed variables. The basic formula for a principal component analysis is as follows:

\[ C_j = \beta_{j1}X_1 + \beta_{j2}X_2 + \ldots + \beta_{jm}X_m \]  

(1)

where \( C_j \) is the first component extracted, \( \beta_{jm} \) is the component loading of the \( j^{th} \) variable on the \( m^{th} \) component. Bentler and Kano (1990) stated that factor analysis does not differentiate between unique variance and error variance to reveal the underlying factor structure. Yet, on the other hand, a PCA accounts for total variance of variables, with components reflecting common variance of variables (Garson, 2010). In short, the PCA-observed variables are relatively error-free, unobserved latent component is perfect linear on its variables, and ideal for data reduction. However, the PCA is suitable for continuous variables. To overcome challenges in estimating categorical variables, we employ the categorical principal component analysis (CATPCA) for non-linear data. The CATPCA methods use the optimal scaling process to transform category labels into numerical values (Linting & Van der Kooij, 2012). The main idea is to extract components that would be used in a regression model.

After conducting the CATPCA, we then estimate an augmented basic growth-poverty model (Dollar & Kraay, 2001; Ravallion, 1997). Consequently, the empirical model we estimate is parsimonious and takes the following form:

\[ \text{Poverty} = \beta_0 + \beta_1 F_1 + \ldots + \beta_m F_m + \mu \]  

(2)

where \( F_1, F_2, \ldots, F_m \) are observable random scalars, \( \mu \) is a random disturbance term, and \( \beta_0, \beta_1, \beta_2, \ldots, \beta_m \) are the parameters we want to estimate. The estimation is an extended regression specification as follows: (Restricted model) (Unrestricted model)

\[ \text{Poverty} = \beta_0 + \beta_1 F_1 + \beta_2 \text{HH gender} + \beta_3 \text{HH gender GEO} + \beta_4 \text{asset HH} + \beta_5 \text{PP Group} + \beta_7 \text{PP Group’ GEO} + \mu \]  

(3)

\[ \text{Poverty} = \beta_0 + \beta_1 F_1 + \beta_2 \text{HH gender} + \beta_3 \text{HH gender GEO} + \beta_4 \text{asset HH} + \beta_5 \text{PP Group} + \beta_7 \text{PP Group’ GEO} + \text{weights} + \mu \]  

(4)
Components that were extracted were used as dimensions representing determinants of poverty. In this case we have; Amenities, Education, Public Services, Economic activity and Household deprivation represented by \( F_1 \). We then add variables such as Household Gender, Geographic location and Population group. To get a detailed picture on the factors contributing to household poverty we do this by interacting household gender and population group with geographic location. The main idea in doing this is to estimate if gender or belonging to a certain population group (race) does have an influence on poverty. We test the model in Equation (3) by using the Ordinary Least Squares (OLS) method and the Weighted Ordinary Least Squares (WOLS) method. In this case, we follow Winship and Larry (1994) argument on selecting the robust model between the two methods, considering that the sample we have is weighted. According to Winship and Larry (1994), when sampling weights are a function of independent variables in the models estimated the unweighted OLS is a natural choice, because it would be unbiased and consistent as long as the variables are linearly independent and have a positive variance. Therefore, we estimate a restricted model where we put controls on certain variables and an unrestricted model. The idea with this approach is to compare the robustness of both models and the best one in determining deprivation. Following Winship and Larry (1994), sampling weights can affect parameters estimates when they are used as a function of the dependent variable. In this case, weights are used as independent variables in the unrestricted model.

3.1. Data
We use the Statistics South Africa Community Survey 2016, which has over 1 million households interviewed in all nine provinces in South Africa. Table 1 provides a list of variables that were used for the factor analysis. As it can be seen from the table, all the variables can be said to describe situations of socio-economic deprivation. The dataset excludes income or anything related to aggregate income earned by households. According to StatsSA (2016), this variable was deliberately excluded, for reasons which were not provided to us. All the variables in table 9 are categorical in terms of measurement.

