

## Unemployment, total factor productivity, budget deficit, and wage share in South Africa

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### Abstract

**Purpose** — The paper investigated the effect of the interaction of fiscal deficits and total factor productivity (TFP) and fiscal deficits and the wage share on unemployment.

**Methods** — The paper applied an autoregressive distributed lag model to South African annual data from 1991-2019.

**Findings** — First, increases in fiscal deficits increase unemployment at all levels of TFP and wage share. Second, increases in TFP increase unemployment at different levels of fiscal deficit, but after the global economic recession, the rate of increase in unemployment declined significantly. This means that the interaction of rising TFP and fiscal deficits in South Africa, where the growth regime is profit-led and technology-driven, always results in increasing unemployment. Third, as the wage share increases, unemployment increases, at all levels of fiscal deficits, suggesting that a wage-led growth regime is no panacea to unemployment either.

**Implications** — The findings imply that expansionary fiscal policy does not necessarily create an economy that works for all unless active labour market institutions are set up. The findings challenge the notion that the solution to unemployment in South Africa is wage flexibility. Neither do the findings support the idea that following a profit-led growth path is a solution. A balanced mix of the two growth regimes would work.

**Originality** — Studies have considered the productivity-enhancing effects of structural fiscal policy, but they have not considered the possible effects of interactions between productivity, fiscal policy and wage shares. The paper addresses the gap by introducing the interactions of TFP and fiscal deficits, as well as the interaction of wage share and fiscal deficits.

**Keywords** — unemployment, total factor productivity, fiscal deficit, wage share

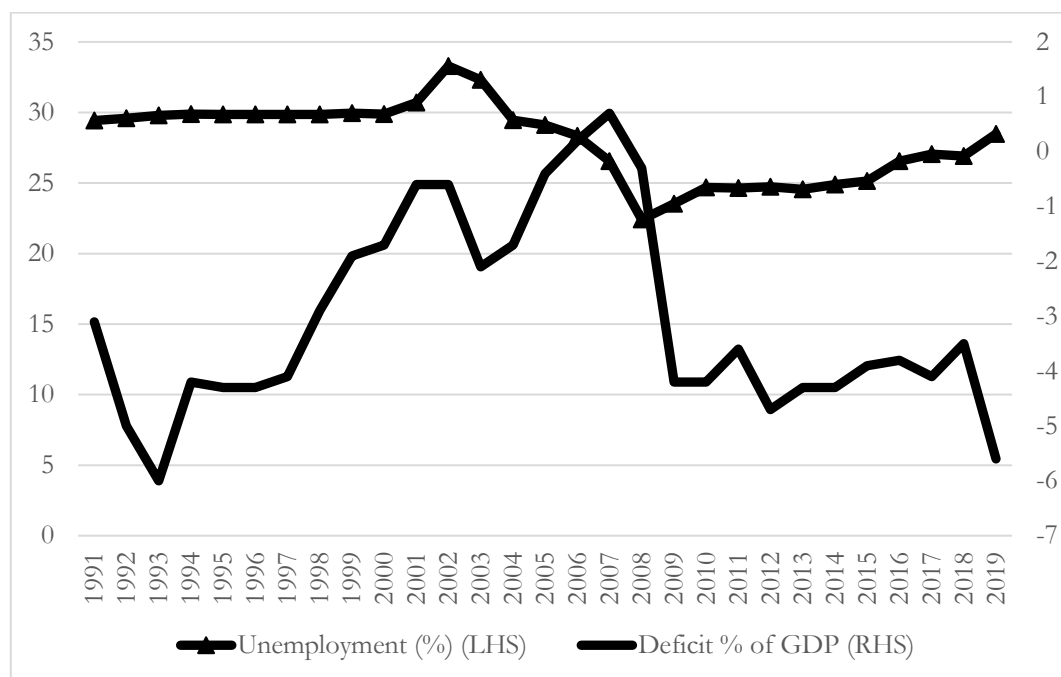
### Introduction

The advent of COVID-19 has amplified the problem of unemployment in various economies, especially those with low labour absorption capacity and chronic unemployment. Developed nations adopted job preserving and income insurance strategies to prevent frictional unemployment and labour productivity erosion (Giupponi, Landais, & Lapeyre, 2022). The recession induced by the pandemic has unearthed the major fault lines of socio-economic policy that have been long in the making. South Africa has been struggling with three social evils –

inequality, poverty, and unemployment, of which unemployment is foundational to the other two. Scholarship has identified unemployment in South Africa to have a life of its independent economic growth, structural, institutional, and resistant to market-based solutions (Schoeman & Blaauw, 2009). Causes of unemployment have been identified, not least a rigid labour market regulatory regime, a public education system that has failed to signal productivity of labour, skill intensification in the labour market, and capital intensification and automation of industrial production processes (Hirsch, 2005; Jeremy Seekings & Nattrass, 2005).

The delegation of public power to the market to deal a durable blow on unemployment, which is structural, has failed. The adoption of fiscal consolidation, which became the official fiscal strategy with the Medium Term Expenditure Framework in February 1998, has been associated with rising unemployment (Marire, 2022b). The debate has been between those who argue that fiscal consolidation creates fiscal space for investing in the long-term productivity of the economy and labour absorption capacity (Burger & Calitz, 2021; Burger, Siebrits, & Calitz, 2016) and those who say fiscal consolidation escalates unemployment, destitution, poverty and inequality (Bond, 2015; Kelton, 2015, 2020; Tanaka, 2022b, 2022a). The latter group argues for an active fiscal policy designed to provide more permanent public works job programmes than are currently in place.

