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Article

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RESEARCH ARTICLE



Inflation-income inequality nexus in South Africa: the role of inflationary environment

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ABSTRACT

We estimate vector autoregressive models to examine the effect of the 3 to 6 per cent inflation target band in the inflation and income inequality nexus in South Africa. We use quarterly data spanning 1993Q1 to 2016Q3 to analyse how growth in income inequality responds to positive inflation shocks when inflation is within the 3 to 6 per cent target band versus when it exceeds 6 per cent. Evidence indicates that positive inflation shocks within the 3 to 6 per cent inflation target band lead to an insignificant decline in income inequality. However, greater income inequality results when inflation exceeds 6 per cent threshold. This suggests that the inflation-income inequality nexus in South Africa is nonlinear due to the 3 to 6 per cent inflation target range. Thus, inflation above 6 per cent is harmful as it increases income inequality. Policymakers should pursue policies that maintain the existing target band.

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Income equality; income distribution; inflation; monetary policy

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1. Introduction

South Africa is one of the most unequal countries in the world and more than one-half of South Africans continue to live in poverty. Most recent data indicates that poverty has been rising since 2011, after almost two decades of steady declines (STATSA, 2017). Within this context, GDP growth has been weak and extremely low whereas the consumer price inflation is much higher, and the double-digit unemployment rate rose above 32 per cent in 2022. There has been a noticeable increase in income inequality measured by the Gini coefficient since the 2009 recession, following huge job losses during the period and a slow recovery in employment. Higher unemployment rates have also contributed to income inequality. As of 2023, about 19 million people are dependent on government social income grants. Policymakers are actively seeking solutions to address this problem and reduce its impact. The dependence adds strain to the fiscus which is highly funded by borrowed funds.

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The ruling political party at its national policy conference in December 2022 and previous conferences resolved to expand the price stability mandate of the South African central bank to either include economic growth or employment or unemployment rate. Habsen et al. (2020) and Chang (2022) call for the social welfare loss objectives of central banks to be modified to include income inequality. Price stability is important for monetary authorities to promote financial stability and long-term economic growth. The inflation targeting framework adopted in February 2000 requires the South African Reserve Bank to keep inflation within the 3 to 6 per cent inflation target (IT) band. D. Kim and Lin (2023) state that understanding how income inequality responds to changes in inflation is important for policymakers when deciding the extent of distributional effects of monetary policy and when designing policy stabilisation programs. Low inflation is desirable for a growing economy, while high inflation whether stable or not hurts economic growth.

In the context of the price stability mandate, this paper determines the responses of income inequality growth to positive inflation shocks when inflation is within the 3 to 6 per cent target band compared to those when inflation is above 6 per cent. This is important because some economic agents believe the optimal inflation rate that will lead to high economic growth and employment growth is above 6 per cent. The critics' alternatives are either for the inflation target to be increased above 6 per cent or the complete scrapping of the IT policy framework. By contrast, the Governor of the South African Reserve Bank, Lesetja Kganyago has called for the lowering of the inflation target to the 3 to 4 percent target band. All these pronouncements are happening in the absence of any supportive empirical analysis. It is the objective of this analysis to contribute to the discussion of the optimal inflation target band in South Africa by showing the differential effects of inflation shocks on income inequality when inflation is within the 3 to 6 per cent IT range and above 6 per cent.

The literature reports mixed results of IT on income inequality in other economies. For instance, the Altunbaş and Thornton (2022) findings contradict Menna and Tirelli (2017) who find that price stability reduces inequality and poverty when the inflation portfolio composition of the poorer household is skewed towards a larger share of money holdings. Bulir (2001a) suggests that price stabilization is beneficial for reducing income inequality by preserving the real value of fiscal transfers. Within this context this study determines the impact of positive inflation shocks within the 3 to 6 per cent IT band on income inequality in South Africa and compares them to those when inflation is above 6 per cent.

South African consumer price inflation is susceptible to domestic and global commodity and energy price shocks, which include oil prices and electricity. The COVID-19 pandemic and the Russia-Ukraine war resulted in a surge in global oil and food prices. The changes in oil and food prices significantly affect consumer price inflation in South Africa. The increases in energy prices adversely impact aggregate output and inflation. However, Choi et al. (2018) suggest that such impacts are currently lower compared to the past, as seen in developed economies. Kilian (2009) suggests that the reduced impact is due to adaptations made by economies to reduce their vulnerability to energy price shocks. Tan and Uprasen (2023) indicate disruptions due to high oil prices include a decrease in overall employment. Workers in sectors that are adversely impacted tend to remain unemployed instead of transitioning to better-performing industries while waiting for conditions to improve in

their sector. Additionally, the expensive procedures of shifting resources across industries intensify the recessionary effects. Lee and Ni (2002) indicate oil prices have significant distributional impacts across sectors and households. The differential impact across households can be particularly important because the share of income that goes to energy-intensive consumption such as utilities and transport services varies considerably between low-income households and others. The costs of increasing energy prices are expected to be unequally distributed across households, as the weight of energy in the consumption basket of the poor and the rich is not the same. Bettarelli et al. (2023) argue that higher-income households may make fewer adjustments to their spending on essentials than low-income ones in response to energy inflation, as energy-sensitive spending accounts for a smaller percentage of their income. This suggests high inflation due to high oil prices will raise the cost of living, exacerbating poverty and income inequality.

First, the motivation for this paper is due to the conflicting empirical findings regarding the effects of inflation on income inequality. None of the existing literature in South Africa has tested the direct effects of inflation shocks, when inflation is within the 3 to 6 inflation target band, on income inequality. Existing literature indicates that inflation tends to increase income inequality and a large body of empirical evidence supports the theoretical predictions showing a robust positive effect of inflation on income inequality (Afonso & Sequeira, 2023; Bittencourt, 2009; Elhini & Hammam, 2021; Roser & Cuaresma, 2016). In contrast, some studies suggest that inflation leads to a reduction in income inequality if the inflationary pressures are supply-driven, that is, when input costs increase faster than profits (Blinder & Esaki, 1978; Buse, 1982; Gramlich, 1974). Doepke and Schneider (2006) argue that supply side induced inflation shocks affect rich households more than other groups because rich households hold more long-term bonds than poor and middle-class households. Beji (2019); Herradi et al. (2023); Herradi and Leroy (2022); Gustafsson and Johansson (1999) also show that inflation significantly reduces income inequality. Considering the conflicting theoretical arguments provided in the literature, the true effects of inflation on income inequality remain an entirely empirical question.

Second, this research is motivated by the omission of the role of the initial inflation environment in the inflation-income inequality nexus debates, despite its role in determining the frequency of price changes and inflation persistence. The higher the inflation persistence the bigger the sacrifice ratio, that is, the output lost when lowering inflation permanently by one per cent. This intrinsic feature of inflation persistence matters for the inflation-inequality nexus. Dias et al. (2004) indicate that prices at the micro-level may remain unchanged for periods that can last up to several months following an economic shock depending on the initial inflation environment. This is postulated by various microeconomics theories that include explicit contract theories, and state-dependent and time-dependent pricing theories. This explains why prices may respond with a delay or not even respond to shocks. These theories have been used to explain price stickiness and its features in various literature, which includes Fabiani et al. (2004); Dias et al. (2004); Álvarez and Hernando (2004); Apel et al. (2005); Dhyne et al. (2006); Dhyne et al. (2011); and Gagnon (2008). Price changes frequently in high-inflation environments impacting income inequality amongst social groups. This is supported by Ndou and Mokoena (2019) in South Africa as they find that prices change more frequently when

inflation is above 6 per cent of the IT band. They also find that inflation is less persistent below 6 per cent compared to when it is above this threshold.

To the best of our knowledge, we are not aware of any study that assesses the redistributive effects of inflation shocks on income inequality that arise when inflation is within the 3 to 6 per cent IT band in comparison to above this band in South Africa and other inflation-targeting economies. The analysis in this paper differs from Siami-Namini and Hudson (2019) who investigated inflation and income inequality in developed and developing countries using VAR and VECM methodology but did not investigate the nonlinear effects of inflation arising within the IT bands of these economies. The analysis also differs from the approach in A. Bulir (2001b) regression model which tests the non-linear effects of inflation on income inequality by representing inflation with a set of inflation dummies, without evaluating the IT band of any of the inflation-targeting economy. The analysis also differs from Merrino (2022) who examined wage inequality under IT in South Africa based on monetary policy shocks but did not examine whether the 3 to 6 per cent IT band matters for the inflation-income inequality nexus. All the above-mentioned studies did not show the effects of positive inflation shocks when inflation is within the 3 to 6 per cent IT band on income inequality compared to when inflation exceeds 6 per cent.¹

The paper methodologically improves the analysis in Sintos (2023) which uses linear and non-linear methods to correct for publication bias while not testing for the role of the IT band on income inequality. This study differs methodologically from Altunbaş and Thornton (2022) who did not show the effects of positive inflation shocks on income inequality when inflation is within the 3 to 6 per cent IT band compared to those above the target band. This paper contributes methodologically by showing the best way to evaluate the IT band effects for policymakers who want to adjust the IT band by comparing the effects of positive inflation shocks within different IT targets. The approach in this paper will assist South African policymakers in determining the costs and benefits of raising the IT band and keeping the existing one. This cannot be evaluated from studies that use a dummy variable for the adoption of the IT band.