4. Results and discussions
Before we proceed with factor analysis, we provide a breakdown of the sample characteristics. As shown in Figure 1, the mean age was between 40 and 60 years. The Eastern Cape Province had a mean age of around 25 years for respondents residing in tribal areas (rural areas). Similarly, in the KwaZulu Natal, North West and the Northern Cape provinces, the mean age was less than 40 years for other races. It can be seen that the respondents who participated in the survey were mostly beyond their youth (18–38 years); this is a reflection of an ageing population, especially in farm and tribal areas. Black Africans had more outliers in terms of age with a number of respondents approaching the age of 100 years, especially in urban areas, and in tribal areas surpassing 100 years. In short, there were no significant differences in terms of age.

4.1. Education
We then focused on education attendance by race and gender as shown in Figure 2. As illustrated in the figure, blacks were the majority in terms of both gender and education attendance. At the same time, the percentage of blacks and coloured people, who were not educated, was closely similar for both genders. Overall, more people were literate regardless of both gender and race; although for whites and Indians, the percentage declined for those who attended and those who did not have any education.

While it was ascertained that a number of people were literate, Likert scale questions were used to elicit respondents pertaining service delivery to the public. Figure 3 reveals that most services rated low were police services, public hospitals and public clinics, with refuse removal following in the list. In terms of quality, public schools (61%), electricity (59%), water (54%) and toilets/sanitation were seen as good. It was unexpected that 21% had poor access to police services considering the high crime rate in South Africa. Similarly, 20% had poor access to public clinics and 18% to public hospitals; this was a norm especially in tribal and farmlands where health access is
| Variable     | Description                                           | Mean   | Std. Dev. | Min | Max |
|--------------|-------------------------------------------------------|--------|-----------|-----|-----|
| RateWater    | Quality of water services                             | 1.729 | .9377088  | 1   | 9   |
| RateRefuse   | Quality of rate refusal removal services              | 2.089 | 1.217637  | 1   | 9   |
| RateElectricity | Quality of electricity supply services              | 1.676 | 1.002849  | 1   | 9   |
| RateToilet   | Quality of toilet/sanitation services                 | 1.805 | 1.043105  | 1   | 9   |
| RateHospital | Quality of local public hospital                     | 2.109 | 1.236232  | 1   | 9   |
| RateClinic   | Quality of local public clinic                       | 2.057 | 1.187887  | 1   | 9   |
| RatePolice   | Quality of police services                           | 1.999 | 1.10803   | 1   | 9   |
| RateSchool   | Importance of education to improve the standard of living of the household | 1.743 | 1.213505  | 1   | 9   |
| Education    | Education level                                      | 1.171 | .4741913  | 1   | 9   |
| Health       | Health access                                        | 1.183 | .4665733  | 1   | 9   |
| LivingConditions | Importance of living conditions to improve the standard of living of the household | 1.207 | .5061563  | 1   | 9   |
| HHAssets     | Importance of Household Assets to Improve the standard of living | 1.232 | .5423362  | 1   | 9   |
| Employment   | Employment status                                    | 1.206 | .534616   | 1   | 9   |
| Safety       | Importance of security to Improve the standard of living | 1.214 | .4979017  | 1   | 9   |
| WaterSource  | Main drinking water source                           | 2.873 | 2.737178  | 1   | 13  |
| Toilet       | Type of toilet in the dwelling                       | 2.770 | 2.328944  | 1   | 10  |
| ElectricityAccess | Household access to electricity                  | 2.560 | 2.125796  | 1   | 9   |
| Refuse       | Number of times refuse is collected                   | 2.702 | 2.001971  | 1   | 7   |
| EnergyCook   | Availability of energy to cook                       | 1.732 | 2.207782  | 1   | 99  |
| AgriAct      | Household agricultural activities                     | 1.824 | .3800848  | 1   | 2   |
| FarmPrc      | Household farm practises                             | 7.284 | 1.901252  | 1   | 8   |
| OwnLivestock | Household livestock ownership                         | 1.890 | .3625061  | 1   | 9   |
| Province     | Province of the household                            | 1.405 | .5601817  | 1   | 3   |
Figure 1. Age by race and geographical location.

Figure 2. Gender and education attendance by race.

Figure 3. Quality of services.
a challenge for many people. Equally, rate of refuse (16%) and water services (18%) were other services where people lacked access. Public service delivery in South Africa has been a challenge considering that there are frequent service delivery protests, with some being violent and vandализation of property.