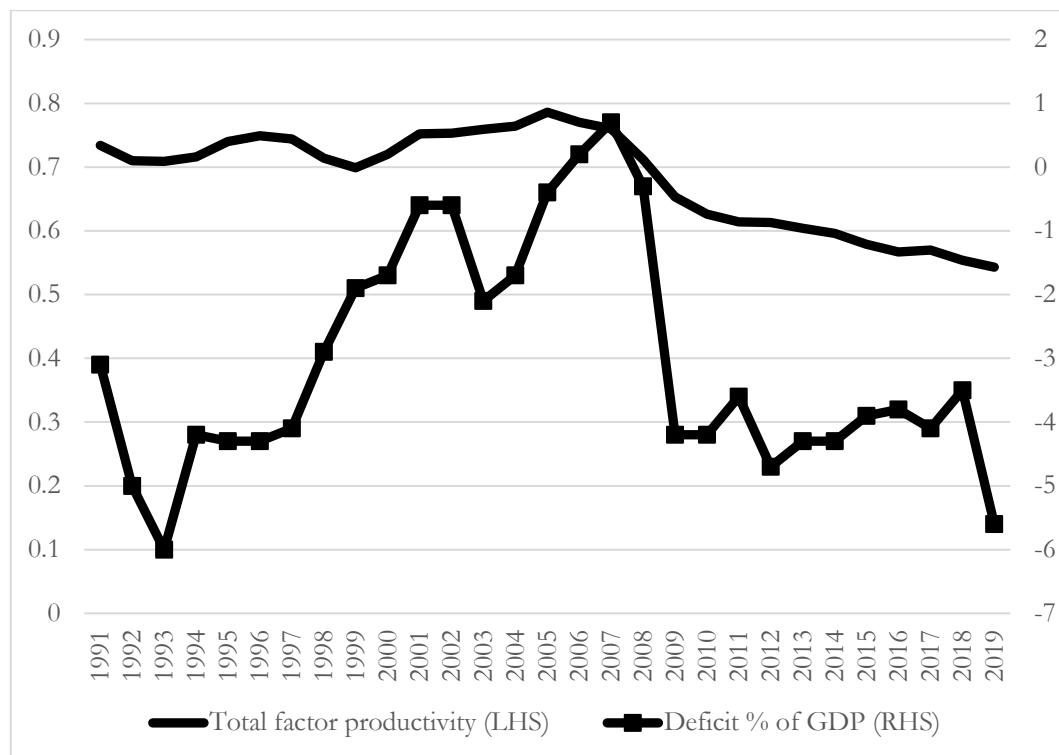
The present paper focuses on the influence on unemployment of the interaction between total factor productivity (TFP) and fiscal deficits on the one hand and fiscal deficits and the wage share on the other. Some scholars suggest that fiscal deficits coupled with rising TFP reduce unemployment in the long run, especially if the wage share falls over time or wages are rigid upwards (Lama & Medina, 2019). South African scholarship has not examined the effect on unemployment of the interaction between the TFP and fiscal deficits and between fiscal deficits and the wage share. Yet, South Africa has rolled out an extensive innovation ecosystem through the National System of Innovation (NSI), with the primary goal of increasing the long-run productivity of the economy (Marire, 2022a). The considerable investment in innovation is expected to interact with fiscal deficits in ways that visibly reduce unemployment. However, the reality is that fiscal consolidation coupled with an underperforming NSI (Rooks & Oerlemans, 2005) have not left any noticeable dent in unemployment in South Africa. A careful examination of the interaction effect of fiscal deficits and TFP provides a clear understanding of how productivity-enhancing fiscal policy can play a crucial role in reducing unemployment in economies struggling with unemployment.



Source: South African Reserve Bank, <https://www.resbank.co.za/en/home/what-we-do/statistics/releases/online-statistical-query>

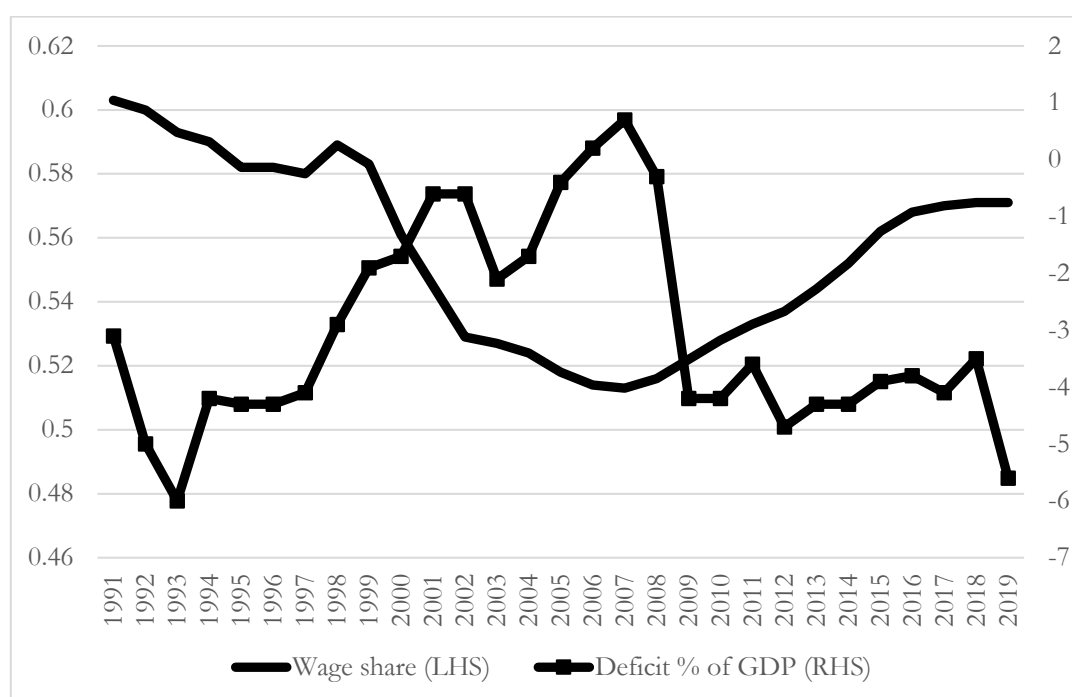
**Figure 1.** Unemployment and fiscal deficit for South Africa

Figure 1 shows that unemployment has not been responsive to fiscal deficits. Still, during the period of commitment to orthodox fiscal consolidation in 1998-2008, fiscal consolidation efforts managed to break the unemployment path for a small period in the early to mid-2000s. One could surmise that fiscal consolidation and the falling budget deficits associated with it provided the correct fiscal response to unemployment.



Source: South African Reserve Bank, <https://www.resbank.co.za/en/home/what-we-do/statistics/releases/online-statistical-query>

**Figure 2.** Budget deficit and the wage share



Source: South African Reserve Bank, <https://www.resbank.co.za/en/home/what-we-do/statistics/releases/online-statistical-query>

**Figure 3.** Unemployment and wage share

Figure 2 shows that periods of fiscal austerity, especially during successful fiscal consolidation in 1998-2008, coincided with falling wage share. This suggests that the public sector's contribution to the wage share is very significant; hence, efforts to contain the public sector wage bill through fiscal consolidation efforts had a huge effect on the size and trend of the wage share. From Figures 1 and 2, it is possible to surmise that fiscal consolidation coupled with the falling wage share might exert an unemployment-reducing effect. Yet, this was only plausible during the 1998-2008 period, beyond which it appears that increasing fiscal deficits coexisted with the rising wage share. Perhaps, this is through the public wage bill effect on the wage share in the post-2008 period.

