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Abstract

Although South Africa is one of the biggest economies in Africa, poverty and income inequality persist and a vast number of households lack access to water and sanitation services. Provincial governments have implemented the Provincial Development and Growth Strategy to improve standards. We evaluate its effects on selected development indicators. Using a generalization of the Difference-in-Differences method, we study the effects on four development indicators: food security, economic well-being, and water and sanitation security. We use secondary data from the General Household Survey, collected between 2002-2017 and conclude that i) the policies improve development indicators; ii) the effects are heterogeneous across racial and geographic distributions of households.

Long-term economic stimulators, such as employment opportunities and education for vulnerable communities, are needed to improve household welfare across the provinces. Programs emanating from these development policies should be ongoing and continuously adapted to fulfill the specific needs of the local groups.

Keywords: *Provincial Development and Growth Strategies; Provincial Poverty Reduction Strategies; development indicators; Difference-in-Differences; Roll-out-of program approach*

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1. Introduction

Most developing countries are battling with poverty eradication and the attainment of economic growth, key points of the Sustainable Development Goals (SDG) adopted by all United Nations member states in 2015 (Kanwar 2006; de Janvry and Sadoulet 2017; Handa et al. 2018). The growing need for poverty alleviation strategies and provision of basic services has pushed governments to create, modify and implement policies to attain targeted goals. One of the largest economies in Africa, the Republic of South Africa (RSA) is a developing country with a three-tier government composed of the national, provincial, and local levels of government, which all have legislative and executive authority. The nine provinces in the country play a key role in carrying out national imperatives, given the different constraints, resource endowments, and population size.

While South Africa is relatively thriving in various development aspects such as a progressive constitution, expansion of industry and finance sectors, and food security at national level, the country is plagued with food insecurity at household level, income inequality, and high unemployment rates, (Francis and Webster, 2019). Shortfalls and backlogs still exist in terms of and lack of access to basic services such as water and sanitation, with previously disadvantaged racial groups and geographic locations lagging (Rhodes and McKenzie 2018). About 20% of South African households had inadequate access to food in 2017 and in 2018, about 11% (6.8 million) of South Africans experienced hunger (StatsSA 2018). The country has one of the highest economic inequalities in the world shown by a Gini Coefficient of 65 in 2015 (StatsSA 2019), including spatial inequality across various dimensions of social deprivation (Cole et al. 2017). Lack of access to water and sanitation poses a danger to health and dignity (Wrisdale et al. 2017) and there remains inequality in terms of water access across geographical areas. Cole et al. (2017) found a water access Gini coefficient of 0.36 with further disparities in terms of food security, which has to be considered from different dimensions (Santeramo, 2015). This has been exacerbated by the spread of households in different settlement areas, trapping the poor households in informal urban and rural areas (Turok 2010).

Efforts by the government ofimproving the livelihoods and developing communities in the country birthed the Provincial Development and Growth Strategies (PGDS)[1] which emanates from the National Medium-Term Strategic Framework. The PGDS is a policy framework geared at the attainment of

[1] The PGDS is a long-term policy framework and not a cash transfer, it provides basis and implementation of development programs within the province. For mor information: http://toolkit.cidb.org.za/Shared%20Documents/PG1-S05%20PGDS%20Guidelines%202005-07.pdf

sustainable and integrated development, that seeks to promote economic growth, development, job creation, and poverty reduction. The strategy provides a framework to coordinate and allocate resources to achieve sustainable development outcomes for citizens at the provincial level. PGDS is implemented through the introduction of various programs targeting local economic development, improving food security, and basic needs provision, amongst other thingsThe implementation of the PGDS provides direction for province-wide development programs and projects, these include poverty alleviation programs such as food gardens, infrastructure rehabilitation, and job-creating initiatives. PGDS implementation takes into consideration of provincial resources, economic, political, and natural resource limitations, and opportunities. Furthermore, it considers the resource, infrastructure, and population needs. The programs and projects emanating from the PGDS differ across the provinces depending on their priorities.

Although the PGDS set to promote sustainable development and growth, local governments are *"faced with the challenge of developing sustainable settlements that will meet the basic needs of local communities and, simultaneously, improve their quality of life and contribute to the growth of the local economy"* (Abrahams 2018,131-145). Plagerson et al. (2019) noted that weak implementation of social development programs has resulted in limiting access to services and in the poor delivery of quality services, adding that weak state capacity to deliver basic and social services has hindered the progress of attaining social policy goals. (Rhodes and McKenzie 2018). Turok (2010) highlighted that the ability and capacity of the provinces to sustainably implement policies are heterogeneous. This has implications for the target beneficiaries, as these disparities in policy implementation could lead to certain groups in society benefitting more, further highlighting the importance of considering inequalities in sustainable development (Cole et al. 2017). These investigations of sub-national inequalities are important for policy planning and sustainable development. Although the PGDS is a wide policy framework, the programs implemented in the provinces emanate from the PGDS.

All provinces have adopted the framework, with common targets of alleviating poverty, improving economic well-being, and basic needs provision. The provincial governments implement the PGDS considering their resource constraints and opportunities, as well as the population needs. As such, the PGDS impact is a reflection of whether the targets have been met and reflect the overall impact of localized programs within the provinces..To this end, this study evaluates the impact of the PGDS on social welfare indicators, food security, economic well-being, water, and sanitation access in South Africa. To the knowledge of the authors, this is the first study to empirically evaluate the impact of PGDS on welfare indicators, thus the paper bears three aims: 1. To evaluate the overall impact of PGDS on

welfare indicators; 2. To evaluate the potential heterogeneity of the impact of PGDS on welfare indicators across population groups and 3. To evaluate the potential heterogeneity of the impact of PGDS on welfare indicators across geographic areas. This is particularly important in the context of South Africa, where citizens belong to different racial groups and are settled in different geographical types across the provinces. In the next section the we review development policy evaluations studies, which gives rise to the adopted empirical methods presented in Section 3. Section 4 discusses the overall and heterogeneous impacts found across social groups, and Section 5 highlights the conclusions and policy recommendations informed bythe results.