The analysis in this paper applies a vector autoregression (VAR) methodology to determine the impacts of positive inflation shocks on income inequality when inflation is within the 3 to 6 per cent IT band. The findings indicate that positive inflation shocks when inflation is within the 3 to 6 per cent inflation target band lead to an insignificant decline in income inequality. However, when inflation is above 6 per cent, inflation shock results in greater income inequality. This evidence contrasts with the findings of Altunbaş and Thornton (2022) who found that the adoption of an IT band has been associated with a worsening of income distribution measured by the Gini coefficient in a panel of advanced and developing economies, including South Africa. This difference between the findings in this paper and those of Altunbaş and Thornton (2022) could be attributed to the fact that this analysis uses inflation shocks relative to the 3 to 6 per cent IT bank rather than a dummy to capture the adoption of the IT framework. We conclude that the 3 to 6 per cent inflation target has induced a structural change in the inflation-income

¹<https://www.news24.com/fin24/economy/sas-45-inflation-target-not-ideal-it-should-be-lower-says-kganyago-20210908>

<https://www.businesslive.co.za/bd/economy/2021-09-08-lesetja-kganyago-supports-an-inflation-target-set-at-3/>

inequality nexus in South Africa. There is a nonlinear inflation-income inequality nexus even under the IT period when considering the 3 to 6 per cent IT band. This is explained by the GDP and employment growth rates, which rise significantly due to positive inflation shocks when inflation is within the 3 to 6 per cent IT band compared to when inflation is above 6 per cent. The results imply that policymakers should resist calls to increase the inflation target band beyond 6 per cent but rather pursue policies that enable lowering the inflation target range as it is consistent with lower income inequality.

The rest of the paper is organized as follows: [Section 2](#) deals with the stylised effects. [Section 3](#) focuses on the literature review of the effects of inflation on income inequality. [Section 4](#) deals with the transmission of inflation shocks to income inequality. [Section 5](#) describes in detail the VAR methodology and the robustness tests. [Section 6](#) presents the data and [section 7](#) discusses the estimated results. The last section gives the conclusions and policy implications.

2. Stylised effects

This section describes three main stylised data facts. The first stylised data is linked to Finn's (2015) decomposition of the Gini coefficient of income at 0.66 for 2015. The decomposition in [Figure 1](#), indicates that wage inequality accounts for 90,65 per cent of overall income inequality in South Africa, i.e., 0.6 of the 0.66 of the Gini coefficient for income. These facts indicate the centrality of overall wages to the levels of income inequality.

Furthermore, the second stylised aspect of data relates to the percentage of people in each decile who live in a household with at least one income earner as shown in [Figure 2](#). According to Finn (2015), p. 85 per cent of people in the poorest decile were not co-residents with any earner. The percentage only falls below 38 per cent from decile 4 onwards. This contrasts with the fact that over 90 per cent of people living in the top three deciles are co-residents with at least one wage earner.

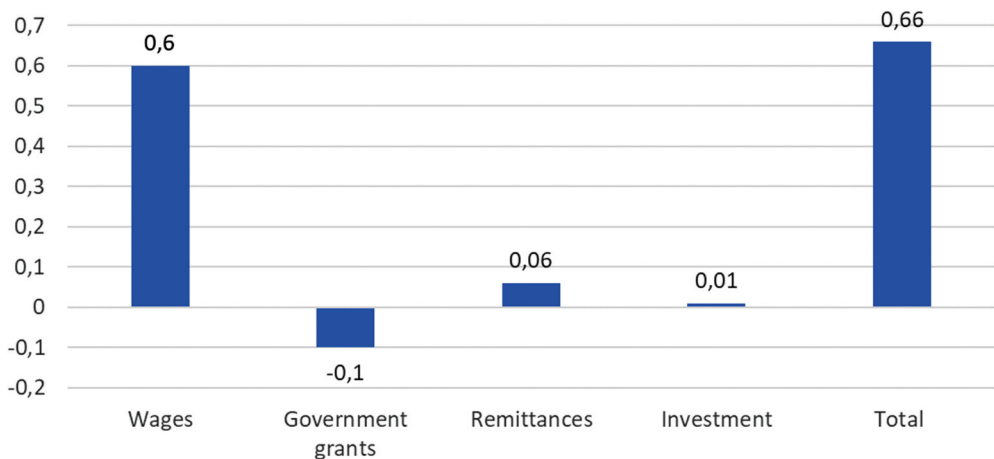


Figure 1. Components of income inequality in South Africa. Source: Data sourced from Finn (2015)

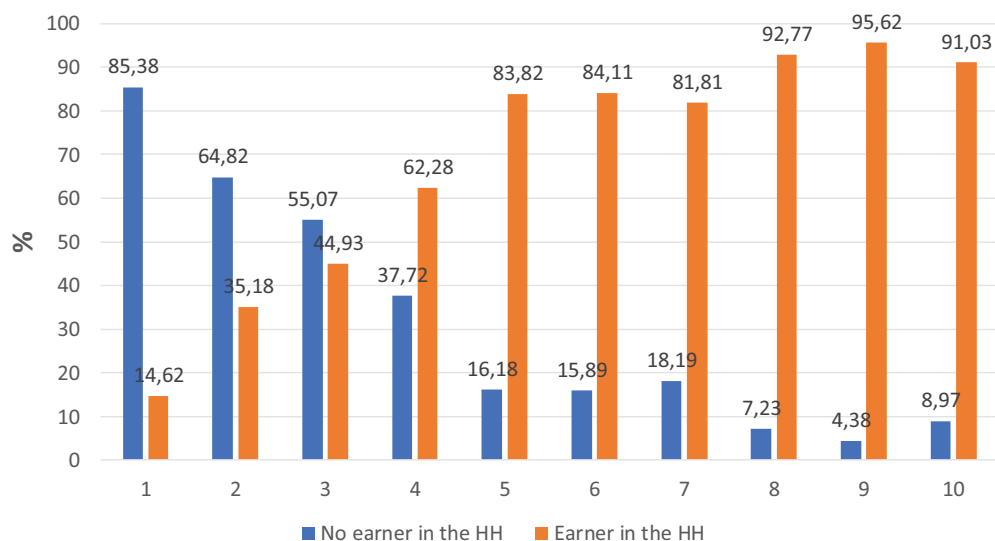


Figure 2. Presence of earners in the household in per cent by income decile. Source: Adapted from Finn (2015)



Figure 3. coefficients of inflation persistence. Source: Authors' calculations

The third stylised aspect looks at the estimate of inflation persistence coefficients based on the autoregression model of inflation on its first lag. These coefficients are separated into when inflation is within the 3 to 6 per cent IT band relative to when inflation is above 6 per cent. Figure 3 shows that the inflation persistence coefficient when inflation is above 6 per cent is more than double the coefficient when inflation is within the 3 to 6 per cent IT band. This suggests that price changes do not remain high in the low-inflation environment.

3. Literature review

The inflation-income inequality nexus is an ongoing debatable matter in South Africa and globally. Although the relationship between inflation and income inequality has

attracted the attention of many researchers, the current literature lacks a clear view of how the inflation environment affects inequality. The first strand of the empirical literature concludes that inflation has a positive and significant impact on inequality (Lindbeck & Weibull, 1987; Blejer & Guerrero, 1990; Beetsma & Van Der Ploeg, 1996; Al-Marhubi, 1997, 2000; Edwards (1997), Romer and Romer (1998); Datt and Ravallion (2011); Persson and Tabellini, 2000; Albanesi, 2001, 2007); Erosa and Ventura (2002); Ferreira and Litchfield (2001); Dolmas et al. (2000); Crowe (2004); Bittencourt (2009); Thalassinou et al. (2012); Roser and Cuaresma (2016); Ghossoub and Reed (2017), Elhini and Hammam (2021), Afonso and Sequeira, 2022). Most studies using cross-country studies find a positive relationship between inflation and income inequality.

The second strand of literature finds that inflation decreases income inequality or has tenuous or no significant effects (Clarke et al., 2006; Coibion et al., 2017; Cutler & Katz, 1991; Doepke & Schneider, 2006; Furceri & Loungani, 2018; Furceri et al., 2018; Gustafsson & Johansson, 1999; Herradi et al., 2023; Jäntti & Danziger, 1994; H. Kim & Rhee, 2022; Mocan, 1999; Parker, 1998). A third group of literature finds that inflation can induce a positive, negative, or U-shaped effect on income inequality. A. C. Chu et al. (2019) find an inverted U effect of inflation on income inequality. Zheng et al. (2020) suggest a negative nexus between inflation and income inequality. Zheng et al. (2023) find mixed results indicating a negative, positive, and U-shaped effect of inflation on income inequality which explains the empirical inconsistency. The relationship between inflation and income inequality arises when the relative dominance of wealth heterogeneity to skill heterogeneity and the ratio of interest income to labour income reacts to prevailing inflation. Monnin (2014) also documented a non-linear (U-shaped) relationship for a sample of OECD countries, and Siami-Namini and Hudson (2019) did so for developing countries.

