

Post-Covid-19 Recovery and Reforms for Output Growth in South Africa: From Rebound to Recovery

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ABSTRACT

The purpose of this study is to investigate the impacts of Covid-19 shocks on South Africa's economy and determine whether post-pandemic reforms could boost output growth in the country. The study employs monthly time series data spanning the period 2020M3 – 2022M6. It uses two proxies for the Covid-19 shocks: i) total confirmed incidences/cases and ii) total deaths while using the Stepwise Least Squares (STEPLS) regression method for the analysis. The findings indicate that the Covid-19 shocks exert a strong negative effect on output growth in the country. Conversely, governance reforms and production variables have a significant positive impact and are capable of boosting output growth in the country. The social implications of this finding are that it provides valuable information on the need for reforms especially a reform mix comprising products and innovation in the use of modern technology and human capital development. There should be full implementation of post-pandemic reforms like the supply-side and demand management policies as well as sustaining pandemic-related supports in the short-run and permanent lifting of all lockdown restrictions. This study is the first empirical effort in South Africa to determine whether post-pandemic reforms could boost output growth in the country.

ملخص

الغرض من هذه الدراسة هو استعراض آثار الأزمات الناتجة عن جائحة كوفيد-19 على اقتصاد جنوب إفريقيا، وتحديد ما إذا كان بوسع الإصلاحات المنفذة في فترة ما بعد الجائحة المساهمة في تعزيز نمو الإنتاج في البلد. وتعتمد الدراسة على بيانات سلاسل زمنية شهرية تمتد للفترة M3 2020

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2022M6. –وتستخدم الدراسة مؤشرين لأزمات كوفيد-19: (1 إجمالي الحالات المؤكدة، و2) إجمالي الوفيات، مع استخدام طريقة المحدار المربعات الدنيا (STEPLS) للتحليل. وتشير النتائج إلى أن صدمات كوفيد-19 كان لها تأثير سلبي بالغ على نمو الناتج في البلد. وعلى العكس من ذلك، كان للإصلاحات على مستوى الحوكمة ومتغيرات الإنتاج أثر إيجابي كبير، وكان لها دور محوري في تعزيز نمو الإنتاج في البلد. وتمثل الآثار الاجتماعية لهذه النتائج في كونها توفر معلومات قيمة عن الحاجة إلى الإصلاحات، لاسيما خطط الإصلاح التي تشمل المنتجات والابتكار في استخدام التكنولوجيا الحديثة وتنمية رأس المال البشري. وينبغي أن يكون هناك تنفيذ كامل للإصلاحات في فترة ما بعد الجائحة، مثل السياسات المتعلقة بجانب العرض وإدارة الطلب، بالإضافة إلى الإبقاء على الدعم المرتبط بالجائحة على المدى القصير، والإلغاء التام والدائم لجميع إجراءات الإغلاق. وهذه الدراسة هي أول جهد تجريبي في جنوب أفريقيا لتحديد ما إذا كان بوسع الإصلاحات في فترة ما بعد الجائحة المساهمة في تعزيز نمو الإنتاج في البلد.

ABSTRAITE

L'objectif de cette étude est d'examiner les impacts des chocs de la Covid-19 sur l'économie sud-africaine et de déterminer si les réformes post-pandémiques pourraient stimuler la croissance de la production dans le pays. L'étude utilise des séries chronologiques mensuelles couvrant la période 2020M3 - 2022M6. Elle utilise deux indicateurs pour les chocs Covid-19 : i) le nombre total d'incidences/cas confirmés et ii) le nombre total de décès, tout en utilisant la méthode de régression Stepwise Least Squares (STEPLS) pour l'analyse. Les résultats indiquent que les chocs Covid-19 exercent un fort effet négatif sur la croissance de la production dans le pays. À l'inverse, les réformes de gouvernance et les variables de production ont un impact positif significatif et sont capables de stimuler la croissance de la production dans le pays. Les implications sociales de ce résultat sont qu'il fournit des informations précieuses sur le besoin de réformes, en particulier un ensemble de réformes comprenant des produits et des innovations dans l'utilisation de la technologie moderne et le développement du capital humain. Les réformes post-pandémiques, telles que les politiques de gestion de l'offre et de la demande, devraient être pleinement mises en œuvre, de même que le maintien des aides liées à la pandémie à court terme et la levée permanente de toutes les restrictions. Cette étude est le premier effort empirique en Afrique du Sud visant à déterminer si les réformes post-pandémiques pourraient stimuler la croissance de la production dans le pays.