2. Review of development policy evaluation studies

Policy impact evaluation has grown popular across the globe in efforts of improving policy-making and implementation, as well as modify policy targets (Matthews, 2021). It is generally described as the examination of the content and implementation of a policy. Additionally, policy evaluation scrutinizes the changes in the well-being of individuals that are brought about by the implementation of a project, program, or policy (Gertler et al. 2016). It should however be noted that, apart from measuring the cause-effect of policies to evaluate failure or success, evaluation is also performed in terms of cost-effectiveness, viability, and acceptability of the stakeholders involved (Ravallion 2008; Maloney and Nayyar 2018). Although in many cases some policies exhibit positive results, some targets are not met and, in some cases, remain possible disincentives for the development of the beneficiaries (Azuara and Marinescu 2013; Garganta and Gasparini 2015; Gutiérrez and Teshima 2016). As such, policies are subjected to refinements or to be entirely halted, thus highlighting the importance of policy evaluation (Resnick et al. 2018).

In general, policymakers devise and implement policy with the expectation of attaining equitable outcomes in society, however, this is not always the case due to social, institutional, and political constraints (Qureshi et al. 2015). In their paper about social exclusion, Hoff and Walsh (2018) emphasize that a phenomenon across the world exists, where certain groups do not fully benefit from public policies for reasons beyond structural and institutional barriers. The groups could be those that are previously disadvantaged or those that exclude themselves. Literature has shown that policy evaluation does exhibit the impact but also reveals the heterogeneity across social groups, income groups, countries, and geographic areas as shown in the literature (Djebbari and Smith, 2008; Dercon,2010; Ravalion, 2011; de Janvry et al.,2010; Hoddinott et al., 2018; Daidone et al., 2019).

Daidone et al (2019) provide evidence from several impact evaluations of government-run cash transfer programs in Sub-Saharan Africa. They used a Difference-in-Difference (DiD) estimator to derive the Average Treatment Effect (ATE) and found that, although cash transfers have positive impacts on livelihoods, they are not adequate to sustainably move households out of poverty. The study also found different impact estimators across countries, which were attributed to factors such as the demographic profile of the beneficiary, program design, and implementation. Using the Random Coefficient Model and the Fréchet–Hoeffding bounds method, Djebbari and Smith (2008) investigated the impact heterogeneity of the Mexican conditional cash transfer program PROGRESA. The study emphasizes that additionally to estimating treatment effects between impacts, the distribution of the impacts is important in evaluating how the program functions. This can be helpful in identifying the inequalities with the population groups, an issue of importance in development programs. The key findings of the study are that variation in impacts exists according to household poverty levels. Similarly, Dercon (2010) evaluated the impact of cash-transfer programs on the livelihoods of beneficiaries with a focus on agricultural activities. And although overall the policies have a positive influence, the study highlights that poverty remains a predominantly rural phenomenon and that the cash transfer programs are not enough to move rural households out of poverty. In contrast, however, de Janvry et al. (2010) noted that after policy efforts for poverty reduction in developing countries, where urban population shifts exist, rural areas contributed more than half the observed aggregate decline in poverty. Daidone et al (2019) noted that households in rural areas face more constraints in generating sustainable livelihoods. Bearing the implication that policy should be altered to meet the needs of different social groups.

The phenomenon of heterogeneity in policy impacts appears to be prevalent across the world. When the heterogeneous effect of policies amongst groups is excluded from the evaluation, their impact is likely to be over or underestimated (Behrman and Hoddinott 2005). It is for this reason that literature suggests that the attainment of food security can be strengthened if social justice is introduced to the design and delivery of policy reforms (Turok 2010). For a developing country, such as South Africa, often short-term strategies such as PPRS are implemented in the form of food safety nets and nutritional programs, whilst longer-term policies such as the PGDS are holistic approaches to improve local economic development, social welfare, and food security. Literature provides evidence of the impact of different types of policies (long-term; short-term, complex, and simple) spanning a wide range of sectors across the globe. As aforementioned, the nine provinces in South Africa have each implemented the PGDS and PRS at different periods and are composed of different proportions of population/racial groups and geotypical distributions. Given these disparities, a holistic policy impact assessment and an evaluation of the

heterogeneous impacts of the policies are presented in this study. The methodological approach followed is presented in the next section.

3. Empirical methods and data

Most policy impact evaluation studies use Randomized Control trials, Propensity Score Matching, among others approaches (Khandker et al, 2010; Gertler et al. 2012)[2]. The DiD is a widely used approach in policy impact analysis (Hoddinot 2009; Janvry et al. 2010; Daidone 2019) and bears a key assumption there is no systematic unobserved time-varying difference between the treatment and control groups that would cause the outcomes for the comparison group and treated group to have different trends over time. This study uses a generalization of the Difference-in-Difference (DiD) technique, the roll-out of a program with panel data to disentangle the impact of Provincial Development and Growth Strategies (PGDS) implemented in a staggered fashion in the nine provinces of RSA.

3.1 Differences-in-differences

The DID estimator allows for the estimation of the Average Treatment Effect (ATE) of the policy. The estimator assesses the differences among treated households (i.e. located in provinces where the policy was implemented) and untreated households (i.e. located in provinces where the policy was not, or not yet, implemented):

$$\Delta Y_i = \alpha + \theta X_i + \varepsilon_i \quad (1)$$

where ΔY_i is the change (first difference) in the development indicator, X_i is a vector of control factors, ε_i is the error term, α measures the changes in intercept, and θ represents the changes associated with the control factors.

The model was used to estimate the effect of the policy in the provinces between the years 2003 and 2004, the period before and after the policy was implemented, and between provinces that implemented the policy and otherwise. Furthermore, a regression model is estimated to evaluate the effect of provinces stopping/or exiting the policy. Most provinces, including EC, FS, GP, NC, and NW paused the implementation during the year 2014. This enables the estimation of the effect in contrast with provinces that continued with the policy. A variable indicating early adopters of the program (equal to 1 if the program is implemented in 2004 and 0 otherwise) was included to establish differences in policy effects between "early" and "late" adopters. The analysis of subsamples of early and later adopters shows if there are differences in the impact of the PGDS on welfare indicators across the two groups.

