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The relationship between growth and employment in South Africa: structural vector autoregressive analysis

Abstract

This paper attempts to re-examine the issue on whether South Africa is experiencing jobless or job-creating growth. Making use of the structural vector autoregressive (SVAR) technique to characterize the dynamics of employment in response to output shocks, this paper shows that output shocks result in an increase in employment, although the effect is not of the same proportion with the change in employment being less than the change in output. An initial 1% change to economic growth leads to a 0.008% change in employment rate in the same period. The dynamic response of employment rate to change in economic growth indicates a very weak or neutral reaction of employment to economic growth and thus, justifies the hypothesis of jobless growth in South Africa.

Keywords: job creating growth, employment, jobless growth, structural vector autoregressive analysis.
JEL Classification: C5, J3.

Introduction

Has South Africa experienced job creating or jobless growth? This important question has generated heated debate among scholars and interested publics in South Africa. A number of studies have shown that despite the positive trend in economic growth and other economic fundamentals in the 1990s, unemployment figures kept on rising in South Africa. For example, Kingdom and Knight (2005) show that unemployment rate rose from 29 to 42 percents between 1995 and 2003, while the economic growth rate was close to 2.3% during the same period. In addition, Mahadea (2003, p. 23) argues that, while theory assumes a positive correlation between employment and economic growth, "In reality, however, positive economic growth rates in South Africa have been associated with shrinking job opportunities in the formal sector during the past few years". Loots (1998) indicates that South Africa has produced a remarkable case of jobless growth.

A number of studies contend that the high unemployment in South Africa is structural – that is a mismatch between the kind of job available and workers' skills. Policy measures such as upgrading of education and training of workers, training and retraining programs for the unemployed and promotion of small business through active participation are often suggested to curb structural unemployment (Fourie and Burger, 2009, p. 498). This reality suggests that, among other reasons, low level of workers' skills refrain from hiring additional workers. The evidence is observed from the number of recurring advertised and unfilled positions.

Altman (2003) proposes the following solutions or intervention to the jobless growth problem in South Africa: Firstly, she proposes the active stimulation of low-productivity labor-absorbing non-traded goods and services to increase the number of opportunities in the market and deepen linkages. Secondly, the author suggests an active labor market policy, that raises employment created at any rate of national growth.

In the light of these concerns, this paper attempts to reexamine the debate on whether SA is experiencing jobless or job-creating growth at macroeconomic level. It is important to understand this debate in the context of expectations that economic growth translates into job opportunities, thereby reducing poverty and inequality indicators. This debate should influence the kind of policies that government adopts in dealing wih the problems of unemployment in South Africa.

In assessing whether economic growth translates into job creation in South Africa, the analysis presented in this paper focuses on this issue at the aggregate level whereby the effect of economic growth is assessed on aggregate or total employment in South Africa.

The structural vector autoregressive (SVAR) technique will be utilized to approve or disapprove these hypotheses. This econometric technique characterizes the dynamics of employment in response to output shocks with reference to South Africa. As a way of setting the scene to the above investigations, Section 1 discusses the issue of economic and employment with reference to international experience. Section 2 focuses the debate in the context of South Africa. Section 3 discusses the data, the methodology and the empirical results of the study. Final section concludes the paper.

1. Economic growth and employment: international experience

Most studies have shown that employment elasticities, how the change in output translates to a

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change in employment, vary within countries over time and between countries. Piacentini and Pini (1998) show that among European countries, Germany and the United Kingdom are the economies where employment elasticity has been increasing, reaching the highest value of about 0.5 percentage point in the period 1960-1995. The performance of other European countries, such as France, Italy and Sweden, indicates a pronounced worsening of the employment elasticity. While in France, the elasticity was near zero in the 1980s and beginning of 1990s, the case of Sweden was even worse where the value of employment elasticity became negative during the same period. Negative employment elasticities were detected for Italy for the period 1990 to 1995.