Keywords: Post-Covid-19 Recovery and reforms, Output Growth, STEPLS model

JEL Classification: E51, E61, O4

1. Introduction

On 11 March 2020, the World Health Organization (WHO) characterized Covid-19 as a global pandemic. The pandemic not only killed many people globally but also halted global economic activities and exacerbated countries' unemployment. In Africa, South Africa is the most hit by the pandemic. The first case of the virus was reported in KwaZulu-Natal province on 5 March 2020. Thereafter, the virus continued to spread to other provinces and different parts of the country. According to the Department of Health (2022), over 4 million incidences/cases were identified with 101, 982 deaths recorded between March 2020 and May 2022. Given the rapid spread and sporadic death rate from the virus, the South African government implemented a total lockdown (including border closure) on 27 March 2020 that resulted in severe negative shocks to the economy (Arndt et al., 2020), especially with a negative effect on investment prospects. The lockdown period disrupted the supply of exports and the operation of non-essential businesses was restricted. This further reduced the demand and supply of goods and services and contracted the Gross Domestic Product (GDP).

The total lockdown contracted GDP by over 16% between the first and second quarters of 2020 (SARB, 2020), worse than the 2008 global financial crisis and the worse in South African history, far steeper than the annualised 8.2% decline in the fourth quarter of 1982. In particular, the disruption from the lockdown affected both the supply and demand sides of the economy with the wholesale and retail trade as well as the community, social and personal services as the worse affected sectors. On the demand side, there was a decline in domestic and foreign demand due to a reduction in income, layoffs due to quarantine, and a rise in unemployment and household consumption which made household spending slump by 49.8%. Spending on restaurants and hotels ground to a complete halt, plunging by 99.9% (Stats SA, 2021). The alcohol and cigarette bans had an impact too with consumer spending on these items falling by 92.4%. This made people resort to the informal market or black market with many individuals making masks and stuff and buying up stocks of items to resell for higher prices. All the rulings and bans put in place by the government to curb the spread of the virus including social distancing, sanitising, and total lockdown affected people and businesses, especially the ripple effects on players in travel, accommodation, food, entertainment, and many other industries.

In addition, the supply side was disrupted by the rise of covid-19 incidences/cases which reduced labour supply because workers were unwell or need to look after their children and other dependents while schools were closed and movements of people were restricted. There were low firm investments as well as total closure of non-essential business operations. There was over a 32% decline in the volume of global merchandise trade which South Africa was badly affected (OECD, 2020). The mental impact of the unknowns of the virus created fear in the mind of the people as those classified as essential workers like health workers and those in agriculture and manufacturing were scared to go to work. Hence, compounding the already deteriorating economic condition of the country.

Given this development and the need to alleviate the impacts of the pandemic, the government issued reforms and stimulus packages (using both fiscal and monetary policies) like the government's Economic Reconstruction and Recovery Plan (ERRP), the \$26 billion package funds which represents the largest in emerging markets to bailout the tourism sector and small businesses to curtail economic downturns (Vitenu-Sackey and Barfi, 2021). Such reforms and stimulus packages were centered on healthcare, businesses, and liquidity support to banks' household consumption (Capano et al., 2020) among others to stimulate the economy. Many studies like Loayza and Fajnzylber (2005), Zettelmeyer (2006), and Song and Zhou (2020) have confirmed that reforms and macroeconomic stimulus packages do boost output growth in the economy as well as improve the economic and social resistance of the people. It is given this claim that this study seeks to investigate the impacts of Covid-19 shocks on South Africa's economy and determine whether post-pandemic reforms could boost output growth in the country.

2. Literature Review

There has been a consensus among economists that Covid-19 shocks would have significant adverse effects on the economy. The initial projection was that many industrialized economies will lose approximately 2.4% of their GDP while African countries may lose about 5 – 6% of their GDP (Vitenu-Sackey and Barfi, 2021). Sadly, the hard lockdown across the SADC countries caused GDP to decline by 20% in the region and threatened the economic stability of the region (Moseley and Battersby, 2020). According to the study conducted by De Villiers

(2020), South Africa's GDP declined by 7.2% in 2020, and the unemployment rate rose to 34.5% in June 2022 (Stat SA, 2022).