Recent empirical studies argue that the inflation-inequality nexus is contingent on the level of the inflation rate. A nonlinearity effect of inflation on income inequality is reported in literature. A. Bulir (2001b) found an inequality-increasing effect in high-inflation countries but not in countries with low inflation. Balcilar et al. (2018) and Galli and van der Hoeven (2000) report the threshold level of inflation above which inflation raises income inequality, but below which inflation alleviates income inequality in the OECD countries and the US, respectively. Nantob (2015) finds that inequality increases and thereafter decreases as inflation rises. Binder (2019) suggests that the association between inflation and inequality depends on the interaction between political regimes and central bank independence. The link between inflation and income inequality becomes more negative as central bank independence increases in democratic European countries. Boel (2018) finds that inequality decreases for low to moderate rates of inflation, while the opposite is true when inflation moves from moderate to high levels.

Merrino (2022) examined wage inequality during the IT period in South Africa based on monetary policy shocks. The author did not examine whether the 3 to 6 per cent IT band matters for the monetary policy-income inequality nexus in South Africa. Dolado et al. (2018) find that strict inflation targeting is more successful in stabilizing the economy and limiting variations in relative income shares compared to other monetary policy rules.

4. The transmission of inflation changes to income inequality

There are various channels through which inflation impacts income inequality via economic growth. Earlier studies produced models which showed that inflation can increase capital accumulation as per the Tobin-Sidrauski portfolio shift model. Alternatively, capital accumulation may decline as per Fischer (1981). In some cases, there is no effect on capital accumulation as per the Sidrauski super neutrality model. From the empirical perspective, there are conflicting conclusions such as in Bruno and Easterly (1996) and Clark (1997). Figure 4 shows the transmission of positive inflation shocks to income inequality via different channels. High inflation will lead to high inflation uncertainty which in turn will adversely impact investment, leading to lower output and employment. The resulting unemployment leads to increased income inequality.

According to Galli and Hoeven (2001), the degree of worsening in income distribution depends on the sensitivity of investment and consumption to higher interest rates and lower expected demand, and on the elasticity of employment to output fluctuations. In periods of low business confidence and highly flexible labour markets the impact on inequality is likely to be severe. Redistribution happens when wage increases lag inflation and when price rises run ahead of wage inflation, there is a shift of income away from wage earners toward profits. Such redistributive effects via inflation raise income inequality by hurting the poor relatively more than the rich (Fischer & Modigliani, 1978; Laidler & Parkin, 1975). The other channel operates via inflation and output

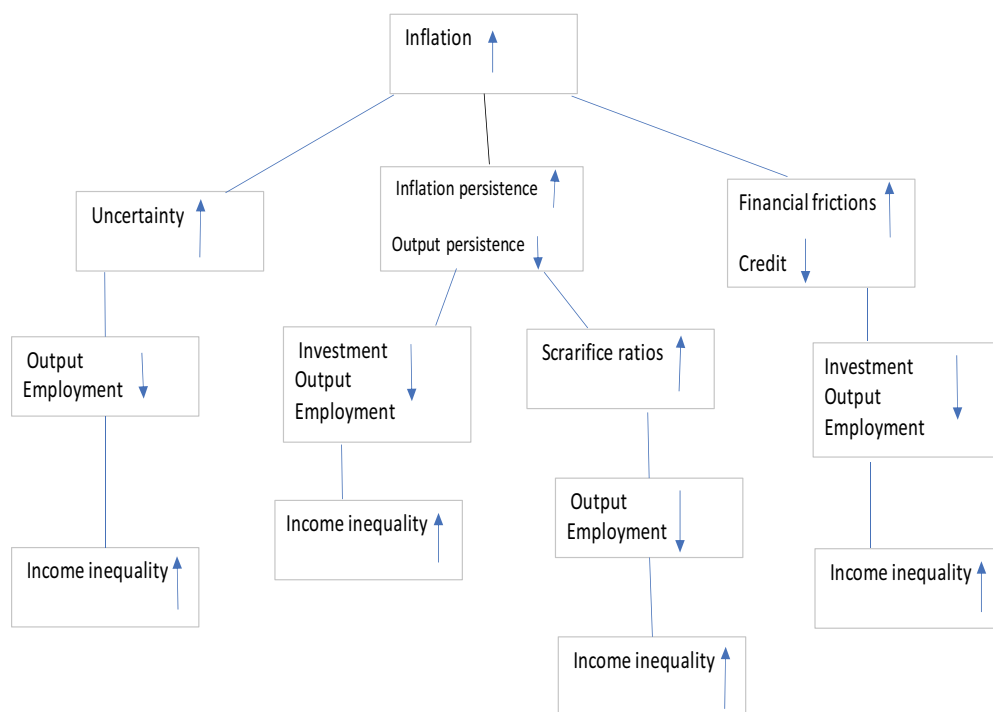


Figure 4. The transmission of the positive inflation shocks to income inequality. Source: Author's drawing

persistence. High inflation persistence will require a prolonged monetary policy disinflation stance, leading to high output sacrifice ratios. The prolonged disinflationary policy stance will lower output which via Okun's law predictions lowers employment and the high unemployment rate will raise income inequality.

The last channel involves the role of friction in the credit markets. High inflation leads to high interest rates, which raises the risk premium, making it expensive to access credit markets. The redistribution of income through inflation occurs via the debtor-creditor hypothesis following the interest rate increase as assets are expressed in terms of money without fully adjusting to the inflation rate. The increased cost of credit will retard investment which adversely impacts output and consequently impacts employment, and the high unemployment rate leads to increased income inequality.

There are other channels involving the role of fixed investments which are not depicted in [Figure 4](#). A lower inflation rate will slow down the loss in purchasing power of non-inflation-indexed nominal fixed incomes arising from the pensions and government transfers compared to the indexed nominal capital income. In those economies where the poor are the majority and get a bigger percentage of their income from transfers than the wealthy households, lower inflation should slow down the rise in income inequality (Albanesi, 2007; Erosa & Ventura, 2002; Easterly & Fischer, 2001). Romer and Romer (1998) suggest that in the short run, the inflation rate will affect income inequality through the business cycles linked to the policy change. Other studies such as Funk and Kromen (2010) as well as Vaona and Schiavo (2007) postulate that in the long run, lower inflation will positively affect the economic growth of countries which initially had high inflation. Whereas in low and moderate inflation countries, inflation does not affect economic instability. Such an outcome can put off investment which then restrains economic growth in the long run.

5. VAR methodology

The analysis in this paper estimates a vector autoregression (VAR) model to determine the relationship between income inequality and consumer price inflation as done by Siami-Namini and Hudson (2019), and Muhibbullah and Das (2019). The VAR approach has advantages over the linear regression model as it limits endogeneity issues that may arise if the economy with greater inequality were more liable to adopt populist policies including higher inflation targets. It allows for the feedback effects between variables. For instance, literature determines the effects of inflation on income inequality and vice versa, the effects of income inequality on economic growth and vice versa, effects of economic growth on inflation and vice versa. Hence, using a VAR approach allows for the feedback effects. We do not use an SVAR approach as we do not have strong a-priori restrictions. Hence, we test the results in different ordering following the literature that examines different aspects of the inflation-inequality nexus.

The analysis uses the main macroeconomic variables displayed in [Figure 4](#) in the model. Income inequality is measured by the Gini coefficient as used in M. A. Bulir and Gulde (1995), Cole and Towe (1996), Sarel (1997), Romer and Romer (1998), Johnson and Shipp (1999), Dollar and Kraay (2002), Erosa and Ventura, (2000), K. Y. Chu et al. (2000), Li and Zou (1998, 2002), Easterly and Fischer (2001), A. Bulir (2001b), Albanesi (2007), Thalassinou et al. (2012), Siami-Namini and Hudson (2019), Muhibbullah and Das (2019) and Sintos (2023). We determine the nonlinear effects of positive shocks on inflation

by using two inflation dummy (*infl_dummy*) variables. The first dummy takes the value of inflation when inflation is within the 3 to 6 per cent target band and zero otherwise. The second dummy equals the value of inflation when it is above 6 per cent and zero otherwise. The inflation dummy variables are included separately in the model estimations.