It is not uncommon to interpret a decrease or negative employment elasticities such as in Italy, France and Sweden as implying jobless growth/jobless recovery. This is because there are different reasons why jobless growth phenomenon occurs. The jobless growth phenomenon may be due to the increase in productivity through automation and robotics. Any technological upgradation not only speeds up the process of production, but also contributes toward reducing the labor cost and the level of employment (Anthuvan, 2005). Another cause for jobless growth is attributed to structural change in the labor market. Workers who have been laid down during recession will need to change jobs or industries during the recovery period and their skill level may become a hindrance for them to acquire a new position (Grosham and Potter, 2003). Free trade has also been suggested as a possible cause. In this view, during recession companies are more likely to move factories and jobs offshore to cut costs. These jobs generally don't come back after the economy improves (Bernanke, 2003).

2. Growth and employment in South Africa: jobless growth or job-creating growth?

Following the recession in the early 1990s (1990-1993), South Africa's economic growth rate has been edging upward. Real GDP growth averaged 2.7% per annum for the 1994-99 period and 3.9% per annum for the 2000-2005 period – with a revised estimate of 4.9% for 2005 (the highest rate since 1981). It is evident that in a typical recovery, an improvement in economic growth should be accompanied by an increase in employment and a decrease in unemployment. Yet South Africa's growth experience has been paradoxical. That is there is an increase in economic growth, which is accompanied by an increase in both unemployment and employment.

There has been some disputes over the interpretation of this phenomenon – with some economists tagging it "jobless growth", while others call it "job-creating growth". Bhorat and Oosthuizen (2006) contend that a positive economic growth that is accompanied by rising unemployment should justify the phenomenon of jobless growth. The basic evidence on which the claim of jobless growth is based is illustrated in Figure 1 (see Appendix) where the trends of employment (EMPL), gross domestic product (GDP) and unemployment (UNEMP) are depicted. A number of features stand out in this diagram. From early 1970s to early 1990s, employment and economic growth moved together, with unemployment hovering around 1 million. That is an increase in economic growth led to an increase in employment. In contrast, for the period 1994-2002 things looked very different – higher economic growth was accompanied by a decrease in employment and increase in unemployment. More particularly, Bhorat and Oosthuizen (2006) alluded to the fact that employment decreased by 12% between 1994 and 2002. The period from 2002 to 2010 is again characterized by job-creating growth.

The debate on whether South Africa experiences jobless growth or not should be attributed to the data on employment in South Africa. Oosthuizen (2006, p. 9) indicates that the underlying employment data render the conclusion of jobless growth problematic. The reliability of employment/unemployment data has always been an issue in South Africa with the validity of most of the survey on employment being questionable (Bhorat and Oosthuizen, 2006). Moreover, the difficulty on assessing whether there has been jobless growth in south resides on the relationship GDP-employment and GDP-unemployment. There are periods of increasing trends of both employment and unemployment in South Africa that render difficult the interpretation of jobless concept. For example during the 1985-1990, both unemployment and employment were increasing when at the same time GDP was increasing. For some, this should be dubbed as jobless growth if the focus is on GDP-unemployment relationship while others may call this phenomenon as job-creating growth if interpreted by the relationship between GDP and employment. To overcome such a difficulty on the interpretation of the phenomenon of jobless/job-creating growth it is important to adopt an empirical analysis that takes into account the long-term relationship between data. Thus, the aim of this paper to introduce a VAR analysis.

An important contribution of this paper is to conduct an empirical analysis in order to assess the effect of economic growth on employment from the period 1970-2008. The end period corresponds to period

just before the full effect of the global financial crisis in South Africa that could negatively affect our interpretation due to external shocks that resulted from the global financial crisis.

3. Methodology, data analysis and empirical results

In assessing the impact of economic growth on employment in South Africa, this paper uses the structural vector autoregressive (SVAR) model to assess the dynamic response of employment to economic growth shocks in South Africa. Thus, the empirical part of the paper will assess how employment will react to the change in economic growth in a given period of time. SVAR allows to assess how unexpected changes in one variable affected other variables. The SVAR provides a theoretical meaning in a VAR model.

3.1. The SVAR technique. The "traditional" VAR approach to modelling dynamic behaviors of economic variables was widely used. It provided interesting insights in forecasting the dynamic of variables through its impulse response function analysis. However there is very little in the way of economic input in a VAR modelling. Thus the results derived from the VAR modelling should be interpreted cautiously. As Lutkepohl and Kratzig (2004) argued, VAR has the status of "reduced form" models and therefore are only vehicles to summarize the dynamic properties of the data as they lack any reference to a specific economic structure.