Burger and Calitz (2021) carried out a study on the impact of Covid-19 shocks on economic growth in South Africa. The study revealed that the Covid-19 crisis worsened an already deteriorating fiscal position in the country and further led to fast-rising debt levels. Khambule (2020) looked at the effects of Covid-19 on the South African informal economy. The study was carried out on the notion that "the informal economy is insulated from global economic volatilities because it functions outside of mainstream economic principles and regulations". However, this assumption was invalid because no sector was insulated from the total lockdown which adversely affects all the sectors of the economy. The study revealed that "the adverse effects of Covid-19 are likely to give rise to social and economic vulnerabilities because of the disruptive nature of the virus on the sustainable livelihoods of billions of people across the globe that are employed in the informal sector".

Arndt et al. (2020) estimated the costs of the lockdown implemented by the South African government beginning on 27 March 2020. The study revealed that the lockdown negatively affected the economy and resulted in a GDP decline of about 5% by the end of 2020. The study concluded that the persistent effects of Covid-19 would bring even worse outcomes for GDP in line with the 'Slow' and 'Long' recovery scenarios.

Francis (2020) conducted a study on unemployment and the gendered economy in South Africa during the Covid-19 shocks. Based on the findings, over 2.2 million people lost their jobs in May 2020 which further increase the already registered 29.1% unemployment rate before the pandemic and resulted in a major decline in GDP. Apergis and Apergis (2021) also investigated the impact of Covid-19 shocks on economic growth using Bayesian Panel Vector Autoregressive (BPVAR) model. The findings revealed that the Covid-19 shocks exert a strong negative effect on industrial production. Also, Chitiga-Mabugu et al. (2021) assessed the potential short-term effects of the Covid-19 pandemic on the South African economy. The findings show significant evidence of a decline in economic growth and employment. This shows that the severe lockdown across the country exerts negative impacts on the production of goods and services.

Safaei and Saliminezhad (2022) investigated the Covid-19 pandemic's economic impacts and government responses across welfare regimes. The study revealed that the “Covid-19 pandemic disrupted lives across all countries, and had severe negative impacts on the global economy, with a massive loss of production and employment, and an increase in national debts”.

While also assessing the impact of Covid-19 shocks on the economy, Ganum and Thakoor (2021) revealed the negative significant impacts of the pandemic on the economy. They further reiterated the need for different types of reforms and packages like innovation, governance, complementary policies, and product market policies to stimulate the economy. In supporting the view for reforms to stimulate the economy after the Covid-19 shocks, Deb et al. (2022) suggested that an increase in vaccination will likely lead to a significant increase in economic activities. Overall, it can be concluded that the relationship between Covid-19 and output growth is negative, and for stronger gains, implementing complementary reforms is important to boost output growth.

Given the above empirical studies that have shown evidence that Covid-19 shocks have significant adverse effects on the economy and that reforms and macroeconomic stimulus packages do boost output growth, to the best of the author's knowledge, no empirical study has investigated whether post-pandemic reforms could boost output growth in South Africa. This study, therefore, seeks to fill this knowledge gap.

3. Theoretical Review

This study is grounded in the classical growth theory and institutional economics. In shaping economic behaviour and the market system, the economic theory of institutions believes that the institutional framework is created when it is efficient to do so (Moroni, 2010). Institutions are formulated to solve economic problems, such as the economic shocks arising from Covid-19 as well as the global supply chain disruption from export/import, and there is a tendency towards efficient institutions in solving these problems. Economic institutions are essential for economic growth since they determine the distribution of resources and economic gains in the country. This means that societies will choose the institutions that maximize their total benefits. In this case, the maximum benefits from

post-Covid-19 reforms for output growth should outweigh the costs for society to maximise their utilities.