4.2. CATPCA analysis results

In order to provide a detailed picture on deprivation, we proceed with a principal component analysis to unearth common factors. Variables tend to belong to the same category when there are strongly correlated. Only five factors were retained because the eigenvalues associated with the remaining factors are less than one (see Table 2). One of the most commonly used methods is to exclude any factor with an eigenvalue of below one according to the Kaiser Criterion. Another method is to keep factors with cumulative variance explained by over 60% of factor; overall, the five factors explain over 60% of cumulative variance.

Streiner and Norman (2008) raised the point that factor loadings (components) should satisfy the following four conditions: (i) factor loadings should be close to 1 or zero; (ii) variance should be evenly distributed across retained factors; (iii) factors should be either positive or negative (unipolar); and (iv) each variable should load on one factor. Once these conditions are satisfied, it becomes easy to interpret the component analysis. Applying the criteria stated before, the five factors account for 60% variance with all of them evenly distributed. Factor loadings are negative and positive, with each variable loading on one factor, as well as close to 1 or zero. Thus, satisfying the criteria stated beforehand. According to literature, there are disagreements with the impact of rotating principal components. One side argues that rotation destroys some properties of principal components, in particular, the first rotated component which no longer has maximal variance. On the other hand, it is strongly argued that rotating principal components means that the total variance explained by those components is equal to the variance explained by rotated components. This is particularly the case when an orthogonal rotation is applied because the components are still uncorrelated. Considering the strand of arguments, we performed a principal component analysis using the varimax orthogonal method to ensure robustness of the identified components.

A screen plot in Figure 4 suggested we retain five factors. A mean value of 1 was set as a cut-off point in determining the factors to retain.

The Kaiser-Meyer-Olkin (KMO) measures the sampling adequacy, where values lie between zero and one. According to Kaiser (1974), values lying below 0.69 are said to be mediocre and over 0.80 are meritorious. According to Table 3, the optimal KMO measure for this study was 0.81 and meritorious. This means the data were adequate for a principal component analysis.

Table 4 provides the components that were extracted from the analysis. The first factor seems to be describing amenities of a household, with the toilet condition loading high (0.3954) and refuse (0.4395). At least 54% of the sampled respondents have a toilet connected to a public sewage system, and over 30% of them have a pit latrine toilet. Yet, in terms of refusal collection, 32% of the respondents are doing their own disposal. Nonetheless, refuse collection has been a problem in

| Table 2. Variance decomposition |
|---------------------------------|
| **Component**  | **Variance** | **Difference** | **Proportion** | **Cumulative** |
|-----------------|--------------|---------------|----------------|----------------|
| Amenities       | 3.79522      | .378496       | 0.1650         | 0.1650         |
| Education       | 3.41673      | 1.07758       | 0.1486         | 0.3136         |
| Public Services | 2.33915      | .0323861      | 0.1017         | 0.4153         |
| Economic activity | 2.30676     | .339515       | 0.1003         | 0.5156         |
| Energy          | 1.96725      | .              | 0.0855         | 0.6011         |
Figure 4. Variance decomposition.

Table 3. KMO results

| Variable          | KMO  |
|-------------------|------|
| RateWater         | 0.8707 |
| RateRefuse        | 0.8917 |
| RateElectricity   | 0.7397 |
| RateToilet        | 0.8523 |
| RateHospital      | 0.6987 |
| RateClinic        | 0.6860 |
| RatePolice        | 0.8614 |
| RateSchool        | 0.8486 |
| Education         | 0.8877 |
| Health            | 0.8723 |
| LivingConditions  | 0.8833 |
| HHAssets          | 0.8916 |
| Employment        | 0.8978 |
| Safety            | 0.8933 |
| WaterSource       | 0.9119 |
| Toilet            | 0.8792 |
| ElectricityAccess | 0.7133 |
| Refuse            | 0.8592 |
| EnergyCook        | 0.9008 |
| AgricAct          | 0.6068 |
| FarmPrac          | 0.5813 |
| OwnLivestock      | 0.6548 |
| Province          | 0.8853 |
| Overall           | 0.8086 |
South Africa, in almost every province. Similarly, the water source loaded moderate at 0.3402. Water quality has been under spotlight in the advent of drought since 2015/16. This has increased the vulnerability of households to waterborne diseases.