What eventually the SVAR model attempts to achieve is to deduce a structural form relationship from the reduced form VAR, and in this way, a VAR can be viewed as the reduced form of a general dynamic structural model. To understand the link between a reduced form VAR and SVAR, let us consider Equation 1 below, representing a dynamic structural model. The reparametrisation of Equation 1 leads to reduced form relationship represented by Equation 2.

$$\Gamma Y_t = B(L)Y_t + e_t. \quad (1)$$

$$Y_t = \Gamma^{-1}B(L)Y_t + \Gamma^{-1}e_t \ \ or \ \ Y_t = B^*(L)Y_t + \mu_t. \quad (2)$$

We can infer from the two equations that:

$$B^* = \Gamma^{-1}B \ (3) \text{ and } \mu_t = \Gamma^{-1}e_t \quad (4)$$

Equation (4) is the core representation of the SVAR model whereby the reduced-form disturbance μ_t is related to the underlying structural shocks e_t.

Furthermore, because we are interested in our analysis on assessing the response of structural variables (Y_t) to a unit structural innovation (e_t), Equations 2 and 4 are reparameterised to obtain the following:

$$Y_t = (I - B^*(L))^{-1}\mu_t \text{ or } Y_t = C(L)\mu_t, \quad (5)$$

where $C(L) = (I - B^*(L))^{-1}$.

And in the form of structural innovation one obtains:

$$Y_t = C(L)\Gamma^{-1}e_t \text{ or } Y_t = C(L)^*e_t, \quad (6)$$

where $C(L)^* = C(L)\Gamma^{-1}$.

The parameters $C(L)^* = C(L)\ \Gamma^{-1}$ contain the impulse response function (IRF) of the structural variables to the structural innovations e_t and because the structural innovations have economic interpretations, therefore the IRF obtained from this representation can be interpreted in a meaningful way. The IRF obtained from Equation 5 is a theoretic and devoid of any economic meanings.

Among the important challenges in a SVAR modelling, is to recover the structural shocks (e_t) from the observed reduced form innovation (μ_t). This refers to the identification problem which is done by imposing some restrictions on Equation 4. Two types of restrictions need to be done. The first to ensure that structural innovations are uncorrelated and independent from each other. The second is to make sure that the orthogonality restriction is applied where the covariances of the structural innovations or shocks are restricted to zero. The second restriction is imposed on the parameter matrix Γ, just as it is done in traditional dynamic simultaneous models using the order and rank conditions of identification. The only difference is that in SVAR models, the parameter matrix Γ models the contemporaneous relationship between the reduced form and structural form innovations, whereas in the simultaneous equation models, the parameter matrix Γ models relationship between variables in the model. As far as the number of restriction in the system is concerned, for a k-dimensional system, $k(k - 1)/2$ restrictions are necessary for orthogonalising the shocks because this corresponds to the number of instantaneous covariances given such a dimension (Lutkepohl et al., 2004, p. 162).

It is essential to note that the SVAR model deals only with modelling unexpected changes in the variables. This can be seen when subtracting the expected value of Y_t, conditional on information in time $t - 1$ from Equation 1. In doing so, one also obtains the following relationship, $\mu_t = \Gamma^{-1}e_t$, as in Equation 4.

3.2. Data analysis and empirical results. The main endeavour of this paper is to assess the response of employment rate to change (shock) to economic growth in South Africa. Thus, the following variables are used in the SVAR model for this end;

- Economic growth (GROWTH), measured as the first difference of the natural logarithm of gross domestic product (GDP).
- Employment rate (EMPLO), measured as the first difference of the natural logarithm of total employment.
- Total investment (INV), measured as the first difference of the natural logarithm of total capital stock.

It is important to note that INV is used as a control variable in the relationship between economic growth and employment rate. All data are sourced from Quantec database. These are yearly data from 1970 to 2008 as the aim of the paper is to assess the response of employment rate to change (shock) to economic growth in South Africa before the effect of the 2008 global financial crisis. It is important to note that the effect of the 2008 global financial crisis had an effect on the South African economy at the end of 2008 and early 2009.