The VAR model is given by

$$A_0 Y_t = \alpha + mX_t + \sum_{k=1}^n A_k Y_{t-k} + v_t \quad (1)$$

where v_t is the vector of serially and mutually uncorrelated structural innovations. For estimation purposes, the model is expressed in reduced form as follows:

$$Y_t = b + DX_t + \sum_{i=1}^n B_i Y_{t-i} + e_t \quad (2)$$

where $b = A_0^{-1}\alpha$, $D = A_0^{-1}m$, $B_i = A_0^{-1}A_k$, $e_t = A_0^{-1}v_t$, and the vector of endogenous variables $Y_t = (\text{infl_dummy}, \text{Ginigrowth}, \text{GDPgrowth})$ for all k , and it is postulated that the structural impact multiplier matrix A_0^{-1} has a recursive structure such that the reduced-form errors e_t can be decomposed according to $e_t = A_0^{-1}v_t$, where the sizes of shocks are standardized using the Cholesky decomposition. We do not use SVAR model because we are not testing different competing theories. In addition, we do not apply the Blanchard and Quah (1998) approach as we do not perform decomposition between long run and short run effects. on. Gini growth is the annual growth rate in Gini coefficient. The inclusion of income inequality and economic growth is based on various economic theories. These theories associate income inequality with economic growth. The first is the political economy approach advanced in Alesina and Rodrik (1994), Persson and Tabellini (1994). There is also the socio-political instability approach as in Perotti (1993), Alesina and Perotti (1996); and Benhabib and Rustichini (1996). Lastly, is the imperfection of capital markets approach in Chiu (1998), Galor and Zeira (1993), Aghion and Bolton (1992, 1997), Banerjee and Newman (1993) and Aghion et al. (1999). In the *baseline* equation (1), the exogenous variables in X_t are the 2007 global financial crisis dummy and inflation targeting dummy. The global financial crisis dummy equals one from 2007Q3 to the end of the sample period, and zero otherwise. The inflation targeting dummy equals one from February 2000 to the end of the sample and zero otherwise. GDP growth is ordered last in the modelling which suggests that both inflation and income inequality affect GDP growth contemporaneously. This is consistent with literature that determines the effects of rising inflation and income inequality on GDP growth.

In the model, the identification of structural shocks is achieved by appropriately ordering the variables and applying the Cholesky decomposition to the variance-covariance matrix of the reduced form for residuals e_t . Inflation is ordered first. This follows studies examining the impact of inflation on income inequality which include M. A. Bulir and Gulde (1995), Sarel (1997), Romer and Romer (1998), K. Y. Chu et al. (2000), Dollar and Kraay (2002), Easterly and Fischer (2001), A. Bulir (2001b), M. A. Bulir and Gulde (1995), Johnson and Shipp (1999), as well as Cole and Towe (1996). Income inequality is ordered after inflation, suggesting it is contemporaneously impacted by inflation. Economic growth is ordered last implying it responds contemporaneously to both inflation and income inequality. This inclusion is motivated by Kaldor (1957), who showed that a trade-off between low inequality and economic growth. Forbes (2000) indicates that high inequality may stimulate economic growth. Other

studies such as Castello-Climent (2004) and Vo et al. (2019) differed from Forbes (2000) indicating that unequal distribution of income leads to declining economic growth. Idowu and Adeneye (2017) also found that in developing countries high inequality impedes economic growth, but high inequality facilitates higher economic growth in developed economies. The models are estimated using two lags as determined by the Hannan-Quinn Criterion statistics and 10 000 Monte Carlo draws. The error bands denote the 16th and 84th percentile confidence bands.

5.1. Robustness testing

The first robustness test entails testing the results to the sensitivity of different orderings. The analysis uses the following ordering: Gini coefficient growth, GDP growth and *infl_dummy*. This follows literature which postulates that economic growth impacts income inequality while other literature hypothesises that rising income inequality has adverse effects on economic growth.

The second robustness test involves adding employment growth as an endogenous variable in the baseline model. In the model, Y_t is a vector of endogenous variables, namely, the *infl_dummy*, Gini coefficient growth, GDP growth and employment growth. We test the results to the following ordering: Gini coefficient growth, GDP growth, employment growth and *infl_dummy*. The third robustness test involves changing the sample period. We split the sample into 1993Q1 to 2016Q3 and 2000Q1 to 2016Q3. We further test the results of differing lag lengths. These impulse responses are shown in the Appendix.

6. Data

The data used in the study spans the period 1993Q1 to 2016Q3. The data is extracted from the databases of the SARB and Statistics South Africa (Statsa).² Income inequality is captured by the Gini coefficient sourced from Statsa and Gumata and Ndou (2017). Figure 5 shows the evolution of inflation relative to the 3 to 6 per cent IT band. The light grey shaded portions indicate periods during which inflation was within the 3 to 6 per cent target band. Since 1993 two high peaks of inflation were observed in 2002 which coincided with the rand/US dollar exchange rate depreciation, following the tech stock crash and 2008 following the global financial crisis.

The basic relationships between income inequality and inflation when inflation is within the inflation target band are shown in Figure 6.

The test of various unit root tests using the Augmented Dickey Fuller tests, Phillips Perron and Zivot and Andrews structural Break test are presented in Table 1. The null hypothesis is that variables have a unit root and therefore nonstationary. The test results indicate that the Gini coefficient growth, repo rate changes, and GDP growth are $I(0)$, indicating they are stationary. However, the Augmented Dickey-Fuller test indicates that inflation is $I(1)$ while Phillips Perron indicates $I(0)$. Zivot indicates the variables are stationary including structural breaks.

²The sample ends at the period as the national Statistical agency will be undertaking its Household income and expenditure survey in 2023/2024 after which they will update the income inequality series over the past years.

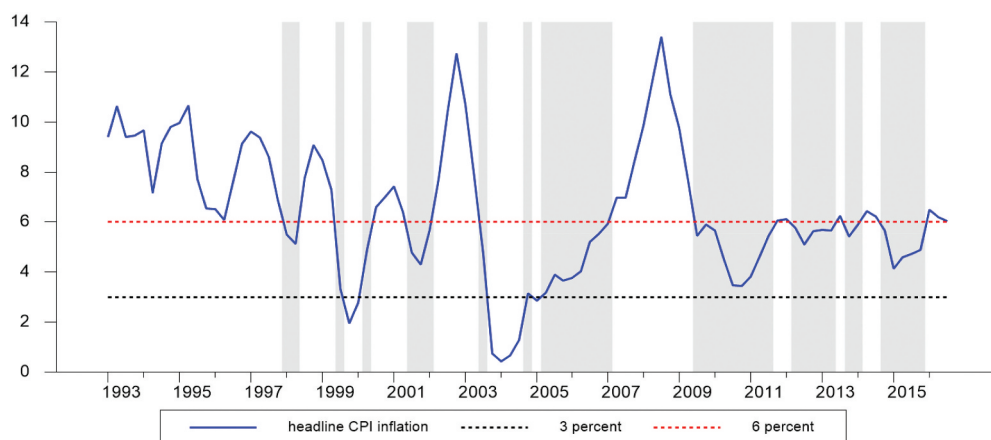


Figure 5. Inflation trajectories and periods when inflation was within the target band. Source: South African Reserve Bank and authors' calculations Inflation targeting was adopted in February 2000

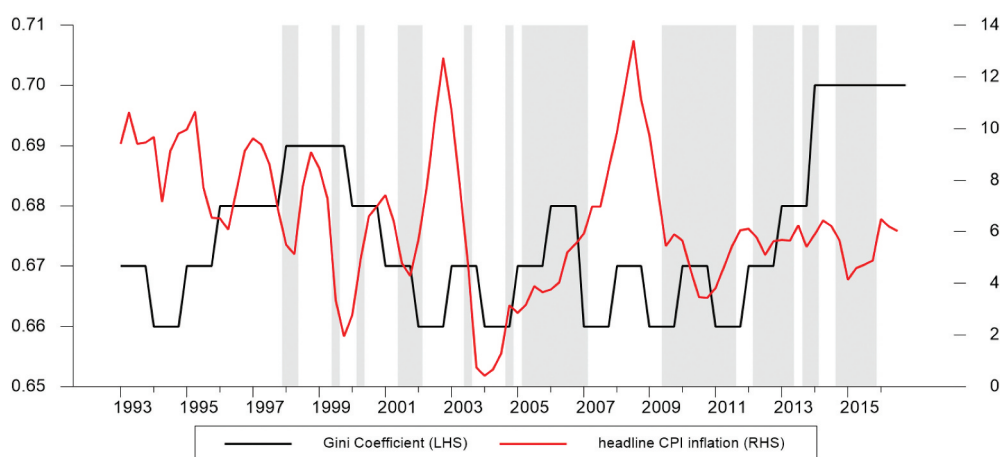


Figure 6. Income inequality and inflation dynamics. Source: Authors' calculations

Table 1. Unit root tests.

	Augmented Dickey fuller test		Phillips Perron test		Zivot and Andrew
	Constant	Constant & Trend	Constant	Constant & Trend	
Gini growth	-4.05980***	-4.04177**	-4.1666***	-4.17999***	-7.84314***
Repo rate changes	-6.33516***	-6.30033***	-6.2176***	-6.21740***	-5.95610***
GDP growth	-2.91468**	-3.22261*	-3.5536***	-3.75626**	-4.66906*
CPI inflation	-2.71743	-2.74992	-3.2061**	-3.31335*	-5.14337**

Source: Authors calculation.