[2] A different strand of literature, rapidly growing in the agricultural economics literature, focuses on econometric models for observational data (El Benni et al., 2023). For recent applications the interested readers may refer to Bystricky et al. (2023) or Santeramo et al. (2023), amongh other papers collected in the Q-Open Special Issue "*Evidence-based agricultural and food policy – the role of research in policy-making"*.

3.2 Roll-out technique of average treatment effect

Given that all provinces implemented policy during different periods, the roll-out technique has been used to analyze the impact of large-scale policies with provinces progressively implementing the development policies in a staggered roll-out (e.g. Galiani et al 2005; Jensen 2007; de Janvry et al. 2010). This is done by including a full set of dummies for each group and all periods, as well as their interactions. The policy dummy then gives the measurement of the effect of the policy.

The estimated equation is given as:

$$Y_{ipt} = \delta P_{pt} + \sum_{k=1}^{K} \theta^k X_{ipt}^k + \sum_{p=1}^{P} \sum_{t=1}^{T} \mu_{pt} + \varepsilon_{ipt} \qquad (2)$$

where *i*, *p*, *t* index households, provinces, and years. The binary dependent variable (Y_{ipt}) is a function of the treatment variable P_{pt} which is the implementation of PGDS during a period *t* in a given province *p*, and of a set of *k* control factors, X_{ipt}^k, namely age, sex, and population groupX_{ipt}^k; μ_{pt} are time-varying province-fixed effects; δ and $\theta^k$are parameters to be estimated, where δ is the estimate of average effect of policy on development; ε_{ipt} is an error term. P_{pt} equals 1 after the *p*-th province has entered the program (0 before and once its implementation is stopped). Due to the possibility that differences across the provinces, and time-varying factors might be correlated with the dependent variables, time and provincial fixed were included in all estimated models. The fixed effects also account for dynamic variables such as income which could be increasing over time. The inclusion of which, controls for unobserved time-variant variables (Galiani et al. 2005). The model in equation (2) is estimated using different dependent variables, Y_{ipt}, as development indicators: food security, economic wellbeing, sanitation security, and water security.

Although food security is a multi-faceted concept, the variable food insufficiency was used as a proxy for food security (i.e. the outcome of the policy). It is captured by the household's insufficiency of food, with 1 if the household never has insufficient food and 0 otherwise. The same model (equation 2) was estimated, replacing the dependent variable with a household expenditure variable, used as a proxy for economic well-being. According to Statistics SA (2019), a poverty line of R561 ($36.1) per person per month was reported, and by using the average of 3.3 people per household in South Africa, the household expenditure variable was set as a binary variable equal to 1 if a household spends above R1800 ($117.4) per month, and 0 below Additionally, water, and sanitation access were used as proxies for water and sanitation security, respectively. Water security is represented by the distance between the household and the main water source, and is a binary variable, where 1 is if the water source is less than 200 meters from

the household, and 0 otherwise. Sanitation security is also a binary variable representing how far the main toilet is from the household, where 1 is less than 50 meters and 0, is otherwise. The farther the distance from water or sanitation source, the harder the access: when it takes more time to collect water or to use the toilets, households are likely to be water and/or sanitation insecure (Anderson and Hagos, 2008; Warner et al. 2008; Foute and Sikod, 2012; Pickering and Davis, 2012). The distance to sources has been conventionally used in welfare studies to measure access and studies highlight that distance to water source is one of the main indicators of water poverty and scarcity (Ngasala et al. 2018; Nonkeou et al. 2022). Statistics South Africa presents water and sanitation access in the GHS as category variables with 5 classes ranging from less than 50 meters to more than 500 meters. To fairly distribute cases and improve variation for analysis, we transformed the variable into a binary one. The binary variables have been used as proxies for water and sanitation security. The implementation of the Provincial Poverty Reduction Strategy (PPRS) was included as a control factor in the regressions as it was at times implemented alongside the PGDS across the provinces. The PPRS is designed to promote the empowerment and development of poor communities through poverty alleviation projects (Mensah and Benedict, 2010).

The indicators chosen for the study makeup two of the United Nations' Sustainable Development Goals (SDGs) (Goals 1 and 6). Water scarcity and inadequate sanitation have also been linked to adverse effects on food security (Le Blanc 2015) and together with poverty reduction, are indicators that the development policies in South Africa aim to improve. As such, the hypothesis tested is if PGDS influences social welfare indicators food security and economic well-being, water, and sanitation security. Considering that PGDS is a long-term policy, including two years as in the DiD estimations might understate or overstate the effect. Including all years may also pose an estimation problem, given that some provinces halt the implementation, to resume at a later stage. For sensitivity analysis, regressions were estimated to evaluate the impact, in the first year of implementation, and each five years after, i.e. 2004; 2009, and 2014. This enables dissemination of policy impacts over time and would indicate if the impact increases or decreases.

3.3 Capturing heterogeneity in policy development impacts

Drawing from the literature, Ruben and Pender (2004) suggest that "one-size-fits-all" policies are not adequate to address developmental issues and that developmental strategy should be accompanied by measures that will yield sustainable growth and development for beneficiaries. Furthermore, after 25 years of democracy, South Africa is still plagued with income inequality, particularly among racial groups. The South African population is made up of four main racial groups, namely African, Indian/Asian, White, and Coloured. The name "Coloured" refers to a legal name designated for a group of

heterogeneous people who are of mixed ancestry in Southern Africa. Salisbury (2016) highlighted that there exists a large portion of earnings differentials of about 34 and 42 percent, driven by the "labor market's lower valuation of African and Coloured worker's productive characteristics" thus, making the two population groups more likely to be food insecure.

Additionally, the spatial distribution of households in South Africa has been considered in various development studies (Maseko et al. 2015; Naicker et al. 2015), where the emphasis has been put on in-depth analysis of development at localized levels. As such, this analysis considers the potential heterogeneous effects of the policies between different racial groups and geographical areas, using policy interaction effects. This included racial group and policy interaction variables in the estimation to compare the impacts across the groups, the same was done for geographic areas. For ease of interpretation, an Ordinary Least Squares Regression was used to estimate the effects of policy. In estimating the effect of PGDS, PPRS was used as a control factor in the analysis, as its omission would yield biased estimates, possibly overstating or understating the effect.