Figure 3 shows that unemployment has fallen whenever the wage share fell substantially and rose when it rose. The trends agree with the conclusion, which has become a mainstream consensus, that unemployment is driven, in part, by high wage cost for business (Burger & Calitz, 2021; Burger et al., 2016). From Figure 3, it would appear as though the falling wage share reduces unemployment, suggesting that the wage regime in South Africa, in general, has been adverse to unemployment management outside the 1998-2008 period of successful fiscal consolidation.



Source: Total Factor productivity data obtained from the Federal Reserve Bank of St. Louis on <https://fred.stlouisfed.org/series/RTFPNAZAA632NRUG> and wage share data obtained from the South African Reserve Bank on <https://www.resbank.co.za/en/home/what-we-do/statistics/releases/online-statistical-query>

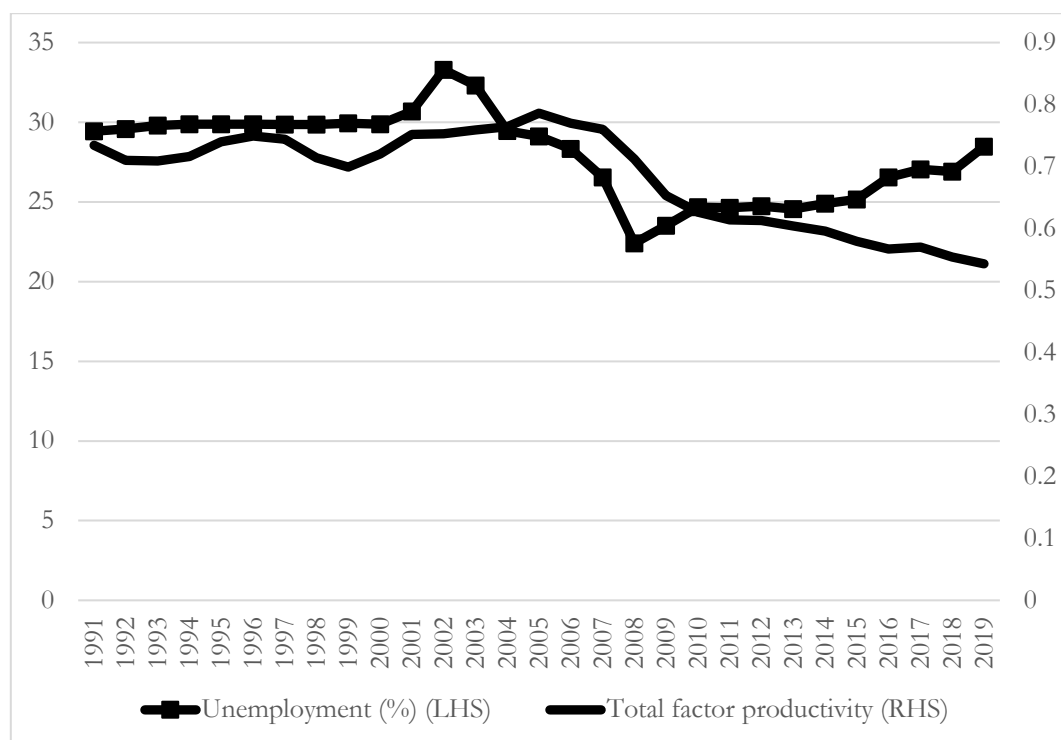
**Figure 4.** Total factor productivity and the wage share

Figure 4 shows that rising TFP tends to be associated with a falling wage share. Such a relationship happens if rising TFP is driven more by capital than by labour. In this sense, capital-driven productivity tends to worsen unemployment.

Figure 5 shows that between 1991 and 2004, unemployment rose with total factor productivity, while after the global financial crisis, the two variables appear to be decoupled. Unemployment is rising while total factor productivity is falling quite sharply. The 1991-2004 suggests that productivity gains might have been capital driven such that unemployment rose with productivity. After the global financial crisis, firms have been reluctant to invest, and falling productivity might be capital driven again.

The trends depicted in Figures 1 to 5 suggest a puzzle that leads to a crucial issue that the paper investigates. First, given the belief in the centrality of fiscal policy in spurring long-run growth

and development, does the interaction between fiscal deficits and TFP and the wage share influence unemployment in South Africa? Examining the interaction effects benefits the design of fiscal policy for a balanced economy that works for all and impacts unemployment perennially. To date, and to the author's best knowledge, these interaction effects have not been examined.



Source: Total Factor productivity data obtained from the Federal Reserve Bank of St. Louis on <https://fred.stlouisfed.org/series/RTFPNAZAA632NRUG> and wage share data obtained from the South African Reserve Bank on <https://www.resbank.co.za/en/home/what-we-do/statistics/releases/online-statistical-query>

**Figure 5.** Total factor productivity and unemployment, South Africa

Literature provides conflicting evidence on the causes of rising unemployment in South Africa. Forslund (2013) argued that the cause of unemployment in South Africa was a structural demand deficit, which a radical increase in wages could resolve. Forslund (2013) argued for a wage-led Keynesian growth process. In a recent study, Ntshwanti (2022) concurred, showing that the South African growth regime is profit-led and jobless. Similarly, Stockhammer and Onaran (2012), examining the EU, established that a wage-led growth regime undermined private investment and exports. Still, in the long term, the wage increases induced consumption effects that outweighed both the negative investment and export effects.

For this reason, like Forslund (2013), Stockhammer and Onaran (2012) advocated increased labour bargaining power and wages. In fact, Villanueva and Cárdenas (2021) found that falling wage shares in the EU co-existed with rising unemployment, thus calling into question the neoliberal stance on wage flexibility and moderation as solutions to unemployment. They showed that falling wage shares did not change Okun's law in the labour market but worsened inequality and unemployment. More distinctly, in a wage-led growth regime, the goods market overshadows the labour market, which means that the consumption effect will dominate the negative effect of rising wages on investment and exports. However, Phelps (2018) counteracted this evidence by using data for developed countries showing that Keynesian policies, in general, slackened economic growth and increased unemployment.