The second factor seems to be describing education because it addresses basic needs that are a necessity in having a literate nation. Health, safety and living conditions load over 0.4, pointing to their usefulness in influencing education. This factor summarises items whose deprivation may be considered indicators of exclusion from basic necessities needed to achieve optimal education. Consequently, it is important in our analysis as it contributes around 14% of the variance.

The third factor seems to describe the public services received by respondents. The hospital and clinic loaded higher (0.5) compared to school and police services. The loadings are moderate, as lack of these basic services contribute to a poor standard of living. Thus, moderate loadings reveal

| Table 4. CATPCA results |
|-------------------------|
| **Variable** | **Amenities** | **Education** | **Public Services** | **Economic activity** | **Energy** | **Uniqueness** |
| RateWater | 0.3057 | | | | 0.6038 | |
| RateRefuse | 0.3950 | | | | 0.3915 | |
| RateElectr | 0.3034 | | 0.5819 | | 0.2987 | |
| RateToilet | | | 0.5378 | | 0.3279 | |
| RateHospital | | 0.5482 | | | 0.306 | |
| RateClinic | | | 0.4393 | | 0.5345 | |
| RatePolice | | | 0.4087 | | 0.586 | |
| RateSchool | | | | | | |
| EducImport | 0.3890 | | | | 0.4829 | |
| HealthImp | 0.4247 | | | | 0.3842 | |
| LivingCond | 0.4183 | | | | 0.4023 | |
| HHAssetsIm | 0.4045 | | | | 0.4413 | |
| Employment | 0.3997 | | | | 0.455 | |
| SafetyImp | 0.4103 | | | | 0.4204 | |
| WaterSource | 0.3402 | | | | 0.4618 | |
| Toilet | 0.3984 | | | | 0.359 | |
| ElectrAccess | | 0.6376 | | | 0.2304 | |
| Refuse | 0.4395 | | | | 0.2713 | |
| EnergyCook | | 0.4377 | | | 0.5911 | |
| AgricAct | | 0.6248 | | | 0.0799 | |
| FarmProduc | | 0.5791 | | | 0.2591 | |
| OwnLivestock | | 0.4904 | | | 0.398 | |

**Inter factor correlations**

| **Variable** | **Amenities** | **Education** | **Public services** | **Economic activity** | **Energy** |
|-------------|-------------|-------------|-----------------|-----------------|---------|
| Amenities | 0.8224 | 0.2309 | 0.0985 | −0.3533 | 0.3685 |
| Education | −0.1745 | 0.9673 | 0.0268 | 0.1720 | −0.0589 |
| Public services | −0.0492 | −0.0801 | 0.8984 | 0.3668 | 0.2524 |
| Economic activity | 0.2003 | −0.0622 | −0.4148 | 0.7685 | 0.4397 |
| Energy | 0.5007 | −0.0251 | 0.1018 | 0.3670 | −0.7769 |

The orthogonal rotation method was used — loadings are >0.3

South Africa, in almost every province. Similarly, the water source loaded moderate at 0.3402. Water quality has been under spotlight in the advent of drought since 2015/16. This has increased the vulnerability of households to waterborne diseases.
that these services are provided on an average basis, meaning there are instances where there is
depprivation of these services.

The fourth factor seems to describe economic activity. All the three items relate to asset own-
ership, with agriculture activity loading high (0.6248) and farming practice (0.5791). These items
seem to describe economic activity of a household.

The last factor describes accessibility to energy. Given that more than 54% of households in
Africa are energy-deprived, this factor is very important on the basis that it determines household
access to energy. A lack of energy means households spend their time looking for energy than
improving their livelihoods. Three items, namely, “rate of electricity”, which loaded with 0.6376,
meaning that electricity access is above average in South Africa. Yet, “energy to cook” loaded with
0.4377, pointing that in general households have access to energy to cook.

Uniqueness can be said to be the percentage of variance for a variable not explained by
a common factor or simply a measurement error. The higher (0.6 >) the uniqueness, the greater
the chances that it is not explained by the factor. In this case, the majority of variables were below
0.6 suggesting that they properly explain the factors.