3.4 Data description

The study uses data from the annual General Household Survey (GHS) in South Africa throughout 2002-2017. The GHS is a cross-sectional survey, conducted annually, since 2002. The survey questions are designed to collect information on service delivery and living conditions and cover a range of broad (StatsSA, 2019). More than 20,000 households were included in the surveys each year, across the nine provinces, namely Western Cape (WC), Northern Cape (NC), Eastern Cape (EC), Free State (FS), KwaZulu-Natal (KZN), North-West (NW), Gauteng (GP) Mpumalanga (MP) and Limpopo (L). The comprehensive dataset portrays a pseudo-panel, as the individual datasets do not necessarily contain information about the same individuals across the years. Given that the PGDS is implemented at the Provincial level, the GHS is suitable because it includes households dispersed across and within the provinces, evading selection bias. The data was supplemented with information about the implementation of Provincial Development and Growth Strategies (PGDS) and Provincial Poverty Reduction Strategies (PPRS), from the provincial government's public documents. The following section presents the descriptive statistic as well as the empirical findings of the study.

4. Results and Discussion

4.1 Descriptive statistics

Table 1 presents the descriptive statistics of development indicators included in the empirical models. The results show that 76.60% of the household never have insufficient food while about 46.76% of the households reported that they are above the poverty line. About 11.30% of households have their toilets positioned over 50m from the house, while 49.93% of the households have their water source within 200m from the house. In addition, the distribution of development indicators across geographic areas and racial groups is shown.

Table 1. Descriptive statistics of development indicators across the population and geographic groups.

Variables	**Description**	**Population Group (%)**				
		African	Coloured	Indian/Asian	White	Total
Food security	0; Food insecure	88.89	7.73	0.9	2.48	23.4
	1; Food secure	75.51	11.09	2.54	10.89	76.6
Economic wellbeing	0; <R1800	56.2	45.82	24.62	16.48	52.4
	1> R1800	43.8	54.18	75.38	83.52	47.6
Water Secure	0; >200m	50.61	34.65	46.69	42.39	50.07
	1; <200m	49.39	65.35	53.31	57.61	49.93
Sanitation Secure	0; >50m	11.7	5.02	10.94	7.75	11.3
	1; <50m	88.3	94.98	89.06	92.25	88.7
Variables	**Description**	**Geographic area (%)**				
		Urban	Urban Informal	Rural	Tribal	Total
Food security	0; Food insecure	42.24	13.28	34.95	5.53	23.4
	1; Food secure	57.13	10.82	25.12	6.92	76.6
Economic wellbeing	0; <R1800	42.47	42.42	67	72.06	52.68
	1; >R1800	57.53	52.58	33	27.94	47.32
Water Secure	0; >200m	34.77	42.79	57.02	42.97	50.09
	1; <200m	65.23	57.21	42.98	57.03	49.91
Sanitation Secure	0; >50m	6.48	11.92	14.12	13.85	11.27
	1; <50m	93.52	88.08	85.88	86.15	88.73

The results show the proportion of households that are water and sanitation secure, as well as those who live above the poverty line (economic well-being), across the different racial and geographic groups. The results indicate that 83.52% and 75.38 % of white and Indian households, respectively, live above the

poverty line, with only 43.8 and 54.2 African and Coloured households, respectively, living above the line. Coloured households have the less percentage of households who have access to water and sanitation (34.6% and 5.02%). The bulk of the households that have less water and toilet access is based in rural areas, while tribal households have the least percentage of households that spend above the poverty line (27.94%).

4.2 Empirical results

Difference-in-Difference approach

Table 2 presents the regression results of the DiD. The results indicate an improvement in household food security and economic well-being after the policies have been implemented, however, no improvement in sanitation access and a negative impact on water access. This contradicts the expectation that the policy would enhance water security. Given the short time between pre and post-policy, it is highly unlikely that long-term structural improvements, such as toilets and water access, would be significantly improved. As such, further analysis that differentiates across geotypes is included in the upcoming subsections to differentiate the impacts. In contrast, food expenditure and sufficiency, that are relatively more attainable goals in the short-run, were improved after the implementation of the PGDS.

Table 2. Regression results of the relationship between food insecurity and Provincial Growth and Development Strategies (PGDS) between 2003/2004.

	Contingent variables		**Structural Variables**	
Variables	Food security	Economic wellbeing	Water security	Sanitation security
PGDS entry	0.07***	0.02**	-0.1**	0.01
	(0.01)	(0.01)	(0.04)	(0.01)
Control Factors	Yes	Yes	Yes	Yes
Constant	0.64***	-0.08***	0.7***	0.85**
	(0.01)	(0.01)	(0.05)	(0.04)
Fixed effects	Yes	Yes	Yes	Yes
Observations	373,435	346,563	101,818	106,470

Notes: ***Significant at the 1% confidence level, Standard error in parenthesis

Provincial and time-fixed effects are included.

Control Factors: Sex, age, population group, PPRS.

For sensitivity analysis, a regression model is estimated to evaluate the effect of provinces stopping/ or exiting the policy. Most provinces, EC, FS, GP, NC, and NW terminated the implementation during the year 2014. This enables the estimation of the effect in contrast with provinces that continued with the

policy. The results, presented in Table 3, indicate that food security declines for households in which provinces have exited, however economic well-being and water security continue to improve for households in provinces that stopped the policy. This indicates that food security is on average more contingent on the policy, such that there could be a decline if the policy ceases to continue. Furthermore, water infrastructure is long-lasting, and once it has been improved, whether a province pauses policy implementation or not, it is unlikely to change. In addition, if the exit variable positively affects water security,this could also be an indication that water security is on average on not dependent on the implementation of the PGDS. The coefficient estimate indicates an improvement in food security for early adopters, which could be an indicator that the early adopters possibly gain resilience (in terms of food security) throughout the years, and that long-term implementation of policy is beneficial.

Table 3. Regression results of the relationship of ceasing the Provincial Growth and Development Strategies (PGDS) between 2014/2015.