Neoclassical thinkers argue that what South Africa needs currently is a reduction of public sector wages, which have chewed into resources that could have been allocated to public capital investment to improve the long-run productivity of the economy and its labour absorption capacity (Burger & Calitz, 2021; Burger et al., 2016). Thinkers in this camp argue that fiscal consolidation

must be deepened and hastened to create fiscal space for investing in long-run economic performance and reduction in unemployment. Yet, critical perspectives have shown that fiscal consolidation, a neoliberal strategy, has been the root cause of unemployment in many a struggling economy (Kelton, 2020; Sawyer, 2020). Esteban-Pretel, Meng, and Tanaka (2021) and Tanaka (2022b) have shown that Japan's lost decade was driven by falling productivity and unemployment problems. Their central argument is that expansionary fiscal policy rather than fiscal consolidation played a crucial role in halting the rising unemployment. Indeed, Betti and Coudert (2022) showed the coexistence of public sector wage cuts and rising unemployment, a point that several Post-Keynesians have pointed out repeatedly also (Sawyer, 2020; Watts & Sharpe, 2013).

The generally accepted conclusion is that rising total factor productivity in the economy eventually reduces unemployment. However, Fernandez-Marquez, Fuentes, Martínez, and Vazquez (2018) found changes in total factor productivity to have mixed effects on unemployment and fiscal variables. However, Zhu (2022) confirmed that unemployment and productivity have a U-shape such that increasing productivity reduces unemployment to lower levels than the turning point. Still, beyond it, rising productivity worsened unemployment. The failure to find a clear-cut empirical relationship between productivity and unemployment is considered a challenge induced by the complexity and impossibility of establishing a simple theoretical relationship. Lama and Medina (2019) established an interaction effect between fiscal variables (e.g. spending and taxation) and total factor productivity that reduced unemployment and budget deficits, especially if wages were rigid upwards.

Similarly, Phiri and Mbaleki (2022) investigated the relationship between fiscal expenditures, revenues, and labour productivity in South Africa and found that both spending and tax variables benefited labour productivity. However, the theoretical link between taxation and labour productivity was tenuous. The effect of fiscal deficits on unemployment remains a major point of discussion, with many conflicting empirical findings. Fedeli, Forte, and Ricchi (2015) found that the OECD fiscal deficits worsened unemployment in the short and long-term. Yuan, Leiling, Saydaliev, Dagar, and Acevedo-Duque (2022) confirmed the short-term positive effect of the interaction between fiscal deficits and productivity on unemployment.

The stubborn levels of unemployment in South Africa are immune to market-based solutions and require strategic and scaled-up fiscal interventions through public works programmes. To this effect also, Modern Monetary Theory scholarship has demonstrated that a job guarantee programme, designed to be a permanent fiscal institution that accommodates a variety of skills and occupations, would always act as a super-automatic stabilizer (Esteban-Pretel et al., 2021; Kelton, 2020; Tanaka, 2022a). They argued that it would provide a long-term solution to the decent job deficit. South Africa has monopolistic and oligopolistic goods and labour markets, which tend to worsen the unemployment problem. Tanaka (2022) has shown that under such conditions of concentrated market power in factor and goods markets, continuous fiscal deficits are a sustainable solution to the problem of unemployment and weakening productivity.

South Africa is relatively integrated into the global financial system and experiences moderate to high levels of capital mobility. Despite receiving a lot of foreign direct investment, Banerjee, Galiani, Levinsohn, McLaren, and Woolard (2008) described the unemployment rate that remains relatively high, in the neighbourhood of 30 percent, as the long-run equilibrium unemployment in South Africa is non-responsive to market-induced solutions. Sadly, unemployment is refusing to climb down from the neighbourhood of 30 percent. However, for a group of advanced economies, Stirati and Paternesi Meloni (2021) confuted the notion of an economy having an equilibrium unemployment rate. Contrary to South African discourses, they found unemployment to drive the wage share down.

Pensiero (2022), however, found that increases in total factor productivity have a large positive effect on unemployment, especially when technology is capital augmenting rather than labour augmenting. Krutova, Koistinen, Turja, Melin, and Särkikoski (2021) concurred that technology-induced productivity tends to worsen unemployment, suggesting that the technology is capital-augmenting. Contrarily, Kapeliushnikov (2019) dismissed, with many empirical and theoretical arguments, the claim that technology worsened unemployment through job destruction.

Instead, in the history of technological revolutions, more jobs have been created, notwithstanding the noise in the relationship between technology and unemployment. Interestingly, Benigno, Ricci, and Surico (2015) established a puzzling pattern in US data that showed that unemployment had been rising while productivity had been rising. However, they demonstrated that the volatility of total factor productivity had a strong positive association with unemployment. This relationship overshadowed the negative association between unemployment and total factor productivity.

## Methods

### Empirical Model

Fiscal deficits often have lagged effects on other economic variables. This is particularly true because of the existence of policy lags such as recognition, reaction, implementation and impact lags. Total factor productivity (TFP) changes have a similar tendency to have a lagged effect on other economic variables dependent on it, such as unemployment. Based on this motivation, an autoregressive distributed lag model provides an essential framework for examining the effect of fiscal deficits and TFP on unemployment. Further, the ARDL model allows for modelling both I(0) and I(1) variables in the same regression. The ARDL ( $p, q, r, m, v, z$ ) model is specified as follows:

$$\begin{aligned} unemployment_t = & \beta_0 + \sum_{i=1}^p \beta_i unemployment_{t-i} + \sum_{j=1}^q \alpha_j deficit_{t-j} + \sum_{h=1}^r \vartheta_h TFP_{t-h} + \\ & \sum_{k=1}^m \vartheta_k (deficit * TFP)_{t-k} + \sum_{l=1}^v \vartheta_l wageshare_{t-l} + \sum_{v=1}^z \vartheta_v (wageshare * \\ & deficit)_{t-v} + \varepsilon_t \end{aligned} \quad (1)$$

In Equation (1),  $p, q, r, m$  and  $v$  are optimal lag lengths determined by the Schwarz information criterion (SIC). A number of factors informed the choice of the SIC, namely a small sample, the SIC being superior to other criteria in small samples and the fact that it determined a model whose residuals approximated the Gaussian process (Cho, Greenwood-Nimmo, & Shin, 2022; Nkoro & Uko, 2016). The error term,  $\varepsilon_t$ , is assumed to be identically and independently distributed with a mean of zero and a constant variance. A priori, fiscal deficits are expected to have mixed effects – reducing unemployment in the short run and increasing it in the long run (Marire, 2022b). The wage share has a positive effect on unemployment; TFP has a negative effect, and the interaction effect has a negative effect.