We plot component loadings in order to identify how the components are related as shown in
Figure 5. It is evident that variables that were measuring service delivery loaded negative in the
plots suggesting that in certain instances service delivery was below average. Variables, which
loaded positively in components, were mainly to do with economic activity and geographical
location. Component loadings are helpful in identifying variables that are correlated. In short,
variables that are close together have high correlations and those on the opposite side have
negative correlations. Nonetheless, most variables showed some correlation, with the exception
of energy variables that showed negative correlation in almost every component.

Figure 5. Component loadings.

![Component loadings](image-url)
4.3. OLS and the WOLS results

As explained previously, we regress the logarithm of number of livestock as a function of household characteristics using the Community Survey 2016 data. The sample was divided into three strata namely, urban, rural and farm areas for each of the nine provinces in South Africa. Based on the F test which indicated that the coefficients in the three strata were not significantly different from each, there was no need to estimate separate regression models. However, two regression models, namely, OLS and WOLS regression models were performed on the dependent and independent variables as illustrated in Table 5. The R-Squared is significant (Probability of F-value = 0.000) at 1% significance level in both models. This indicates that all the independent variables jointly have a significant effect on the dependent variable. In addition, several diagnostic tests were carried to reduce multicollinearity as explained in the CATPCA model. The urban strata were dropped in the regression analysis on the basis that urban dwellers may or may not have livestock. In both the OLS and WLS model, the dependent variable was the number of livestock owned. Livestock ownership is an indication of agricultural productivity, income generation, and self-subsistence (Batana, 2013; Booysen, Von Maltitz, Van Der Berg, Burger, & Du Rand, 2008).

In both models, the indicators (Amenities, Education, Public services, Economic activity and Energy) were statistically significant at 1% significant level. In terms of gender, females were 5 times less likely to influence household poverty compared to males on the same household; the variable is statistically significant at 1% level. This finding is held by the Department of Women (DoW) (2015), where it was pointed out that there exists a poverty gap between males and females in South Africa. Similar sentiments were echoed by the Human Sciences Research Council (2014) where it found that there were more poor female-headed households than male-headed households, especially in provinces such as Mpumalanga, Free State and KwaZulu Natal.

All the five poverty indicators, namely, Amenities, Education, Public services, Economic activity and Energy—were statistically significant at 1% significance level in both models. In terms of coefficients, they were negative with the exception of Amenities, although the WOLS has high t values compared to the OLS in the stated variables. The interpretation is that a reduction in the education, public services, economic activity, energy and household assets would increase the likelihood of a household being exposed to poverty. Dutta (2015) pointed that low education level leads to lack of formal employment. Thus, households with low education levels are expected to be in a poverty trap.

Meanwhile, a unit increase in amenities decreases poverty by 3%. We added the household assets variable and it was significant at 5% level in the WOLS and not significant in the OLS. The household asset variable has an impact in terms of minimizing the impact of poverty by cushioning households to sell or lease assets to raise income. For instance, households owning farming equipment can lease it out to raise income that can be used for their consumption. Dutta (2015) pointed that poor households rely on single income mainly from agriculture, as a result, in critical situations they end up selling their livestock or land in the long term because of a weak asset base. Consequently, such households mainly in rural areas are exposed to poverty as shown by their lower livestock numbers. Cohen and Saisana (2014) argued that livestock ownership can secure nutritional needs and provide transport for households. This means there is an incentive to keep livestock apart from it being an investment for man households.

In terms of geographical location, there was a negative association between livestock owned and tribal areas in both the OLS and WOLS. The variable was significant at 1% level of significance for the WOLS and at 5% level of significance for the OLS. Suggesting that rural area households had few livestock that can be used to cushion against poverty. In other words, there were more likely to face poverty compared to farm areas. This is particularly the case because whites who own property in form of land and other capital assets residing in farm areas are not in poverty. As a result, the likelihood of them being poor is minimal. Thus, the variable is strongly significant at 1% level of
### Table 5. OLS and WOLS results