	Contingent variables		**Structural Variables**	
Variables	Food security	Economic wellbeing	Water security	Sanitation security
PGDSexit	-0.13***	0.05***	0.46***	-0.22
	(0.01)	(0.01)	(0.04)	(0.2)
Early adopters	0.21***	-0.07***	-0.54***	0.21
	(0.01)	(0.02)	(0.06)	(0.2)
Control Factors	Yes	Yes	Yes	Yes
Constant	0.82***	0.5***	0.7***	0.47***
	(0.01)	(0.01)	(0.05)	(0.02)
Fixed effects	Yes	Yes	Yes	Yes
Observations	50485	36709	11956	1155

Notes: ***Significant at the 1% confidence level, Standard error in parenthesis.

Provincial and time-fixed effects are included.

Control Factors: Sex, age, population group, PPRS.

The negative effect on water security for early adopters shows that provinces that implemented early, largely those with a higher number of households based in rural and informal settlements, still have a long way to go in providing water security. For instance, in the Eastern Cape province, one of the early adopters, Hay et al. (2012) noted that water supply infrastructure cannot meet water requirements and towns experience shortfalls. Furthermore, StatsSA (2017) revealed that only 74,2% of households in the Eastern Cape, which is less than the national average of 84% have access to water, so although they adopted policy early, the provinces still lag in terms of water access. Another justification is that in 2008, the Department of Water Affairs intensified water reforms throughout the country to develop water reconciliation strategies (*ibid*, 2012), these would be relatively more easily integrated into projects which

provinces that adopted later are undertaking. There were no significant policy impacts on sanitation security in the estimated model.

Roll-out of program technique regression

A roll-out technique regression method was then estimated to evaluate the impact of the policy between 2002 and 2017. This gives the average effect of the policy given that provinces implemented it during different periods. The Provincial Poverty Reduction Strategy (PPRS) was also included in the model as a control factor as it was a strategy that was concurrently adopted across the provinces throughout the years. Table 4 shows that food security, economic well-being, and sanitation security improved after the implementation of PGDS. However, a negative effect is found on water security. This shows that PGDS have generally been effective in tackling development indicators.

Table 4. Regression results of the relationship between food insecurity and Provincial Growth and Development Strategies (PGDS).

	Contingent variables		**Structural Variables**	
Variables	Food security	Economic wellbeing	Water security	Sanitation security
PGDS	0.06***	0.02**	-0.2***	0.06***
	(0.01)	(0.01)	(0.04)	(0.01)
PPRS	0.2***	0.67***	0.33***	-0.51***
	(0.01)	(0.01)	(0.04)	(0.06)
Control Factors	Yes	Yes	Yes	Yes
Constant	0.65***	-0.14***	0.85***	0.85**
	(0.01)	(0.01)	(0.02)	(0.04)
Fixed effects	Yes	Yes	Yes	Yes
Observations	373,435	346,563	101,818	106,470

Notes***Significant at the 1% confidence level, Standard error in parenthesis.

Provincial and time-fixed effects are included.

Control Factors: Sex, age, population group.

4.2.2. Time dimension of development policy effects

For sensitivity analysis, regressions were estimated to evaluate the impact, in the first year of implementation, and each five years after, i.e. 2004; 2009, and 2014. This enables dissemination of policy impacts over time and would indicate if the impact increases or decreases over time. The results in Table 5 indicate that the impact of PGDS on food security increases over time, moving from 0.08 in 2004, to 0.2 after 10 years of implementation, a 150% increase in the average impact. This also applies to economic well-being, although there is a slight decrease after 2009. In 2004, PGDS positively impacted water

security, however, had the opposite effect 10 years later. The impact on sanitation security was constant between 2004 and 2009.

Table 5. Regression results of the periodic impacts of PGDS on development indicators.

	Year		
Indicator Variable	**2004**	**2009**	**2014**
Food Security	0.08*** (0.01)	0.16***(0.01)	0.2*** (0.01)
Economic Wellbeing	0.01 (0.01)	0.07***(0.01)	0.06*** (0.01)
Water Security	0.2***(0.02)	-0.24*** (0.04)	-0.24***(0.04)
Sanitation Security	0.05*** (0.01)	0.05***(0.01)	0.03(0.04)

Notes: ***, **,*=Significant at the 1%, 5%, and 1% confidence level, respectively. Standard error in parenthesis

Provincial and time-fixed effects are included. Control Factors: PPRS, sex, age, population group.

This shows that PGDS has a positive effect on food security and well-being and that the continuation of implementation could help strengthen the resilience of South African households in terms of these indicators.

4.2.3. Heterogeneous effects of development policies

Table 6 presents regression results of the average effect of PGDS while considering the interaction effects of Policy and race. Salisbury (2016) highlighted that there exists a large portion of earnings differentials amongst racial groups. This is consistent with the findings of this study where results show a positive average effect of the PGDS on food security, with significantly higher effects for white households and slightly lower for coloured[3] households. The results indicate that African households benefit less in terms of all the development indicators. Consistent with the findings of StatsSA report on livelihoods (2019), showing an increase in inequality amongst African and white households. Whilst both Policy variables individually improve food security, the results generally show they, on average, have a higher impact on white households, highlighting the heterogeneity. In this model, PGDS generally does not improve economic well-being, but the opposite is true for white households. The policy generally does not have a positive effect on water and sanitation security.

Table 6. Regression results of the relationship between food insecurity and PGDS and the PPRS across racial groups.

	Contingent		**Structural**	
VARIABLES	Food security	Economic wellbeing	Water security	Sanitation security
PGDS	0.12***	-0.05***	-0.06	0.09***
	(0.01)	(0.01)	(0.05)	(0.02)
PGDS _african	-0.14***	-0.14***	-0.14***	-0.04***
	(0.01)	(0.01)	(0.04)	(0.01)
PGDS _white	0.08***	0.46***	-0.16***	-0.14**
	(0.01)	(0.01)	(0.05)	(0.06)
PGDS _indian	-	-	-	-
PGDS _coloured	0.03*	0.27***	0.2	-0.08
	(0.02)	(0.02)	(0.33)	(0.1)
PPRS	0.12***	0.46***	-0.34***	-0.52***
	(0.01)	(0.01)	(0.04)	(0.06)
Constant	0.8***	-0.15***	0.86***	0.87
	(0.01)	(0.01)	(0.04)	(0.01)
Control factors	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Observations	398,439	346563	101,818	106,470

Notes:***, **,*=Significant at the 1%, 5%, and 1% confidence level, respectively. Standard error in parenthesis. The PGDS_indian was omitted due to collinearity.