Note. *** denotes significant 1%, ** significant at 5 %, * denotes significant at 10%

7. Empirical results

7.1. Evidence from the three-variable VAR model

In Figure 7 a) a one percentage point increase in inflation within the 3 to 6 per cent target band leads to an insignificant decline in income inequality growth. This finding contrasts with dynamics in Figure 7 b), which reveals a significantly greater income inequality to positive inflation shocks when inflation is above 6 per cent. In addition, the impulse responses of GDP growth are different depending on where inflation resides relative to the target band. Positive inflation shocks raise GDP growth significantly when inflation is within 3 to 6 per cent, whereas GDP growth declines significantly when inflation is above 6 per cent. This evidence indicates that the inflation target band brought a structural change in the relationship between inflation and income inequality. These findings are robust to the different orderings of the variables in the model and using a short sample period as displayed in Figure A1 in the appendix using the sample spanning 2000Q1 to 2016Q3. The positive relationship between inflation and inequality in a high-inflation environment is consistent with the findings of Beetsma and Van Der Ploeg (1996), Al-Marhubi (1997), Romer and Romer (1998) and Albanesi (2001, Albanesi, 2007). There is link between GDP and income inequality dynamics. Income inequality rises (declines) while GDP growth declines (rises) in a low inflation environment. This concurs with the findings of Roine et al. (2009) and Afandi et al. (2017) that economic growth causes inequality.

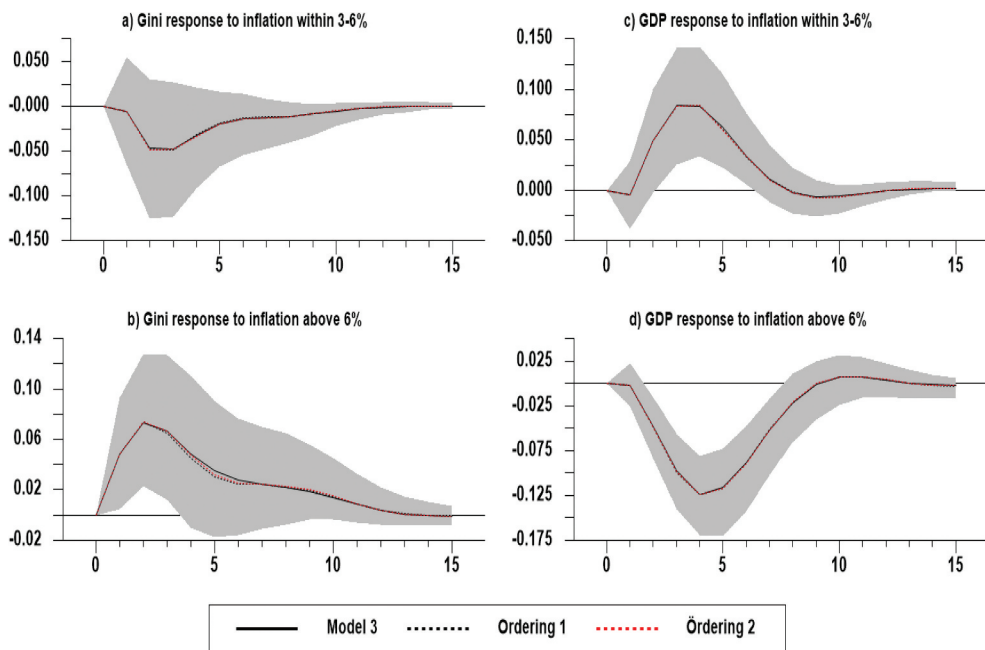


Figure 7. Income inequality responses in baseline VAR model. Source: Author's calculations. The ordering of variables in ordering 1 is as follows: GDP growth, infl_dummy and Gini growth. The ordering of variables in ordering 2 is as follows: Gini growth, infl_dummy and GDP growth. The infl_dummy refers to the dummies for inflation within 3 to 6 per cent and when above 6 per cent as defined in an earlier section.

7.2. Evidence from the four-variable VAR model

We compare the responses of income inequality growth, GDP growth and employment growth to positive inflation shocks that arise when inflation is above 6 per cent to those when inflation is within the 3 to 6 per cent target band in Figure 4. Both inflation shocks are transitory in Figure 8 a). Income inequality growth rises over one quarter when inflation exceeds 6 per cent. This contrasts with an insignificant decline when inflation is within the 3 to 6 per cent band. In Figure 8 c) and d) the GDP and employment growth rises to positive inflation that arises within 3 to 6 per cent, whereas these variables contract to shocks arising in inflation above the 6 per cent threshold. This suggests that the 3 to 6 per cent target band induced a structural change in the inflation-income inequality nexus. These findings support the results in Galli and Hoeven (2001) and A. Bulir (2001b) who show that the impact of inflation on inequality is nonlinear and depends on the initial level of inflation. Balcilar et al. (2018) find that when inflation is above a threshold of about 3 per cent, it affects relative prices and increases income inequality.

We further show the responses to positive inflation shocks to a general positive inflation shock to those when inflation is within the 3 to 6 per cent band. In Figure 9 a), the inflation shock tends to persist significantly for 5 quarters to general positive inflation. The response of inflation when inflation is within 3 to 6 per cent is high transitory. The income inequality rises significantly to a general inflation shock until the third quarter. This contrasts with the insignificant decline in income inequality growth due to positive inflation shocks arising within the 3 to 6 per cent band. The GDP and employment growth rise significantly to positive inflation arising within the 3 to 6 inflation band for 6 and 8 quarters respectively. GDP and employment decline significantly due to general positive inflation shocks. In absolute terms, the peak declines in GDP and employment growth are bigger to general positive inflation shocks and when inflation exceeds 6 per cent. It is this trade-off between

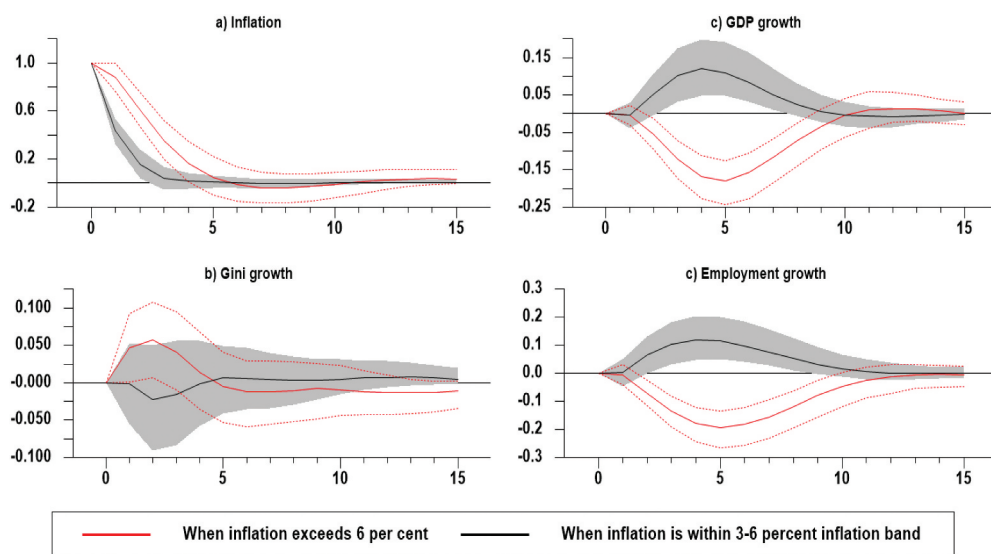


Figure 8. Comparisons of the responses of income inequality growth and employment growth to a positive inflation shock. Source: Author's calculations

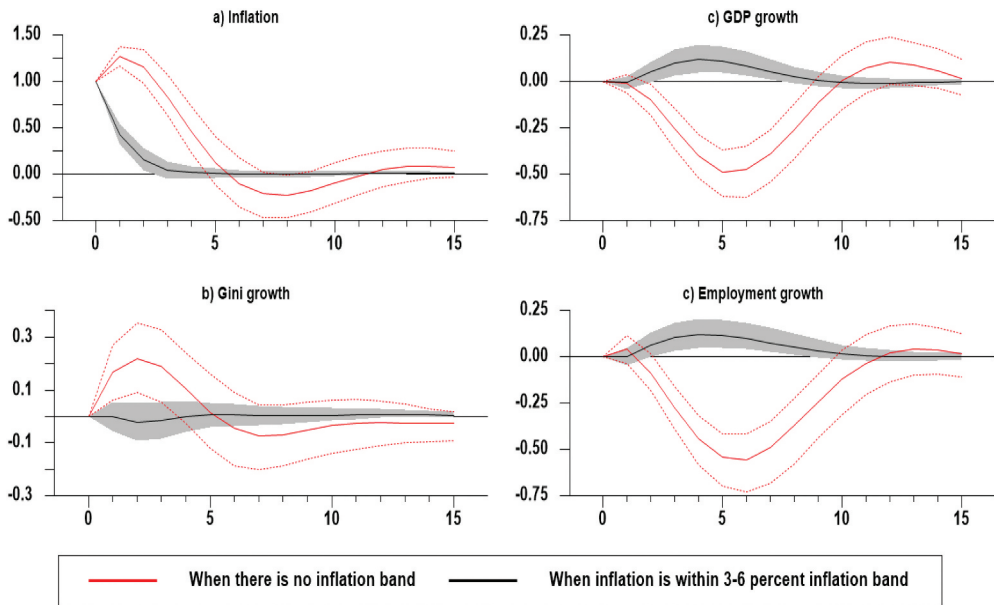


Figure 9. Comparisons of the responses of income inequality growth and employment growth to a positive inflation shock. Source: Author's calculations

inflation and unemployment which impacts the link between inflation and income inequality, and this is dependent on the initial level of inflation. This is exacerbated as in Wyplosz (2000) and Ribba (2003) by the prevalence of downward rigidities in nominal wages which implies that monetary policymakers reducing inflation to lower levels will lead to a bigger rise in unemployment. This evidence concurs with Galli and Hoeven (2001) findings of an increase in income inequality in the high initial inflation rates. However, a decrease in inequality income occurred at low initial inflation rates. In addition, Blejer and Guerrero (1990) as well as Albanesi (2007) conclude that the distribution of income was worsened by inflation.