|                                | OLS                        | WLS                        |
|--------------------------------|----------------------------|-----------------------------|
|                                | Total livestock            |                            |
| Amenities                      | Coef. 3.0876, Std. Err. .740666 | T 4.17, P > t 0.000***     |
| Education                      | Coef. -1.2458, Std. Err. .317170 | T -3.94, P > t 0.000***    |
| Standard of living             | Coef. -2.469999, Std. Err. .6877512 | T -3.59, P > t 0.000***    |
| Economic activity              | Coef. -6.942623, Std. Err. 1.308372 | T -3.78, P > t 0.000***    |
| Energy                         | Coef. -1.897778, Std. Err. .6017574 | T -3.15, P > t 0.000***    |
| HHassets                       | Coef. -0.0149375, Std. Err. .0142893 | T -1.05, P > t 0.000***    |
| HeadHH_Sex                     |                             |                             |
| Female                         | Coef. -4.101745, Std. Err. .3310655 | T -1.24, P > t 0.026**     |
| Tribal/traditional areas       | Coef. -3.495048, Std. Err. 1.56985 | T -2.23, P > t 0.000***    |
| Farm areas                     | Coef. 18.48452, Std. Err. 13.86553 | T 1.33, P > t 0.183        |
| Female#Tribal/traditional areas| Coef. -2.106746, Std. Err. 1.166577 | T -1.81, P > t 0.071**     |
| Female#Farm areas              | Coef. -25.08716, Std. Err. 16.00337 | T -1.57, P > t 0.117       |
| HeadHH_Derived_PopGroup        |                             |                             |
| Coloured                       | Coef. 1.166358, Std. Err. 1.5947035 | T 1.96, P > t 0.050**      |
| Indian/Asian                   | Coef. .893105, Std. Err. .87576 | T 2.22, P > t 0.027**      |
| White                          | Coef. 2.485116, Std. Err. 2.240023 | T 1.11, P > t 0.268        |
| Other                          | Coef. -1.335415, Std. Err. .5967716 | T -0.22, P > t 0.826       |
| HeadHH_Derived_PopGroup#GeoLocation |                      |                             |
| Coloured#Tribal/traditional areas | Coef. 1.819519, Std. Err. 1.851552 | T 0.98, P > t 0.326        |
|                          | OLS                  | WLS                  |
|--------------------------|----------------------|----------------------|
|                          | Coef. | Std. Err. | T     | P > t | Coef. | Std. Err. | t     | P > t |
| Coloured#Farm areas      | 16,80273 | 17,85497 | 0,94 | 0,347 | Coloured#Farm areas | 10,86,848 | 1,645,281 | 6,61 | 0,000*** |
| Indian/Asian#Tribal/traditional areas | 1,160239 | 1,921417 | 0,60 | 0,546 | Indian/Asian#Tribal/traditional areas | 1,788,794 | 5,597,301 | 0,32 | 0,749 |
| Indian/Asian#Farm areas  | 76,05122 | 85,98735 | 0,88 | 0,377 | Indian/Asian#Farm areas | 30,34694 | 8,54328 | 3,55 | 0,000*** |
| Indian/Asian#Farm areas  | 189,3891 | 118,8422 | 1,59 | 0,111 | Indian/Asian#Farm areas | 143,5144 | 1,333673 | 107,61 | 0,000*** |
| Other#Tribal/traditional areas | -4,367189 | 7,707835 | -0,57 | 0,571 | Other#Tribal/traditional areas | -4,364,202 | 3,031097 | -1,14 | 0,286 |
| Other#Farm areas         | -15,32223 | 10,71617 | -1,43 | 0,153 | Other#Farm areas | -0,042,923 | 0,0038487 | -11,04 | 0,000*** |
| _cons                    | 5,207093 | 1,538925 | 3,43 | 0,001*** | _cons | 6,440565 | 3,462359 | 18,60 | 0,000*** |
significance. Steinert, Cluver, Melendez-Torres, & Vollmer (2016) posit that indeed poverty levels are high in rural families. This reinforces our findings.