After performing an F-bounds test for cointegration on (1) and establishing a cointegrating relationship, an ARDL error correction representation can be estimated. The ARDL bounds test model can be specified as:

$$\begin{aligned} \Delta unemployment_t = & \beta_0 + \sum_{t=1}^p \beta_i \Delta unemployment_{t-i} + \sum_{j=1}^q \alpha_j \Delta deficit_{t-j} + \\ & \sum_{h=1}^r \vartheta_h \Delta TFP_{t-h} + \sum_{k=1}^m \omega_k \Delta (deficit * TFP)_{t-k} + \sum_{l=1}^v \gamma_l \Delta wageshare_{t-l} + \\ & \varphi_1 unemployment_{t-1} + \varphi_2 deficit_{t-1} + \varphi_3 TFP_{t-1} + \varphi_4 (deficit * TFP)_{t-1} + \\ & \varphi_5 wageshare_{t-1} + \varepsilon_t \end{aligned} \quad (2)$$

The coefficients,  $\varphi_1, \varphi_2, \varphi_3, \varphi_4$ , and  $\varphi_5$  are error correction long-run coefficients, and  $\beta_i, \alpha_j, \vartheta_j, \omega_k$ , and  $\gamma_l$  are short-run coefficients. The ARDL F-bounds test is applied to the joint hypothesis that  $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$ . If the observed F exceeds the upper bound critical F value of the bounds test, there is a long-run relationship; otherwise, there is none.

In turn, the ARDL error correction representation can be specified as:

$$\begin{aligned} \Delta unemployment_t = & \beta_0 + \sum_{t=1}^p \beta_i \Delta unemployment_{t-i} + \sum_{j=1}^q \alpha_j \Delta deficit_{t-j} + \\ & \sum_{h=1}^r \vartheta_h \Delta TFP_{t-h} + \sum_{k=1}^m \omega_k \Delta (deficit * TFP)_{t-k} + \sum_{l=1}^v \gamma_l \Delta wageshare_{t-l} + \theta ECT_{t-1} + \\ & \varepsilon_t \end{aligned} \quad (3)$$

In (3), we replace  $\varphi_1 unemployment_{t-1} + \varphi_2 deficit_{t-1} + \varphi_3 TFP_{t-1} + \varphi_4 (deficit * TFP)_{t-1} + \varphi_5 wageshare_{t-1}$  with  $\theta ECT_{t-1}$  whereby  $\theta$  is a measure of the speed of adjustment to the long run and ECT is the error correction term. For convergence to the long run,  $\theta \in (-2, 0)$ .

Since the model involves continuous variables interactions, interpreting the estimated results will follow the calculus approach (Kam & Franzese, 2007). For example, the effect of fiscal deficit on unemployment will have to be estimated from Equation (1) thus,

$$\frac{\partial(\text{unemployment}_t)}{\partial \text{deficit}_{t-k}} = \sum_{j=0}^q \alpha_j + \sum_{k=0}^m \vartheta_k TFP_{t-k} + \sum_{s=0}^z \vartheta_s \text{wage share}_{t-s} \quad (4)$$

Equation 4 indicates that the effect of fiscal deficit on unemployment varies at different levels of total factor productivity and wage share. The size and signs of  $\vartheta_k$  and  $\vartheta_s$  indicate how large the interaction influence modifies the effect of fiscal deficit on unemployment. Similar procedures to Equation (4) can be replicated with respect to TFP and the wage share, as well as with respect to lagged fiscal deficit and TFP.

The fiscal deficit and unemployment, and wage share data used in the study were obtained from the South African Reserve Bank and total factor productivity from the Federal Reserve Bank of St. Louis.

## Results and Discussion

### Unit Root Tests

**Table 1.** Unit root test results

	Levels	1 <sup>st</sup> difference	2 <sup>nd</sup> difference	Integration
ADF:				
Unemployment	-1.270	-3.835***		One
TFP	-0.520	-2.803*	-5.116***	Two
Deficit	-1.478	-4.451***		One
KPSS:				
Unemployment	0.399			Zero
TFP	0.498	0.259**		One
Deficit	0.156			Zero

Note: \*\*\* means  $p < 0.01$ ; \*\* means  $p < 0.05$  and \* means  $p < 0.10$

The results of the unit root tests suggest that an ARDL model can be estimated since all variables are integrated of either order zero or one, except for TFP, which is integrated of order two at 1% (order one at 10%) under the ADF test. However, the KPSS test is a superior test to the ADF; thus, it is safe to rely on the KPSS for further analysis.

### Regression Results and Interpretation

The F-bounds test in Table 2 shows that Equation (1) variables have a long-run relationship. The interpretation of the estimated results in Table 2 requires considerable care since the model has interactions of continuous variables. The coefficients in this case do not measure partial effects directly as demonstrated in Equation (4) (Kam & Franzese, 2007). To provide a more intuitive interpretation, the paper presents the graphs of the derivatives of unemployment with respect to current fiscal deficits, current TFP and current wage share evaluated with sample data. Graphs for lagged terms are not presented for the economy of space, but they yield similar intuition as the ones presented here. To give a dynamic view, the evaluated derivatives are plotted against time. This presentation enables a historical analysis of the resultant trends, which can be matched to some policy areas.

The trend in Figure 6 can be subdivided into four parts, namely, 1994-2002, 2002-2005, 2006-2011, and 2002-2019. The period 1994-2002 demonstrates that fiscal deficits, at various values of the wage share and TFP, increased unemployment at a diminishing rate. The period coincides with the golden years of fiscal consolidation, 1998-2008, the era of the Growth, Employment and Redistribution (GEAR) and part of the Accelerated Shared Growth Initiative South Africa (ASGISA) policies. In these periods, fiscal deficits were reduced significantly to the point of halving national debt between 1994 and 2008 (Burger & Calitz, 2021; Burger et al., 2016). Unfortunately, fiscal consolidation came at a price of rising unemployment just as heterodox