On the other hand, the classical growth theory which was developed during the industrial revolution and the need for output growth explains “economic or output growth as a result of capital accumulation and the reinvestment of profits derived from investment, specialization, the division of labour, and the pursuit of comparative advantage (Lanza, 2012)”. The theory provides an account of the wide-ranging forces that influenced economic/output growth and the mechanisms through which the underlying growth process can be achieved. One such mechanism is through effective economic reform in different sectors of the economy. Creating a conducive environment for post-Covid-19 reforms for productive investment and reinvestment of profits will go a long way in driving output growth in South Africa.

These theories (classical growth theory and institutional economics) are very crucial because this study establishes the effect of reforms for output growth during the post-Covid-19 era to create sustainable output growth in the country.

3.1. Data Description and Data Sources

This study employs monthly time series data spanning 28 months, from March 2020 to June 2022, to investigate the impacts of Covid-19 shocks on South Africa’s economy and determine whether post-pandemic reforms could boost output growth in the country. The starting date is linked to when Covid-19 incidences/cases were first detected in South Africa and not the rest of the world, while the cut-off date is linked to when Covid-19 restrictions were lifted in the country. The variables for the chosen data are Gross Domestic Product (GDP), Covid-19 variable, governance reform variables, and production variables. The GDP data is collected from the South African Reserve Bank (SARB) and Statistics South Africa (Stat. SA), the data for the production variables (labour and capital) are collected from Quantec Database and the Federal Reserve Bank of St. Louis, the Covid-19 data is sourced from the European Centre for Disease Prevention and Control. This data source gives an update on the Covid-19 situation worldwide. The governance reform variables on the other hand are sourced from the World Development Indicators and Global Competitiveness Indicators.

3.2. Definition and Description of Variables

- **Gross Domestic Product (GDP):** the real GDP, which reflects the inflation-adjusted value of goods and services employed. This is in line with Goel et al. (2021) who carried out a study on supply chain performance, economic growth, and the impact of Covid-19 disruptions. The GDP data is only available in quarterly frequency, and not in monthly frequency. To obtain the monthly frequency data for this variable, this study interpolated the quarterly data using interpolation and frequency conversion methods. The interpolation of low-frequency data to high-frequency data is a standard approach in the literature (see Cheng, 2006; Morgese *et al.*, 2008; Borys *et al.*, 2009; Ngalawa and Viegi, 2011; Davoodi *et al.*, 2013 and Kutu and Ngalawa, 2016).
- **Production variables:** in line with Ayres and Voudouris (2014), production variables are capital (K) and labour (L). Capital is measured by gross capital formation while labour (L) is the labour force participation rate (% of the total population aged between 15 and 64) as compiled by the International Labour Organization (ILO).
- **Covid-19 (C-19):** this is an infectious disease caused by the SARS-CoV-2 virus. It makes an infected person seriously ill or dead and hence, requires urgent medical attention. The first case was discovered in the country on 5 March 2020, which led to the stiffest lockdown restrictions imposed from 27 March 2020. Two proxies were used for the Covid-19 shocks: i) total confirmed incidences/cases per month and ii) total deaths per month. This means the addition of the monthly infection cases and deaths among the people in the country are used as the proxy for the Covid-19 shocks. This is in line with Apergis and Apergis (2021).
- **Governance Reforms:** in line with Ganum and Thakoor (2021), this index has a combination of indices in five areas: (i) the voice of accountability (VOA); (ii) political stability (PS); (iii) government effectiveness (GE); (iv) control of corruption (COC); and (v) regulatory quality (RQ). Each of these indexes has an equal weight.

3.3. The Theoretical Model

To effectively model post-Covid-19 reforms and their effects on the economy, we rooted this study in the Cobb-Douglas production function. The choice of this theory arose from the fact that the theory models the relationship between production output and production inputs (factors). This is in line with the aim of this study, which seeks to determine the impacts of the production variables (inputs or factors) and the Covid-19 variable on the economy and examine whether post-Covid-19 reforms could boost output production in the country. In addition, the Cobb-Douglas production function is chosen for this study because it creates a role for policymakers. This means that there is a role for monetary and fiscal policy stimuli using this model. This model holds that long-run output production is explained by policy measures that are implemented in the economy (Frimpong and Oteng-Abayie, 2006), for instance, during the Covid-19 period.