Provincial and time-fixed effects are included.

Control Factors: Sex, age.

Table 7 presents the average effect of policy considering the interaction of policy and the geographic location of the household. The spatial distribution of households in South Africa has been considered in various development studies (Maseko et al. 2015; Naicker et al. 2015), where the emphasis has been put on in-depth analysis of development at localized levels. The results show that PGDS positively impacts food security, with different effects across geographic types. Households in urban and tribal areas are on average more food secure as compared to those in urban informal settlements and those in rural areas.

Food security and economic well-being are shown to improve after the implementation of the policy, but not for households in rural and informal settlements. The results are consistent with previously mentioned studies, which highlight the plight of urban informal settlements where poverty levels are higher. This can

be grounded based on these households being at the bottom of the social ladder and also bearing characteristics that impede upward mobility (Turok 2010).

Table 7. Regression results of the relationship between food insecurity and (PGDS) (P1) across geographic groups.

	Contingent variables		**Structural variables**	
VARIABLES	Food security	Economic wellbeing	Water security	Sanitation security
PGDS 1	0.27***	0.2**	-0.68***	-0.08
	(0.1)	(0.01)	(0.17)	(0.1)
PGDS _urban	-0.13	-0.06	0.78***	0.2**
	(0.1)	(0.1)	(0.17)	(0.1)
PGDS_urban informal	-0.24**	-0.2**	0.76***	0.18**
	(0.1)	(0.01)	(0.17)	(0.1)
PGDS _rural	-0.25***	-0.22**	0.46***	0.14
	(0.1)	(0.1)	(0.17)	(0.1)
PGDS _tribal	-0.11	0.2**	0.57	0.11
	(0.1)	(0.1)	(0.17)	(0.1)
PPRS	0.2***	0.67***	-0.33***	-0.51***
	(0.01)	(0.01)	(0.04)	(0.06)
Constant	0.65***	-0.14	0.85***	0.82***
	(0.01)	(0.01)	(0.04)	(0.01)
Control factors	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Observations	398,439	346,563	101,818	106,470

Notes:***, **,*=Significant at the 1%, 5%, and 1% confidence level, respectively.Standard error in parenthesis.

Provincial and time-fixed effects are included.

Control Factors: Sex, age.

In contrast, the PGDS has positive impacts on water and sanitation security for households in rural and informal settlements. These are areas where interventions are needed most, and the results indicate that in these terms. Rhodes and McKenzie (2018), noted that rural households are worse off in terms of water access, due to infrastructural, and technical constraints, as well as poor service delivery in these areas, however, the implementation of PGDS over time seems effective in improving access to both water and sanitation. The significant positive estimate can also be attributed to the fact that rural and informal settlement households start on a lower base than their geographic counterparts, as such it is expected for

the impact to be higher. Sanitation access has improved in urban and urban informal areas after the implementation of PGDS.

5. Conclusions and recommendations

The Provincial Growth and Development Strategies (PGDS) is a policy framework adopted by provinces in South Africa, to improve the social well-being of citizens. This study focuses on the impact of the broader, long-term PGDS on development indicators and the potential heterogeneity of the impact across social groups, using DID and the Roll-out-of program approach. We found that the policy generally has a positive average effect on food security and economic well-being. The impact is higher after years of implementation have increased i.e. 2004 vs. 2014: the prolonged implementation has benefits for the households of South Africa. Hoff and Walsh (2018) highlighted that certain groups might not benefit from public policies for reasons beyond structural and institutional barriers and added that groups could be those that are previously disadvantaged or those that exclude themselves. This is consistent with the findings of this study: heterogeneous effects exist across racial groups, with African and Colored households, previously disadvantaged groups in South Africa, benefitting the least. The findings are also consistent with Salisbury (2016), who highlighted earnings differentials amongst racial groups, with non-white groups earning relatively less than their white counterparts. Rhodes and McKenzie (2018) also found that African households are worse off in terms of water and sanitation access. In addition, we show that the differential impacts are evident across geographic types, insofar households in informal settlements and rural areas benefit less.. We also found positive impacts of the PGDS on water security for selected geographical types. However, the average (overall) impact tend to be e negative impact, calling for further interventions on water security. In general, this shows that the policy should continuously be adapted to benefit all racial and geographic groups across the country, according to needs and basis. This can be done in putting emphasis on long-term economic stimulators such as education and health, particularly for the PGDS. The transfer of human capital in rural areas for the sustainable delivery of services, is needed. Efforts should be put into empowering households in informal settlements and rural areas, which are areas of historical neglect, primarily occupied by Africans and Coloured households, two racial groups that bear the lowest average effect of the policy. Furthermore, solutions such as the creation of employment opportunities in rural and informal settlements need to be at the forefront of policy to improve food security in these areas. The continuation of combining short and long-term strategies with programs with inter-linkages and synergies on targets is recommended to target broader social welfare issues (Outlook 2011; Turok 2010; Dredge 2015; Mamoon and Rabbi 2017).

A shortcoming of this study is that the data used is a pseudo-panel, as such a generalized average effect is estimated. Due to the policy being implemented by the provincial government, and the broad nature of the policies, it is not possible to have a clear control and treatment group within the provinces, even though not all households in the treated provinces could have benefited from the programs that emanate from these policies. Nonetheless, the study provides a benchmark for further studies based on more refined data. Future research should focus on specific programs. and on different aspects of food, water and energy security. Furthermore, individual provincial estimates could shed light on which provinces need to improve the provision of basic services and the enhancement of food security and well-being. This can help in the formulation of relevant context-specific interventions. The study calls for future research on the impacts of policy interventions on the WEFE nexus, to plan effective (and synergic) interventions.

References

Abrahams Diane. 2018. “Local Economic Development in South Africa: A Useful Tool for Sustainable Development”. In *Local Economic Development in the Changing World*, edited by Christian Rogerson, 131-145. Routledge.

Anderson, E., & Hagos, F. (2008). Economic impacts of access to water and sanitation in Ethiopia: Evidence from the welfare monitoring surveys. *University of East Anglia, International Water Management Institute*.