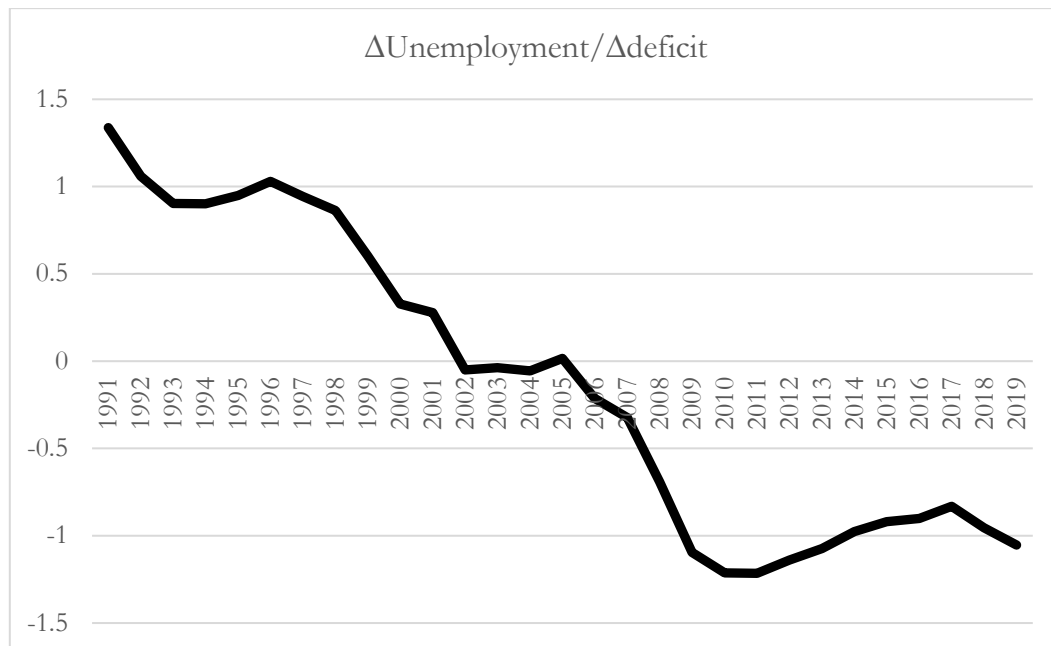


scholars maintain it should (Kelton, 2015, 2020; Marire, 2022b; Tanaka, 2022b, 2022a). The period 2002-2005 shows that fiscal deficits at various wage share and TFP levels had an almost zero effect on unemployment. This period coincides with the currency crisis of 2001/2002. The period 2006-2011 shows that fiscal deficits were associated with falling unemployment. This period coincides with the implementation of the Accelerated Shared Growth Initiative of South Africa (ASGISA), which replaced the neoliberal Growth, Employment and Redistribution (GEAR) policy of 1996-2004. The GEAR managed to deliver sound public finances but failed on some key social goals like reducing inequality, poverty and unemployment. Lastly, the period 2012-2019 indicated that fiscal deficits at various levels of the wage share and TFP reduced unemployment but at a diminishing rate.

**Table 2** ARDL regression model

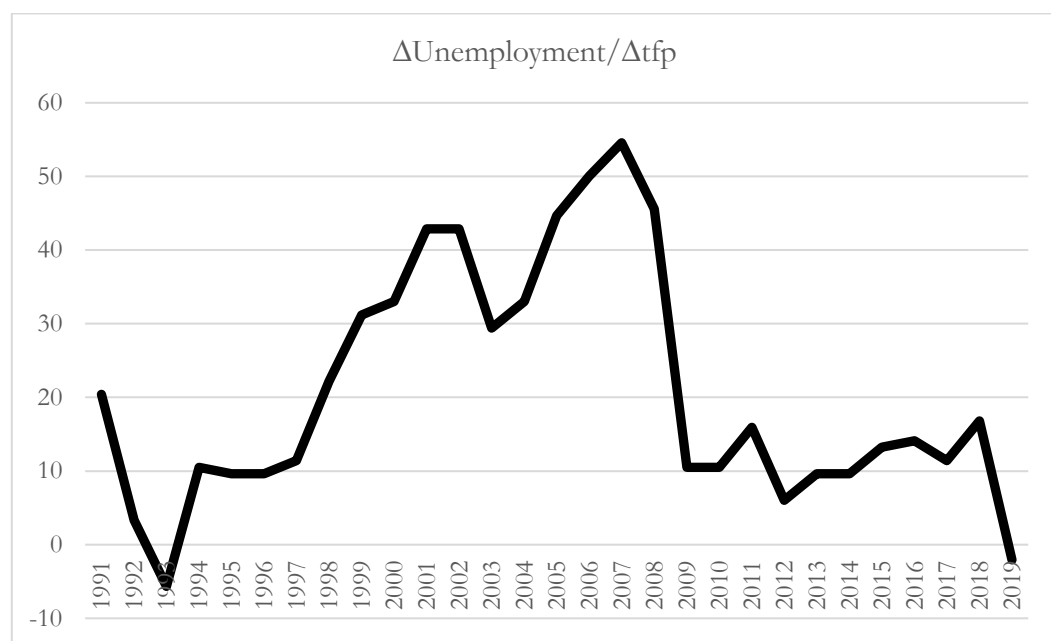
$U_t(2, 1, 0, 0, 3, 3)$	$U_t$	ECM model	$\Delta U_t$
$U_{t-1}$	0.738*** (0.161)	$\Delta U_{t-1}$	0.583*** (0.112)
$U_{t-2}$	-0.583*** (0.179)	$\Delta Wageshare_t$	35.758 (23.945)
$Wageshare_t$	35.758 (77.451)	$\Delta TFP_t$	48.280*** (10.884)
$Wageshare_{t-1}$	97.629* (49.331)	$\Delta TFP_{t-1}$	26.880** (10.311)
$Deficit_t$	-17.960*** (4.652)	$\Delta TFP_{t-2}$	39.123*** (9.049)
$Wageshare_t \times Deficit_t$	21.065*** (6.014)	$\Delta (TFP \times Deficit)_t$	8.995*** (1.040)
$TFP_t$	48.280* (23.085)	$\Delta (TFP \times Deficit)_{t-1}$	-0.829*** (0.209)
$TFP_{t-1}$	24.404 (21.718)	$\Delta (TFP \times Deficit)_{t-2}$	-0.947*** (0.199)
$TFP_{t-2}$	12.242 (23.531)	$ECT_{t-1}$	-0.845*** (0.092)
$TFP_{t-3}$	-39.123** (14.784)	Intercept	-79.802*** (8.734)
$TFP_t \times Deficit_t$	8.995*** (2.854)	$R^2$	0.861
$TFP_{t-1} \times Deficit_{t-1}$	0.144 (0.475)	$F$	11.020 [0.000]
$TFP_{t-2} \times Deficit_{t-2}$	-0.118 (0.321)		
$TFP_{t-3} \times Deficit_{t-3}$	0.947** (0.339)		
Intercept	-79.802*** (24.628)		
$R^2$	0.969		
$F, [prob]$	24.545 [0.000]		
$F$ -bounds, [5% crit. values]	9.563 [2.62; 3.79]		
Normality, $\chi^2, [prob]$	0.424 [0.809]		
Serial correlation LM, $\chi^2, [prob]$	4.018 [0.134]		
Het test, $\chi^2, [prob]$	11.736 [0.626]		
Ramsey reset, $t, [prob]$	0.456 [0.658]		