The difference in the income inequality growth reactions to positive inflation shocks between low inflation and high inflation environments can be explained by several microeconomic theories, which point to the role of price stickiness or rigidities and frequency of price changes depending on the level of inflation. The key explanation lies in the transitory nature of inflation when inflation is within 3 to 6 per cent compared to above 6 per cent. This contrasts with the inflation increase which tends to be persistent to positive inflation shocks arising above the 6 per cent inflation threshold. Ndou and Mokoena (2019) found that prices are less flexible or exhibit rigidity below 6 per cent than about this threshold consistent with the menu costs theory.

We also point to the influence of the Ball et al. (1988) postulation in which firms are assumed to be able to set prices, but changing prices involves costs, which makes it be done infrequently. Hence, only a fraction of all firms would alter their prices at any one time. These authors postulate that when firms initially maximize profits, a demand or supply shock may not cause price movements because the gain to the firm from altering the prices in the immediate area of the maximum could be small and need not exceed the

associated adjustment costs. In this context, the adjustments will take place gradually from an aggregate perspective. In addition, Ball et al. (1988) and Defina (1991) indicate that in a high-inflation environment, this is not the case as inflation trends much higher, so profit-maximizing firms change prices more quickly on average, which in turn, raises the benefits from more frequent price adjustments. So, higher average inflation leads to more frequent price adjustments such that shocks lead to larger nominal effects as inflation ratchets upward.

The transitory inflation increases in a low-inflation environment, maybe related to the role of the inflation environment, in which economic agents understand price stability, which reduces the need to change prices in a low-inflation regime. The small reaction in the low-inflation environment could be due to barriers to immediate price adjustment as alluded to Fabiani et al. (2004), Dias et al. (2004), Álvarez and Hernando (2004), Apel et al. (2005), Dhyne et al. (2006) and Gagnon (2008). In these settings, firms need to maintain long-term relationships with customers. This may be due to the prevalence of explicit contracts, which have stated the agreed price, which is changed through renegotiations and coordination problems as firms prefer not to change prices unless their competitors do so. Due to the costs of gathering information, in a non-price competition, firms will react to shocks by changing the features of products and not the price. Moreover, firms may be unwilling to do price re-adjustment as they regard the shock as transitory.

The impact of inflation on inequality has also been the subject of a long-standing literature debate, which emphasizes that the distributional effects of inflation can occur through various channels (Albanesi, 2007; Easterly & Fischer, 2001; Erosa & Ventura, 2002; Jaravel, 2021; Romer & Romer, 1999). Households' exposure to inflationary pressure can be very uneven, depending on their consumption profile (Charalampakis et al., 2022). In this view, the poorest are expected to suffer more from inflation, as they lack savings to smooth their consumption over time (Albanesi, 2007). Moreover, they hold savings in cash or in low-interest-rate bank accounts that are not protected from inflation, while richer people very often hold assets that can be shielded from inflation or inflation-linked bonds (Galli & Hoeven, 2001; Doepke and Schneider, 2006). Low-income workers may also experience lower real wages, if inflation exceeds pay rises, due to their lower bargaining power (Easterly & Fischer, 2001). The empirical evidence generally finds that higher inflation raises income inequality (M. A. Bulir & Gulde, 1995; Crawford & Smith, 2002; Garner et al., 1996; Hobijn & Lagakos, 2005). Figure A2, Figures A3 and A4 in the Appendix show the impulse responses to different ordering of the variables.

7.3. Robustness in using the inflation targeting period (2000Q1 to 2016Q4)

The preceding analysis used data spanning 1993Q1 to 2016Q4 and this sample includes data before the adoption of the IT framework in February 2000. It may not be a good approach to use the 3 to 6 per cent threshold band for the pre-inflation targeting period, hence we show the results using data from the IT period only in Figures 9 and 10.

There are similarities in impulse responses in Figures 11 and 8. The positive inflation shocks that arise within the 3 to 6 per cent band lead to an insignificant lesser income inequality growth with a significant increase in GDP growth and employment. This contrasts with the significantly greater income inequality growth to positive inflation

shocks arising from inflation above 6 per cent. In addition, the impulse responses shown in Figure 11 conform to those shown in Figure 9. This shows the results are robust to change periods under review. We conclude that the 3 to 6 per cent threshold brought a structural change in the inflation-income inequality nexus in South Africa. The finding is robust to the inflation targeting period and the periods that include both before and during the inflation targeting period.

These findings concur with conclusions in Narob (2015) that there is a non-linear relationship between inflation and income inequality. They found that inflation has a positive significant effect on income inequality indicating that higher inflation is associated with higher income inequality. However, their inflation rates are extremely large and higher inflation raised income inequality through economic growth. The results support evidence in A. Bulir (2001b)'s regression model which found the non-linear effects of inflation on income inequality by representing inflation with a set of inflation dummies. Li and Zou (2002) find that high inflation worsens income inequality and reduces the economic growth rate. Thalassinou et al. (2012) also states that inflation has a positive influence on the inequality of income in European countries.

7.3.1. Forecast error variance decompositions

We determine the forecast error variance decompositions of income inequality growth in a model with inflation within 3 to 6 per cent and when inflation exceeds 6 per cent.

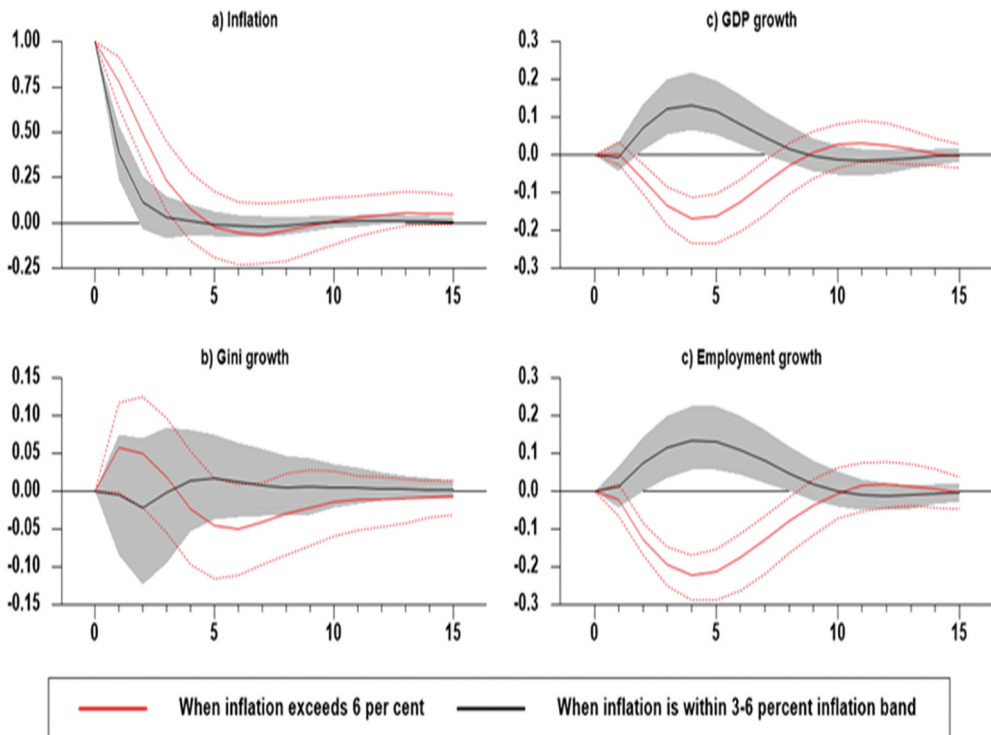


Figure 10. Comparisons of the responses of income inequality growth and employment growth to a positive inflation shock in 2000Q1 to 2016Q4. Source: Author's calculations