Azuara Oliver and Ioana Marinescu. 2013. "Informality and the expansion of social protection programs: Evidence from Mexico, " *Journal of Health Economics,* 32(5):938-950.

Banerjee Abhijit V., Rema Hanna, Gabriel E. Kreindler and Benjamin A. Olken. 2017. "Debunking the Stereotype of the Lazy Welfare Recipient: Evidence from Cash Transfer Programs," *The World Bank Research Observer* 32 (2): 155-184.

Behrman Jere R. and John Hoddinott. 2005. "Program Evaluation with Unobserved Heterogeneity and Selective Implementation: The Mexican PROGRESA Impact on Child Nutrition," *Oxford Bulletin of Economics and Statistics* 67 (4): 547-569.

Bystricky, M., Bretscher, D., Schori, F., Mack, G. (2023). “Reducing feed-food competition with direct payments? An ex-ante assessment of economic and environmental impacts”. Q Open

Chaudhury Nazmul, Jed Friedman and Junko Onishi. 2013. "Philippines Conditional Cash Transfer Program Impact Evaluation" *Manila: World Bank Report* 75533-PH.

Cole Megan, Richard Bailey, James Cullis and Mark New. 2017. "Spatial Inequality in Water Access and Water Use in South Africa," *Water Policy* 20 (1): 37-52.

Cole Megan, Richard Bailey and Mark New. 2017. “Spatial Variability in Sustainable Development Trajectories in South Africa: Provincial Level Safe and Just Operating Spaces”. *Sustainability Science* 12(5):829-848.

Daidone Silvio, Benjamin Davis, Sudhanshu Handa and Paul Winters. 2019. "The Household and Individual-Level Productive Impacts of Cash Transfer Programs in Sub-Saharan Africa," *American Journal of Agricultural Economics* 101 (5):1–31.

De Groot Richard, Sudhanshu Handa, Michael Park, Robert Osei Darko, Isaac Osei-Akoto, Garima Bhalla, and Luigi Peter Ragno. 2015. "Heterogeneous Impacts of an Unconditional Cash Transfer Program on Schooling: Evidence from the Ghana LEAP Program." *UNICEF Office of Research–Innocenti Working Paper WP-2015-10*.

de Janvry Alainand and Sadoulet Elizabeth. 2010. “Agricultural Growth and Poverty Reduction: Additional Evidence,” *The World Bank Research Observer*, 25 (1):1–20.

de Janvry Alain and Sadoulet Elizabeth. 2017. "*Achieving the Sustainable Development Goal on Poverty Eradication"*. No. P190. Foundation for Studies and Research on International Development (FERDI).

de Janvry Alain, Craig McIntosh and Elisabeth Sadoulet. 2010. "The Supply-and Demand-Side Impacts Of Credit Market Information," *Journal of Development Economics* 93(2):173-188.

Dercon Stefan. 2009. "Rural poverty: Old challenges in New Contexts," *The World Bank Research Observer* 24 (1): 1-28.

Devereux Stephen. 2016. "Social Protection for Enhanced Food Security in Sub-Saharan Africa," *Food Policy* 60: 52-62.

Djebbari Habiba and Jeffrey Smith. 2008. "Heterogeneous Impacts in PROGRESA," *Journal of Econometrics* 145(1-2): 64-80.

Dredge Dianne. 2015. "Short-term versus Long-term Approaches to the Development of Tourism-related Policies," *A review of effective policies for tourism growth, OECD Tourism Papers* 1 (2015): 375-384.

Eberhard-Ruiz Andreas and Alexander Moradi. 2019. "Regional Market Integration in East Africa: Local but no Regional Effects?" *Journal of Development Economics* 140:255-268.

El Benni, N., Grovermann, C., & Finger, R. (2023). Towards more evidence-based agricultural and food policies. *Q Open*, qoad003.

Fotue, L. A. T., & Sikod, F. (2012). Determinants of the households' choice of drinking water source in Cameroon. *Journal of sustainable Development in Africa*, *14*(3), 86-97.

Francis, D., & Webster, E. (2019). Poverty and inequality in South Africa: critical reflections. *Development Southern Africa*, *36*(6), 788-802.

Galiani Sebastian, Paul Gertler, and Ernesto Schargrodsky. 2005. "Water for life: The Impact of the Privatization of Water Services on Child Mortality," *Journal of Political Economy* 113 (1):83-120.

Garganta Santiago and Leonardo Gasparini. 2015. "The Impact of a Social Program on Labor Informality: The Case Of AUH in Argentina," *Journal of Development Economics* 115:99-110.

Gertler Paul, Sebastian Martinez, Patrick Premand, Laura Rawlings and Christel Vermeersch. (2016). *Impact Evaluation in Practice*. The World Bank:1-30.

Gertler Paul, Martinez Sebastian and Rubio-Codina. 2012. "Investing Cash Transfers to Raise Long Term Living Standards," *American Economic Journal: Applied Economics* 4: 164–92.

Gutiérrez Emilio and Kensuke Teshima. 2016. "Does Household Financial Access Facilitate Law Compliance? Evidence from Mexico," *Economics Letters* 149: 120-124.

Handa Sudhanshu, Silvio Daidone, Amber Peterman, Benjamin Davis, Audrey Pereira, Tia Palermo, and Jennifer Yablonski.2018. "Myth-busting? Confronting Six Common Perceptions About Unconditional Cash Transfers as a Poverty Reduction Strategy in Africa," *The World Bank Research Observer* 33(2): 259-298.

Hay E, Riemann K, Van Zyl G and Thompson I. 2012. “Ensuring Water Supply for all Towns And Villages in the Eastern Cape and Western Cape Provinces of South Africa,” *Water SA* 38(3), 437-444.

Hoddinott John, Susanna Sandström and Joanna Upton. 2018. "The Impact of Cash and Food Transfers: Evidence From A Randomized Intervention In Niger," *American Journal of Agricultural Economics* 100 (4): 1032-1049.

Jensen R. 2007. “The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector,” *The Quarterly Journal of Economics* 122(3): 879-924.

Hoff K. and Walsh, J. 2018. “The Whys of Social Exclusion: Insights From Behavioral Economics,” *The World Bank Research Observer* 33(1): 1–33.