Given the above explanation for the choice of the Cobb-Douglas production function, the point of departure for the production function is rooted in an economy where there are two types of factors of production; the reproductive economy, which can accumulate over time (e.g., physical and human capital) and the non-reproductive economy, which is fixed in every period (e.g., land). In this economy (reproductive and non-reproductive), it is assumed that output is given by a production function of the following form:

$$Y_t = A_t L_t^\beta K_t^\alpha \quad (1)$$

$$0 < a < 1, 0 < b < 1$$

Where

Y_t is the total output of goods and services produced at time t ;

A_t is total factor productivity (TFP) over time;

L_t is labour input (total number of man-hours over a given period);

K_t is capital input (the real value of all machinery, equipment, and buildings at a given time);

β and α are the output elasticity of capital and labour, respectively.

Given that $\beta + \alpha = 1$, this means that the Cobb-Douglas production model shows constant returns to scale. This means that doubling the use of K_t and L_t will result in doubling Y_t . On the contrary, if $\beta + \alpha > 1$, this shows increasing returns to scale, and if $\beta + \alpha < 1$, it shows diminishing returns to scale.

Equation 1 above can be transformed into a linear form:

$$Y_t = C_o + A_t + \beta L_t + \alpha K_t \quad (2)$$

where Y_t , L_t , and K_t remain as output, labour, and capital, respectively, C_o is a constant parameter and A_t is TFP or other factors not captured by labour and capital (can also be referred to as an unconventional input). For this study, these factors or inputs include: the governance reform variables and the Covid-19 variable which is given as:

$$A_t = f(VOA_t, PS_t, GE_t, COC_t, RQ_t, C19_t) \quad (3)$$

Therefore, substituting A_t in equation (3) into equation (1), gives a new extended Cobb-Douglas production function:

$$Y_t = VOA_t^{\beta_1} PS_t^{\beta_2} GE_t^{\beta_3} COC_t^{\beta_4} RQ_t^{\beta_5} C19_t^{\beta_6} L_t^\beta K_t^\alpha, \quad (4)$$

Equation (4) represents our output growth for South Africa's economy where Y_t captures GDP (output growth), $\beta_1 - \beta_6$ are coefficients for the governance reform variables and the Covid-19 variable. β and α on the other hand are coefficients for production variables (labour and capital).. Following Omar and Hussin (2015:102), we linearize equation 4 as:

$$GDP_t = C_o + \beta_1 VOA_t + \beta_2 PS_t + \beta_3 GE_t + \beta_4 COC_t + \beta_5 RQ_t + \beta_6 C19_t + \beta L_t + \alpha K_t + \varepsilon_t \quad (5)$$

where GDP_t represents output growth, C_o is a constant term; $\beta_1VOA_t + \beta_2PS_t + \beta_3GE_t + \beta_4COC_t + \beta_5RQ_t + \beta_6C19_t$ capture TFP or A_t ; L_t and K_t are labour and capital respectively and ε_t is an error term. Equation 5 is the final equation derived from the Cobb-Douglas production and employed for the regression model.

4. Robustness check

4.1. Unit Root

The first form of robustness check is to ensure the stationarity of the dataset. This helps the study prevent spurious results. To achieve this, we follow Nwakanma and Ibe (2014) and Cheng et al. (2014) to carry out a unit root test on the dataset. The robust version of Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests are employed to ensure consistency and valid results. It also allows the study to compare the results of the two tests.

Table 1: Unit Roots Test Results in the model variables

Variable	Augmented Dickey-Fuller (ADF)			Philip's Peron (P-P)		
	Order of integration	t* Statistics	P Value	Order of integration	t* Statistics	P- Value
GDP	I(1)	-2.9912	0.0391**	I(1)	-5.1591	0.0000***
C-19	I(1)	-2.7652	0.0667*	I(1)	-12.4336	0.0000***
PS	I(1)	-3.1843	0.0239**	I(1)	-2.8955	0.0491**
COC	I(1)	-3.6938	0.0055**	I(1)	-10.0629	0.0000***
GE	I(1)	-4.8139	0.0001***	I(1)	-7.5132	0.0000***
RQ	I(1)	-3.3111	0.0169**	I(1)	-8.0739	0.0000***
VOA	I(1)	-2.9009	0.0487**	I(1)	-7.8389	0.0000***
K	I(1)	-5.4621	0.0000***	I(1)	-3.3632	0.0144**
L	I(1)	-3.0672	0.0359**	I(1)	-2.9707	0.0449**