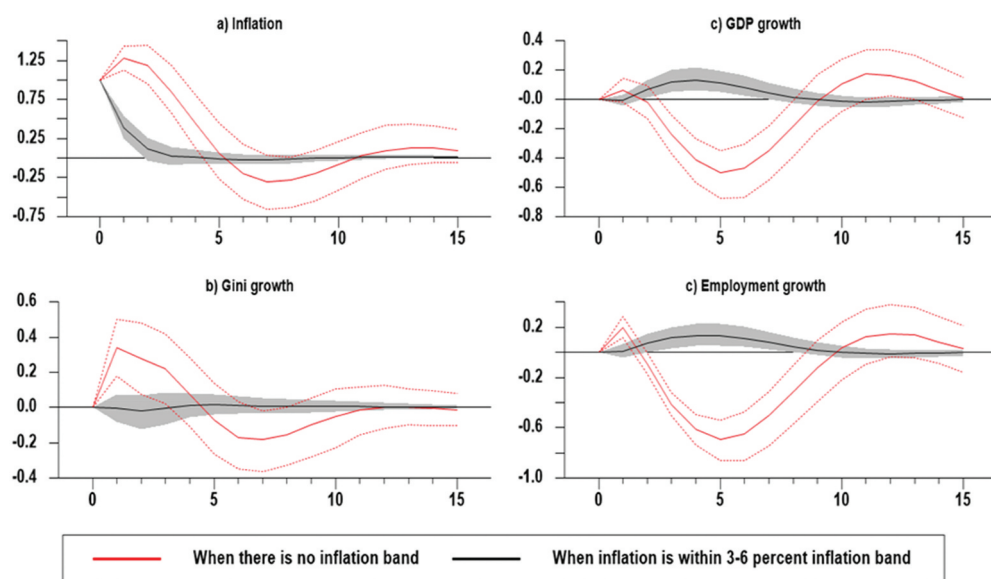


Figure 11. Comparisons of the responses of income inequality growth and employment growth to positive inflation shock in 2000Q1 to 2016Q4. Source: Author's calculations

In [Table 2](#), inflation within 3 to 6 per cent explains less than one per cent of movements in income inequality growth. More than 84 per cent of movements in income inequality are due to their own movements in income inequality. Employment growth explains more than 10 per cent of movements in income inequality growth after 5 quarters. Thus, GDP growth explains less than 3 per cent of movements in income inequality growth. [Table 3](#) shows the forecast error variance decomposition of income inequality growth in a model which includes inflation above 6 per cent. In [Table 3](#) inflation above 6 per cent explains about 3 per cent of movements in income inequality, and this is much higher than movements explained by inflation within 3 to 6 per cent. A large proportion of movements in income inequality is explained by its movements rather than GDP and employment growth.

7.4. Examining the channels of transmission

We conclude the analysis by showing the impulse responses of income inequality and variables deemed to be important channels of transmission of positive inflation shocks to income inequality. We show the impulse responses from the four-variable VAR model to shocks arising in inflation within different inflation bands.

The impulse responses shown in [Figures 12 and 13](#) point to an inverse relationship between income inequality and GDP and employment growth. When GDP and employment rise, to positive inflation shocks, arising within the target band, the income inequality growth declines. In the low inflation environment, this is working via capital accumulation as in the Tobin-Sidrauski portfolio shift model, which raises economic growth and lowers income inequality. However, the opposite is observed to those shocks to inflation above 6 per cent. The results indicate that GDP and employment growth are transmitters of inflation shocks to

Table 2. Forecast error variance decompositions of income inequality growth.

Steps	Std Error	Inflation within 3 to 6 percent	Income inequality growth	GDP growth	Employment growth
1	1,045	0,313	99,687	0,000	0,000
2	1,318	0,233	99,247	0,426	0,094
3	1,398	0,479	97,568	0,404	1,548
4	1,442	0,735	93,254	0,593	5,418
5	1,474	0,812	89,317	1,112	8,758
6	1,493	0,817	87,053	1,526	10,604
7	1,502	0,812	86,050	1,667	11,470
8	1,505	0,809	85,641	1,668	11,883
9	1,508	0,808	85,407	1,686	12,099
10	1,509	0,817	85,194	1,766	12,223
11	1,511	0,840	84,991	1,871	12,299
12	1,513	0,874	84,826	1,957	12,344
13	1,514	0,911	84,714	2,007	12,369
14	1,514	0,941	84,651	2,028	12,380
15	1,515	0,962	84,622	2,033	12,383
16	1,515	0,973	84,610	2,034	12,384

Source: Author's calculations.

Table 3. Forecast error variance decompositions of income inequality growth in per cent.

Steps	Std Error	Inflation above 6 percent	Income inequality growth	GDP growth	Employment growth
1	1,036	0,012	99,988	0,000	0,000
2	1,309	0,470	98,721	0,673	0,136
3	1,399	1,648	96,057	0,633	1,663
4	1,448	2,540	91,379	0,840	5,241
5	1,480	2,748	87,574	1,484	8,194
6	1,498	2,709	85,482	2,047	9,763
7	1,506	2,684	84,590	2,288	10,437
8	1,509	2,694	84,264	2,323	10,719
9	1,510	2,714	84,113	2,319	10,854
10	1,511	2,738	83,989	2,342	10,932
11	1,513	2,774	83,865	2,378	10,984
12	1,514	2,828	83,751	2,403	11,018
13	1,514	2,898	83,652	2,412	11,037
14	1,515	2,972	83,571	2,412	11,044
15	1,516	3,035	83,510	2,411	11,044
16	1,516	3,078	83,470	2,410	11,042

Source: Author's calculations.

income inequality. This is consistent with the postulation in Li and Zou (2002) that inflation affects income distribution through its effect on economic growth, as high inflation may lower capital accumulation as in Fischer (1981), which in turn reduces economic growth leading to high unemployment and income inequality. These authors found that high inflation worsens income distribution whilst slowing down economic growth.

8. Conclusion

The paper estimates a VAR model to show the effects of positive inflation shocks on income inequality when inflation is within the 3 to 6 per cent band relative to when it is above 6 per cent. We find that positive inflation shocks when inflation is within the 3 to 6 per cent IT band lead to an insignificant decline in the income distribution measured by the Gini coefficient. However, when inflation is above 6 per cent, there is greater income inequality. Evidence indicates that the 3 to 6 per cent inflation target induced a structural

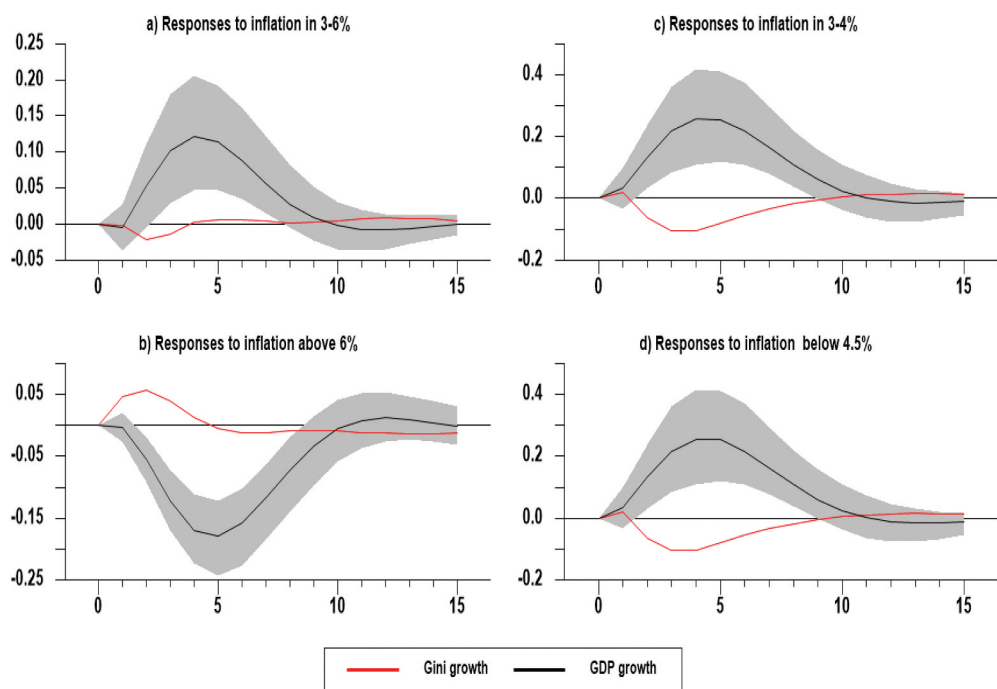


Figure 12. Responses of income inequality growth and GDP growth to positive inflation shock according to inflation bands. Source: Author's calculations