Note: \*\*\* means  $p < 0.01$ ; \*\* means  $p < 0.05$  and \* means  $p < 0.10$



Source: Author's analysis

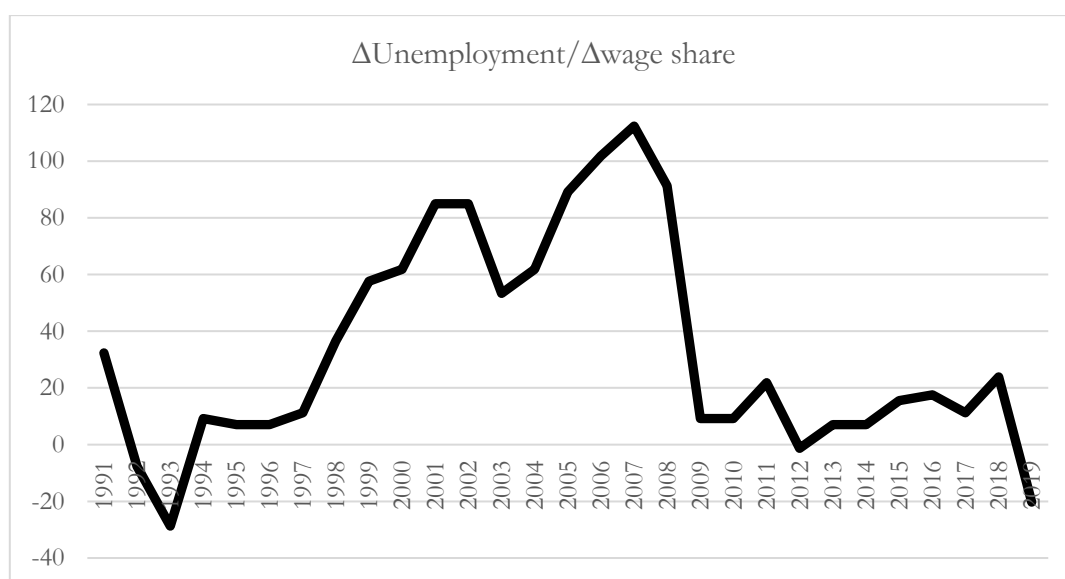
**Figure 6.** Interaction effect of fiscal deficit & TFP on unemployment



Source: Author's analysis

**Figure 7.** Interaction effect of fiscal deficit and total factor productivity on unemployment

Similarly, Figure 7 can be partitioned into four parts, 1994-2002, 2003-2007, 2007-2009, and 2009-2018. An increase in TFP, at various values of fiscal deficit, worsened unemployment at an increasing rate during the first two periods. This is a puzzling finding, but the literature explains it. The literature identifies two potential explanations: that South Africa has experienced skill intensification (Banerjee et al., 2008; Jeremy Seekings & Nattrass, 2005) and capital intensification of production processes, with technology augmenting capital more than it does labour (Ferreira, 2016). In that sense, rising TFP could co-exist with unemployment. The advent of the global financial crisis, 2007-2009, might have changed the effect of TFP on unemployment at various levels of fiscal deficit. Marire (2022a) has shown that the productivity of the South African national innovation system changed after the global financial crisis. This shift might also have impacted the link between unemployment and TFP at various levels of fiscal deficit. The effect of TFP on unemployment at all levels of fiscal deficit remained largely stable between 2010 and 2019.



Source: Author's analysis

**Figure 8.** Interaction effect of wage share and fiscal deficit on unemployment

Between 1994 and 2000, the wage share, at all levels of fiscal deficit, increased the level of unemployment at an increasing rate (Figure 8), while between 2000 and 2008, the wage share, at all levels of fiscal deficit, increased unemployment at a diminishing rate. The plausible explanation is that the growth of government size, measured by rising budget deficits, might have resulted in a larger public service. The ruling political party instituted a cadre deployment policy, which increased the employment of many black African people in public service. The cadre deployment policy's goal was to ensure that the party captured the state for its development agenda by having a loyal bureaucracy. The large public service might have resulted in severe competition with the private sector for skilled labour resulting in rising wage costs. Rising wage costs would increase unemployment. Figures 7 and 8 look identical, suggesting that the wage share and the TFP at all levels of fiscal deficit tend to have related but not similar effects.

The study's results demonstrate the value of controlling for interactions of fiscal and productivity variables in trying to explain unemployment and design inclusive economic policy interventions. The findings fit the empirical realities of South Africa. They suggest that the theoretical link between fiscal deficit and unemployment is not as straightforward as heterodox and neoclassical scholarship postulate but rather is non-linear and depends on the working out of the interactions between TFP and fiscal deficit on the one hand and fiscal deficit and the wage share on the other. The paper succeeds in demonstrating the value of controlling these interactions.