4.2. Diagnostic Tests

As a furtherance to conduct a robustness check and reliability of the model, serial correlation, heteroscedasticity and normality tests are carried out. The essence of these tests is to ensure that the model is free

from serial correlation, and heteroscedasticity and ensure the normality of the residuals. The benchmark null hypotheses that are tested for the serial correlation, heteroscedasticity and normality are:

- $H_0: \alpha = 1$, there is no serial correlation, no heteroskedasticity and the residuals are normally distributed.
- $H_1: \alpha \neq 1$, there is serial correlation, heteroskedasticity and non-normality of residuals.

5. Empirical Results and Discussion

5.1. Unit Root

As earlier stated, the study adopted the robust version of Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests to ensure the stationarity of the dataset and prevent spurious results. Table 1 presents the results of the unit root tests. As shown in the table, all the variables were not stationary in levels, but in first differences i.e. I(1). The stationary of all the variables at I(1) is an indication that they no longer have unit roots. Given these results, the purpose of ensuring the stationarity of the dataset and preventing spurious results has been achieved.

5.2. Discussion of Results of the STEPLS- Stepwise Least Squares Method

Table 2 shows the results of the Stepwise Least Squares (STEPLS) regression technique employed for the study. The study follows Silhavy et al. (2017) in adopting this model. The STEPLS method can be thought of as a special case of LS- Least Squares (NLS and ARMA) and similar to Two-Stage Least Squares (2SLS) and dynamic Generalised Method of Moments (GMM) techniques based on orthogonality condition between their parameter estimation and testing (Hanssens et al., 2001) and uses the robust standard error to account for heteroscedasticity and serial correlation. The choice of this approach is because it is a combination of forward and backward selection that involves an automatic process for selecting independent variables (Silhavy et al., 2017). In addition, it can accommodate many variables without running out of a degree of freedom (Giudice et al., 2012). Furthermore, it is objective and reproducible, computationally efficient, and produces a good solution (Naimi and

Araújo, 2016). The statistical accuracy of the findings from this model is further cemented by the use of 1% and 5% levels of significance. As shown in Table 2, the results show that all the variables in the model significantly determine output growth in South Africa.

As revealed by the coefficient of the Covid-19 variable in the model, the variable was found to have a negative significant impact on output growth. This means that an increase in Covid-19 shocks will lead to a significant decrease in output growth in the country. The implication of this is that there is a risk that output growth could be lower for longer, with a setback or persistent increase in Covid-19 infections and death cases in the country.

With the prolonged hard national lockdown restrictions that disrupted various economic activities in the entire country especially the associated disruption of demand and supply chains, the economy is likely to face a protracted period of a slowdown before significant output growth can be recorded. This finding conforms to Ataguba (2020) and Arndt et al. (2020) that carried out a study on the impact of Covid-19 on the South African economy.

The studies revealed that GDP declined as a result of the Covid-19 outbreak and that “the persistent effects of Covid-19 would bring even worse outcomes for GDP in line with the 'Slow' and 'Long' recovery scenarios”.

Conversely, governance reforms such as the voice of accountability, political stability, government effectiveness, control of corruption, and regulatory quality have a significant positive impact on output growth. As revealed by the coefficients of these variables in the model, improve governance reforms will lead to a significant increase in output growth in the long run. During the pandemic, South Africa’s government introduced a control of corruption strategy in which a palliative care committee was set up to monitor the palliative and fund disbursement during the Covid-19 period. In addition, regulative qualities such as regulations and guidelines that include travel restrictions, surveillance and the control of notifiable medical conditions, alert level one to alert level 4 lockdown regulations, and Covid-19 social relief of distress among others were implemented. Furthermore, government effectiveness like amendment directions to municipalities and provinces on measures to combat and

prevent the spread of the virus was introduced. There are also protocols for personal care services as well as a total ban on the sales of alcohol during the lockdown. There was also the political stability policy reform targeted at the unrest and subsequent looting which took place in July 2021 in KwaZulu-Natal and Gauteng provinces due to the severe effects of Covid-19 shocks. The South African Property Owners Association (SAPOA) estimated the cost of the unrest to exceed R20 billion in KwaZulu-Natal alone. Hence, political stability reform in which all political parties jointly issued a statement and strategy to address the problem.