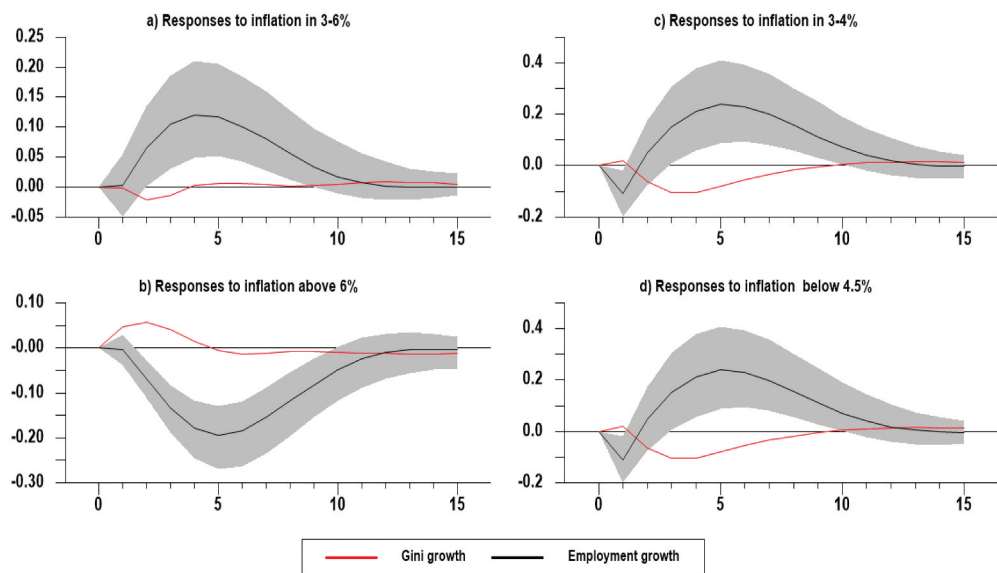


Figure 13. Responses of income inequality growth and employment growth to positive inflation shock according to inflation thresholds. Source: Authors' calculations

change in the inflation-income inequality nexus in South Africa. This finding is robust to using data during the IT period and the long sample that combines both pre- and post-IT data. Evidence in this paper indicates a nonlinear inflation-income inequality nexus exists in the IT period based on a 3 to 6 per cent IT band. This could be explained by GDP and employment growth rates, which rise significantly due to positive inflation when inflation is within the 3 to 6 per cent IT band compared to when inflation is above 6 per cent. Future research will examine the effects of positive oil price shocks on income inequality and whether the role of the inflation environment matters. The findings imply that price stability matters for the inflation-income inequality nexus in South Africa. Policymakers should resist calls to increase the inflation target band beyond 6 per cent but rather pursue policies that maintain the existing target band or that enable lowering the inflation target range.

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Notes on contributor

Eliphas Ndou Is a Senior Economics Lecturer at the University of South Africa. He Holds a PhD in economics and has authored several books on economics issues in South Africa. His research interests include macroeconomics, microeconomics, monetary economics, economic inequality and public policy.

Code availability statement

The codes that support the findings of this study are available from the author, upon reasonable request.

Data availability statement

The data that support the findings of this study are available from the author, upon reasonable request.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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Appendix A.

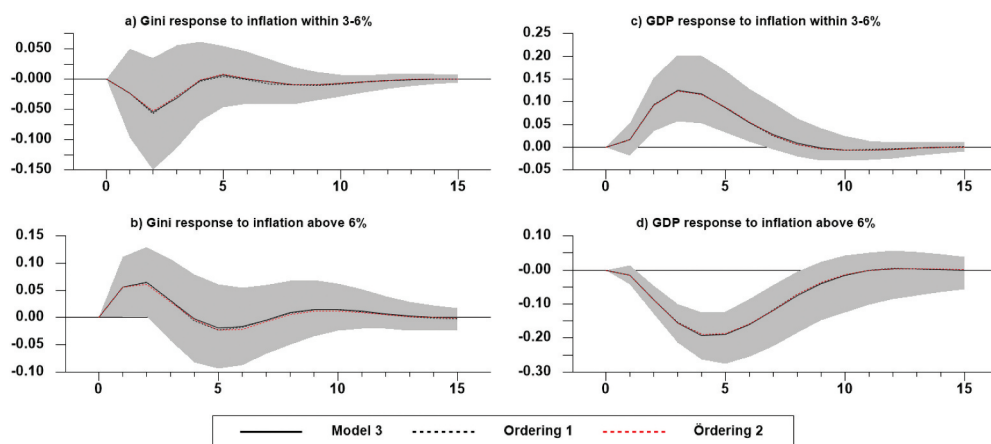


Figure A1. Responses in the 2000Q1 to 2016Q4. Source: Authors' calculations Ordering of the variables: GDP growth, employment growth, inflation and gini growth

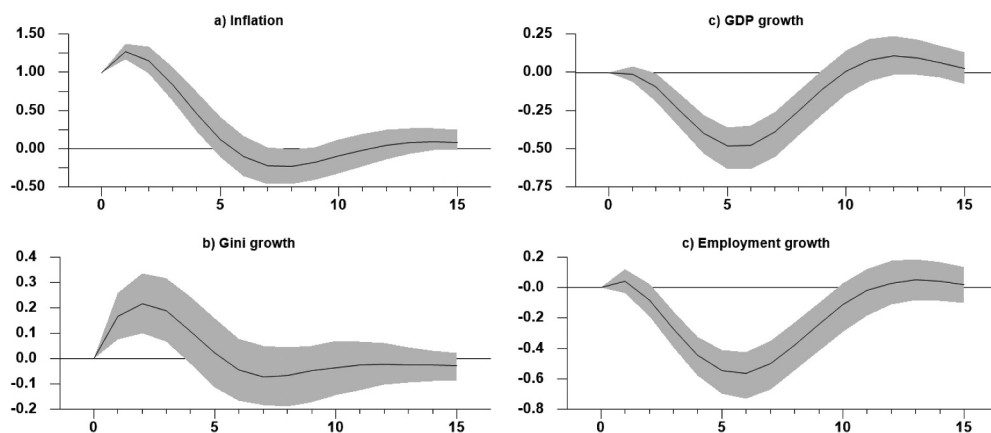


Figure A2. Responses in the 1993Q1 to 2016Q4. Source: Authors' calculations Ordering of the variables: GDP growth, employment growth, inflation and Gini growth

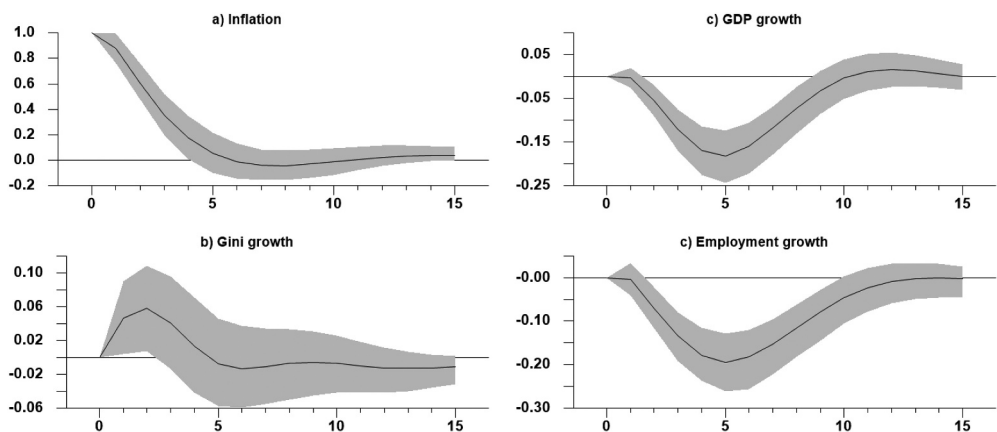


Figure A3. Responses in the 1993Q1 to 2016Q4. Source: Authors' calculations Ordering of the variables: GDP growth, employment growth, inflation and Gini growth

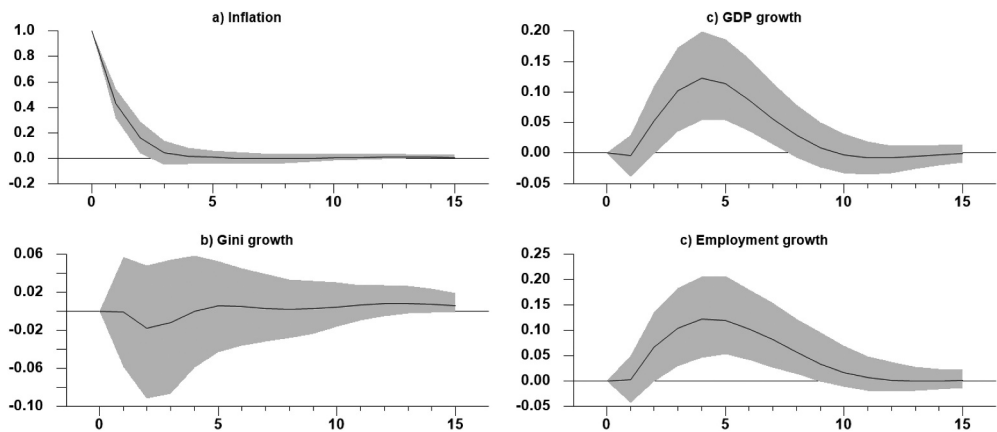


Figure A4. Responses in the 1993Q1 to 2016Q4. Source: Authors' calculations Ordering of the variables: GDP growth, employment growth, inflation, and Gini coefficient growth.