## Causality Tests

**Table 3.** Block exogeneity causality tests

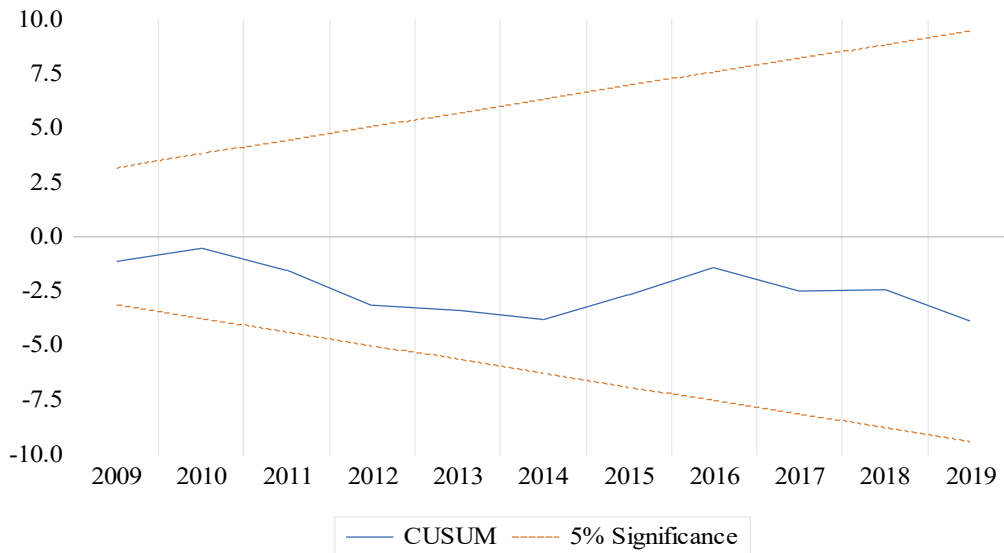
Excluded	F-stat [*t-stat]	P-value	Conclusion
Wage share	20.477	0.0002	Wage share granger causes unemployment
Deficit*	-3.861	0.0026	Deficit granger causes unemployment
Wage share x deficit*	3.502	0.0049	Interaction of wage share and deficit granger causes unemployment
TFP	7.662	0.0033	TFP granger causes unemployment
Deficit x TFP	4.929	0.0160	Interaction of TFP and deficit granger causes unemployment

Note: \* means the test statistic is a t-statistic

Table 3 shows that unemployment, TFP, fiscal deficit and wage share, as well as their interactions granger-cause unemployment. The causality tests confirm theoretical postulations that fiscal deficits, wage shares and TFP influence unemployment.

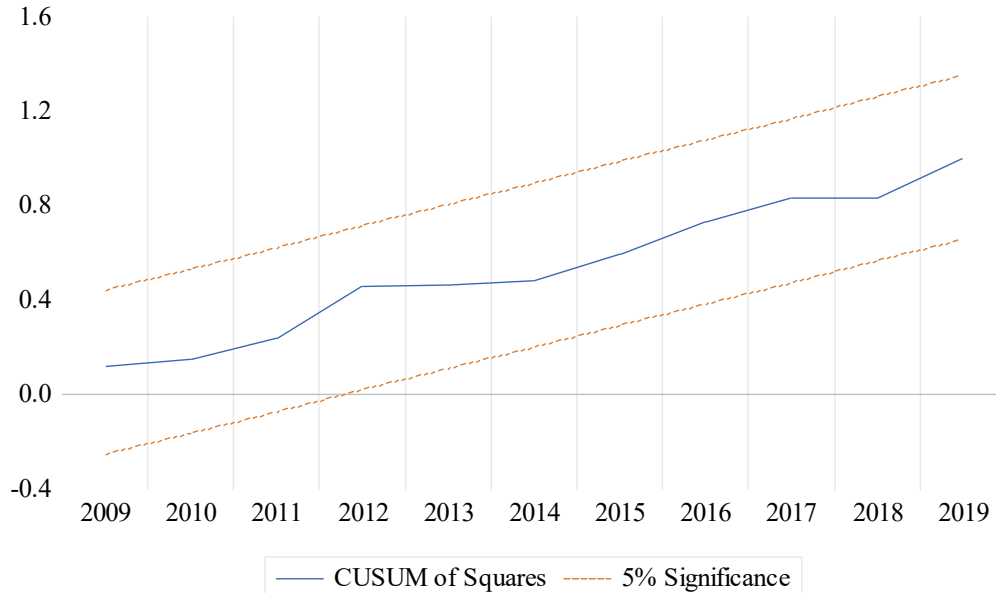
**Stability Tests**

The diagnostic tests in Table 2 suggest that the model does not suffer from classical regression problems such as heteroscedasticity, serial correlation, non-normality, as well as specification bias, judging by the Breusch-Pagan-Godfrey, Breusch-Godfrey, Jarque-Bera and Ramsey Reset tests respectively. Further, the CUSUM and CUSUM squared, Figures 8 and 9, indicate that the model's parameters satisfy the stability condition.



Source: Author's analysis

**Figure 9.** CUSUM test



Source: Author's analysis

**Figure 10.** CUSUM of squares test

**Conclusion**

The paper investigated the effect on unemployment of the interaction of fiscal deficits and total factor productivity on the one hand and fiscal deficits and the wage share on the other. The effect of the interactions has remained an unexamined issue in the context of South Africa and, more broadly, in literature. Three broad conclusions were derived from the findings. First, fiscal consolidation increases unemployment, and this is more so in the context of the interaction of fiscal deficit and total factor productivity, as well as with wage share. However, an expansionary

fiscal policy reduces unemployment, especially with rising productivity and wage share. Second, increases in total factor productivity increase unemployment at different levels of fiscal deficit. This means that the interaction of rising productivity and fiscal deficits, in the South African context, where the growth regime is profit-led always results in increasing unemployment. In this case, even technological dividends improve the earning capacity and employability of capital, not labour. Third, as the wage share increases, unemployment increases, and the effect is much more pronounced when wage share and fiscal deficit interact.

The study has both theoretical and policy implications. First, theories that explain unemployment must control for interactions of various factors that define the structure of factor markets, good markets and economic policy. Interactions help us move away from linear models that often give a partial understanding of the examined problems. For example, the demand deficiency theory of unemployment benefits from interacting fiscal parameters and variables with labour market parameters to clearly understand how a fiscal strategy will work out and whether it will achieve the intended goals. Another example is structural theories of unemployment and hysteresis of unemployment benefit from interactions.

The policy implication of the study is that South Africa needs to rethink its commitment to structural fiscal policy. For a long time, nearly 20 years, she has been pursuing fiscal consolidation while lamenting the stubbornness of unemployment. Sound finances that do not lead to an economy that works for all are not something to be particularly proud of. The policymakers need to find a middle-of-the-road approach that accommodates the policy wisdom from heterodox scholarship and the more conventional neoclassical wisdom. Since falling fiscal deficits controlling for the level of productivity and the wage share agrees with long-held claims that South Africa suffers from a structural demand deficiency driven by a low wage regime. A return to the virtuous Keynesian growth model that is wage driven seems to cure the present weak aggregate demand problem.

The findings bring a new understanding that expansionary fiscal policy does not necessarily create an economy that works for all unless active labour market institutions are set up in ways that transform the economy into an inclusive one. For example, the institution of job guarantees would result in TFP and fiscal deficits interacting in a way that reduces unemployment. Current public works programmes that provide transitory jobs provide a less effective solution to unemployment. Further, investing in innovation and productivity in an economy that is profit-led always results in jobless growth. Alternatively, even worse, destruction of existing jobs.

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