Table 2: Estimation Results of the Stepwise Least Squares (STEPLS)

Dependent Variable: GDP				
Method: Stepwise Least Squares				
Sample: 2020M3Q1 2022M6				
Included observations: 28 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C19	-3.25341	0.914930	-3.555914	0.0006
GE	4.080517	1.651646	2.470576	0.0281
PS	2.128900	0.714600	2.978900	0.0030
RQ	0.024340	0.008252	2.949505	0.0300
VOA	0.056000	0.024500	2.285900	0.0235
COC	0.004534	0.001935	2.343612	0.0193
K	0.841700	0.350000	2.404900	0.0172
L	0.009600	0.005400	1.763700	0.0533
C	-0.72415	0.083091	-9.918680	0.0000
R-squared	0.8135	Mean dependent var		6701.2
Adjusted R-squared	0.7687	S.D. dependent var		3093.7
S.E. of regression	753.34	Akaike info criterion		25.899
Sum squared resid	9.8811	Schwarz criterion		26.118
Log-likelihood	-1441.36	Hannan-Quinn criteria.		25.988
F-statistic	52.790	Durbin-Watson stat		0.1936
Prob(F-statistic)	0.0000			
Selection Summary				

Source: Author's Computation

This means that given the uncertainty going forward in the economy, post-Covid-19 reform policies will continue to play an important role in stimulating the economy and complementing pandemic-related support in South Africa. Such pandemic-related supports include emergency tax relief leaflets, debt relief finance schemes, business growth or resilience facilities, spaza support scheme, Covid-19 agricultural disaster support, and tourism relief fund among others. All these supports were introduced for businesses and households that were negatively affected by Covid-19 shocks. Therefore, implementing reforms together with these pandemic-related supports will continue to boost output growth in the country. This result conforms to Ganum and Thakoor (2021) who revealed that governance reforms have a significant impact on growth and inclusion in Sub-Saharan African countries. The roll-out of robust demand management policies as well as supply-side reforms will aid the recovery of the economy and boost output growth in the country.

Furthermore, production variables (labour and capital) were found to have a positive and statistically significant impact on the country's output growth. For example, changes in inventories (capital- as measured by gross capital formation) and the use of modern technology will tremendously lead to an increase in output growth in the country. In addition, increase labour (human capital) will boost output growth in the country. This finding is consistent with Battisti et al. (2018) that assessed the impact of labour productivity growth and capital accumulation on economic growth in OECD and non-OECD countries. Their findings revealed a significant positive impact of labour and capital on economic growth. The finding is also in line with Feddersen et al. (2017). Therefore, in promoting faster output growth in the country, capital intensive and labour oriented strategy should be promoted. The country can tap from massive infrastructural development and value acquisitions as well as massive jobs or skills development training for workers to boost their productivity in the economy.

5.3. Robustness Checks

Tables 3 and 4 as well as Figure 1 present the results of diagnostic tests conducted on the regression model (STEPLS) to test its robustness and reliability. Tables 3 and 4, in that order, present the result of the tests for serial correlation and heteroscedasticity. As shown by the p-value, the results of both tests show that the two models are free from serial

correlation and heteroscedasticity. Therefore, based on the benchmark null hypothesis, we do not have enough evidence to reject the null hypothesis of no serial correlation and heteroscedasticity in the model. Figure 1 on the other hand shows the result of the normality test for the residual. The result shows that the residual is normally distributed and the dataset is well modelled. Overall, the null hypothesis of no serial correlation, no heteroscedasticity, and normality of the residuals cannot be rejected. These results show that our model is consistent and favourable in investigating the impact of Covid-19 shocks on South Africa's economy and in determining whether post-pandemic reforms could boost output growth in the country.