Le Blanc D. 2015. “Towards Integration at Last? The Sustainable Development Goals as a Network of Targets,” *Sustainable Development* 23(3): 176-187.

Maloney William F and Nayyar Gaurav. 2018. “Industrial Policy, Information, and Government Capacity,” *The World Bank Research Observer* 33(2): 189-217.

Matthews, A. (2021). The contribution of research to agricultural policy in Europe. Bio-based and Applied Economics, 10(3), 185-205.

McKenzie D.. 2017. “How Effective Are Active Labor Market Policies in Developing Countries? A Critical Review of Recent Evidence,” *World Bank Research Observer (*32):127–154.

Mensah, S. A., & Benedict, E. (2010). Entrepreneurship training and poverty alleviation: Empowering the poor in the Eastern Free State of South Africa. *African Journal of Economic and Management Studies*. 1 (2): 138-163.

Naicker Nisha, Mathee Angie and Teare June. 2015. “Food Insecurity in Households in Informal Settlements in Urban South Africa,” *South African Medical Journal* 105 (4): 268-270.

Ngasala, T. M., Masten, S. J., Phanikumar, M. S., & Mwita, E. J. (2018). Analysis of water security and source preferences in rural Tanzania. *Journal of Water, Sanitation and Hygiene for Development*, *8*(3), 439-448.

Nounkeu, C. D., Metapi, Y. D., Ouabo, F. K., Kamguem, A. S. T., Nono, B., Azza, N., ... & Kuate, D. (2022). Assessment of drinking water access and household water insecurity: A cross sectional study in three rural communities of the Menoua division, West Cameroon. *PLOS Water*, *1*(8), e0000029.

Omotilewa Oluwatoba, Jacob Ricker-Gilbert and John Herbert Ainembabazi. 2019. "Subsidies for Agricultural Technology Adoption: Evidence From A Randomized Experiment with Improved Grain Storage Bags in Uganda," *American Journal of Agricultural Economics* 101(3): 753-772.

Outlook. 2011. Medium and Long-term Developments: Challenges and Risks. *OECD Economic Outlook* (2011).

Pickering, A. J., & Davis, J. (2012). Freshwater availability and water fetching distance affect child health in sub-Saharan Africa. *Environmental science & technology*, *46*(4), 2391-2397.

Plagerson Sophie, Leila Patel, Tessa Hochfeld and Marianne S. Ulriksen.2019. "Social Policy in South Africa: Navigating the Route to Social Development," *World Development* 113: 1-9.

Qureshi Ejaz, Dixon, John and Wood Melissa. 2015. "Public Policies for Improving Food and Nutrition Security at Different Scales," *Food Security*, 7(2): 393-403.

Mamoon Dawood and Muhammad Rabbi Ahsan. 2017. "Short term Versus Long Term Economic Planning in Pakistan: The Dilemma," *Journal of Economics Library* 4 (1): 30-40.

Ravallion Martin. 2008. "*Evaluation in The Practice of Development,*" *The World Bank Research Observer* 24 (1): 29–53.

Resnick Danielle, Steven Haggblade, Suresh Babu, Sheryl Hendriks and David Mather. 2018. "The Kaleidoscope Model of Policy Change: Applications To Food Security Policy In Zambia," *World Development* 109: 101-120.

Rhodes Bruce and McKenzie Tamlyn. 2018. "To What Extent Does Socio-Economic Status Still Affect Household Access to Water And Sanitation Services in South Africa?" *Journal of Economic and Financial Sciences 11*(1): 1-9.

Ruben Ruerd and Pender John. 2004. "Rural Diversity And Heterogeneity In Less-Favoured Areas: The Quest For Policy Targeting," *Food Policy 29*(4): 303-320.

Sachs Jeffrey. 2016. "The Age of Sustainable Development**."** *American Journal of Agricultural Economics 98 (2)*: 667–669.

Salisbury Taylor. 2016. "Education and Inequality in South Africa: Returns to Schooling In The Post-Apartheid Era," *International Journal of Educational Development* 46: 43-52.

Santeramo, F. G. (2015). "Food security composite indices: implications for policy and practice". Development in Practice, 25(4), 594-600.

Santeramo, F.G., Russo, I., Lamonaca, E. (2023). "Italian subsidised crop insurance: What the role of policy change". Q Open

Statistics South Africa (StatsSA) (2018). Community Survey 2017: Agricultural households. Statistics South Africa Report.

Statistics South Africa (2019). Inequality Trends in South Africa: A Multidimensional Diagnostic of Inequality, 2017. Statistics SA Report

Sunil Kanwar. 2006. "Globalization and the Developing Countries: Emerging Strategies for Rural Development and Poverty Alleviation," *American Journal of Agricultural Economics* 88 (1): 274–277.

Teresa Molina Millán, Tania Barham, Karen Macours, John A. Maluccio and Marco Stampini. 2019. "Long-Term Impacts of Conditional Cash Transfers: Review of the Evidence," *World Bank Research Observer* 34(1):119-159.

The Department of Local Government (DLG), South Africa.2005. Provincial Growth and Development Strategy Guidelines.

Turok Ivan. 2010. "Towards a Developmental State? Provincial Economic Policy in South Africa," *Development Southern Africa* 27(4): 497-515.

Warner, N. R., Levy, J., Harpp, K., & Farruggia, F. (2008). Drinking water quality in Nepal's Kathmandu Valley: a survey and assessment of selected controlling site characteristics. *Hydrogeology Journal*, *16*, 321-334.

Wrisdale, Laura, Matodzi Michael Mokoena, Lutendo Sylvia Mudau, and Jo-Anne Geere. "Factors that impact on access to water and sanitation for older adults and people with disability in rural South Africa: An occupational justice perspective." *Journal of Occupational Science* 24, no. 3 (2017): 259-279.

Notes

1. In this paper, cash transfer programs are considered as short-term policies, although the provision may last up to several years, the provision of transfers is relatively contingent compared to structural interventions and reforms.
2. Water Security given by 1 if distance between household and main water source is less than 200m and 0 otherwise. Toilet Security given by1 if distance between household and toilet is less than 50m and 0 otherwise.
3. The Indian interaction effect was omitted due to collinearity. Coloured people are a multiracial ethnic group native to Southern Africa.