Interacting gender with location, we find that females residing in tribal areas/rural areas are more exposed to poverty than males. Both models confirmed this, where the p-value was significant at 10% level of significance for the OLS and at 1% significance level in the WOLS. Yet, females in farm areas were exposed to poverty than their male counterparts in the WOLS and strongly significant at 1% level of significance. Rogan (2016) found evidence that females in South Africa were more exposed to poverty compared to males. This was attributed to discriminatory laws in the labour market, which led to skewed wages in terms of gender. Similarly, Sundaram and Tendulkar (2003) found evidence that households belonging to certain tribes and lower caste have limited assets. The same can be said about African tribes in South Africa, they are the most exposed to poverty. The United Nations Women (2015) points out that, globally, the poor tend to be girls and women because they earn 24% less than males. This has the likelihood of leading to uneven distribution of power in a household. Power imbalances are very evident in rural/tribal areas where cultural roles are biased towards males. As a result, women are the most vulnerable in terms of poverty exposure. Given their exposure to poverty, women face more gender violence because of their overdependency on males (DoW 2015).

In terms of population groups, we note that coloures in farm areas and whites were unlikely to be facing poverty. Both models confirmed this, where the interaction was strongly significant for the WOLS, and not significant for the OLS. The coefficient was statistically significant at 1% level of significance and positive in both models, suggesting that a positive effect on the independent variables is expected to increase the dependent by 5% for the OLS and 6% for the WOLS, and vice versa. The results are consistent with the DoW (2015) in terms of poverty; black Africans were poorer compared to coloures and whites. According to the results in Table 5, whites in farm areas were over 143% better off, with whites staying in tribal areas being 30% better than black Africans and coloures in farm areas 10% better.

We then make a comparison between the OLS and WOLS to find the robust model. The result on the comparison of the robustness of both models is found below.

\[
\begin{align*}
SSR \text{ restricted} & = 9.84 \\
SSR \text{ unrestricted} & = 1.01
\end{align*}
\]

The sum of squares of residuals (SSR) is the residual difference between the actual \( y \) and the predicted \( y \) from the model. Thus, the smaller the SSR, the better the model is. From the data, we can see that after we drop the weight variable, the SSR increases from 1.01 to 9.84, which is an over 800% increase. Therefore, we can conclude that we should keep the variable. Our F statistics is 130.67 and statistically significant at 1% level of significance.

According to Winship and Larry (1994), if the parameter estimates are similar, the OLS is preferred since it produces standard errors that are more efficient. However, in this case the WOLS produces more robust results than the OLS. Thus, we prefer the WOLS to the OLS.

5. Conclusions and recommendations

Poverty remains a major issue among population groups in South Africa and elsewhere sub-Saharan Africa. The findings of the study revealed that in terms of poverty, black Africans and coloures were the major affected. Ethnic and racial differences are said to reinforce ethnic identity by parents who create a boundary between the poor and non-poor. In the process, contributing to racial stereotypes and policing of racial groups boundaries. Consequently, policies meant to address poverty should clearly dissociate poverty from ethnicity and race, to avoid stereotypical views on racial differences. In this paper, we have argued that culture is part of the drive to address poverty in rural areas in South Africa. However, it is often overlooked by
poverty scholarly. Culture often determines which ethnic groups end up in poverty. Therefore, to determine if whether black Africans born in homelands (rural areas) are likely to escape poverty demands that different cultural tools and strategies are utilised than simple determining that certain individuals fall below or above the poverty line. Thus, to understand racial and ethnic disparities amongst groups needs that we break down culture into various components where policy can target. Poverty is seen as self-perpetuating in certain cultural orientations. Therefore, future studies should endeavour to build on the knowledge base on culture. Once a broader understanding of how culture determines households likelihood of escaping poverty, then customised solutions can be adopted to address the problems identified. Unfortunately, current poverty studies rely mainly on quantitative approaches to estimate poverty trends. Although various social and ecological studies have shown that poverty is not a simple game of numbers. It is an endemic driven by certain social constructs, which need various tools. The family behavioural model helps to explain that certain sociologically factors like an altruistic household head can keep a household in generation poverty through unforeseen decisions-making. Something that has been prevalent in numerous ethnicities in the sub-Saharan Africa, where patriarchy is practised with impunity.

Funding
The authors received no direct funding for this research.

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Citation information
Cite this article as: Gender and poverty in South African rural areas, Privilege Cheteni, Yohane Khamfula & Gisele Mah, Cogent Social Sciences (2019), 5: 1586080.

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