Table 3: Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	250.1242	Prob. F(2,101)	0.7418
Obs*R-squared	93.18581	Prob. Chi-Square(2)	0.3455

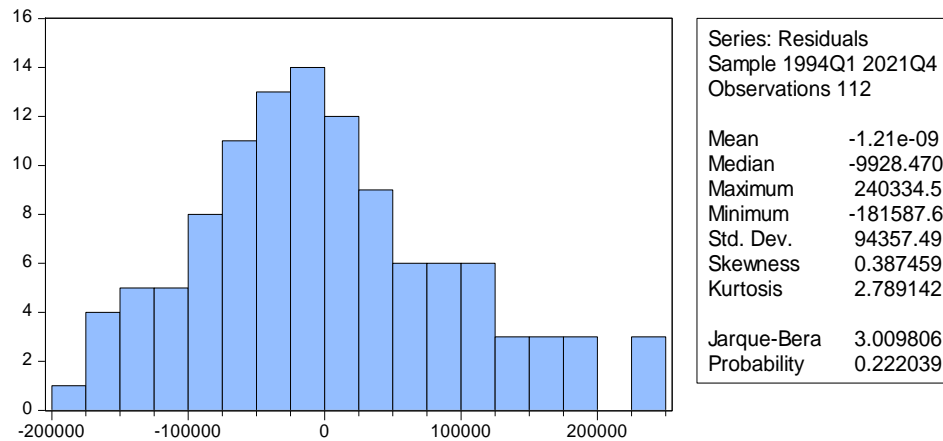
Source: Author's Computation

Table 4: Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.641122	Prob. F(8,103)	0.1019
Obs*R-squared	24.69137	Prob. Chi-Square(8)	0.1118
Scaled explained SS	18.68092	Prob. Chi-Square(8)	0.1627

Source: Author's Computation

Figure 1: Normality Tests

Source: Author's Computation

6. Conclusion

This study set out to investigate the impact of Covid-19 shocks on South Africa's economy and determine whether post-pandemic reforms could boost output growth in the country. Estimations of a Cobb-Douglas production function using the Stepwise Least Squares (STEPLS) regression technique and monthly data for the period 2020M3 – 2022M6 revealed that Covid-19 shock has a negative significant impact on output growth. This means that an increase in Covid-19 incidences/cases will lead to a significant decrease in output growth in the country. This finding is consistent with Ataguba (2020) and Danylyshyn (2020), among others. On the other hand, the study also finds that governance reforms such as the voice of accountability, political stability, government effectiveness, control of corruption, and regulatory quality have a significant positive impact on output growth. This tends to support the view that governance reforms are critical for boosting output growth in the country. Governance reforms will in the offing determine how rapidly South Africa bounces back from the Covid-19 crisis, and boost income and output growth levels going forward. Reforms will furthermore improve resilience and adaptability to future shocks. On the contrary, in the absence of reforms, the country will face a more protracted recovery and worsened social and economic vulnerabilities.

The study also finds that labour and capital play an important role in influencing the level of output growth in South Africa. Both variables

were found to have a positive and statistically significant impact on the country's output growth. This finding supports Phiri and Mbaleki (2022) who confirmed the role of labour productivity and capital in stimulating output growth in South Africa.

The contribution of this paper stems from the fact that this study is the first in South Africa to determine whether post-pandemic reforms could boost output growth in the country. Given all the governance reform variables included in the estimation model and line with Ganum and Thakoor (2021), it can be concluded that those variables can account for the long-run associated gains from reforms with political stability as the most important areas in governance reforms. With more focus by the government on effective policy towards the control of corruption and the need to ensure accountability as well as government effectiveness and regulatory quality, sustainable output growth can be achieved in this recovery period.

Overall, the practical implications (findings) from this study provide valuable information to policymakers on the need for reforms in stimulating output growth in the country. Consistent with the theory of social-economic reforms and disruptive innovation, we recommend a reform mix comprising products and innovation in the use of modern technology and human capital. This will aid a bottom-up approach in target groups and service deliveries among people severely affected by Covid-19 shocks. Another form of reform mix is the continuous use of pandemic-related supports and post-Covid-19 reforms within this recovery time. That is, there should be a sustainable mechanism for the pandemic support so far introduced for businesses as well as rapid formulation and implementation of post-Covid-19 reforms that can replace pandemic support and sustain the economy in the long run. For example, we recommend that there should be full implementation of post-pandemic reforms like the supply-side and demand management policies as well as the elimination of all border closure, total removal of all the lockdown restrictions, and the need for development approaches that can anticipate and respond to future, uncertain shocks.

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