To identify the variables, the following contemporaneous restrictions are applied in the vector autoregressive model:

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & b21 \\ b31 & b32 & 1 \end{pmatrix} \begin{pmatrix} \mu_t INV \\ \mu_t EMPLO \\ \mu_t GROWTH \end{pmatrix} = \begin{pmatrix} a11 & 0 & 0 \\ 0 & a22 & 0 \\ 0 & 0 & a33 \end{pmatrix} \begin{pmatrix} e_t INV \\ e_t EMPLO \\ e_t GROWTH \end{pmatrix}. \quad (7)$$

The matrix on the left represents the errors of the reduced form VAR and the matrix on the right represents the error of the structural VAR. The identification is as in Equation 4. Economic relationships in the above matrix can be interpreted parsimoniously as follows: Total investment is affected by economic growth and employment with a lag or delay. Economic growth is directly affected by total investment and employment. This is true from the production function specification. Employment rate is directly affected by economic growth. This is in line with the reality that the demand for labor is derived from economic growth.

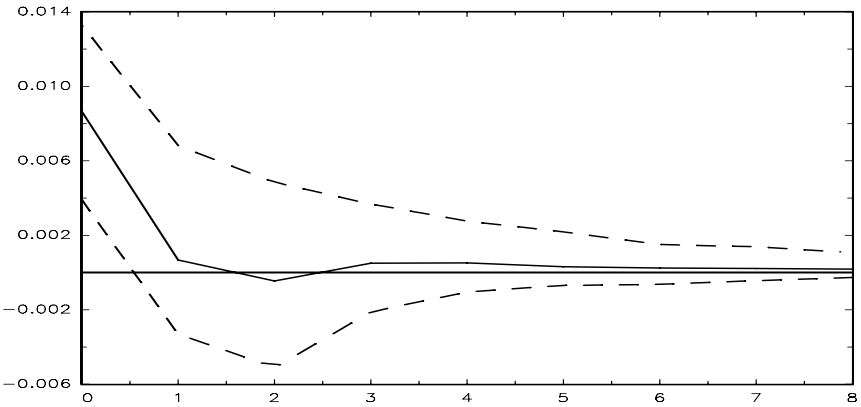
Before presenting the results of the impulse response functions of the model estimated from Equation 4, we first test the stability of stationarity of the vector that includes INV, EMPLO and GROWTH. The result presented in Table 1 shows that no root lies outside the unit circle, so the VAR is stable or stationary.

Table 1. Test of the stability of the vector autoregressive (VAR) model

Root	Modulus
0.985527	0.985527
0.742110	0.742110
0.417303 - 0.384086i	0.567154
0.417303 + 0.384086i	0.567154
0.220918 - 0.361140i	0.423352
0.220918 + 0.361140i	0.423352

Source: own construction from Quantec data.

The results of the reaction (impulse response function) of employment rate to change to economic growth are presented in Figure 2. The solid line represents the magnitude of this reaction and the dashed line represents the 95% confidence interval. It is important to note that if the dash lines are between the values of zero, the magnitude of the reaction should be interpreted as not being statistically different to zero.



Source: own construction from Quantec data.
Note: the vertical axis represents the magnitude of the response and the horizontal axis represent the time period of the response.

Fig. 2. Response of employment rate to change to economic growth

The interpretation of the results depicted in Figure 2 is as follows: an initial 1% change to economic growth leads to a 0.008% change in employment rate in the same period. The reaction of employment changes to a 1% change to economic growth becomes neutral (close to 0%) from period 1 onwards. This dynamic response of employment rate to change to economic growth indicates a very weak or neutral reaction of

employment to economic growth and thus, justifies the hypothesis of jobless growth in South Africa. As discussed early, this reaction is due, to a certain extent, to the existence of structural unemployment. A number of authors have supported the fact that conditions, such as structural unemployment, have led to the decline in labor absorption capacity in the recent periods (Mohr, 2005, p. 85). These are the issues to address, among others, if the South African government intends to create condition for 'job creating growth'.

Conclusion

This article commenced with an important question: is there any evidence that improvement in the average growth rate is translating into better job-creating or jobless growth? In the literature, it was found that there is disagreement among economists about how to interpret South Africa's growth experience. There are also contradicting pieces of evidence which support both views. Using data on employment rate, economic growth and total investment, mainly to assess the dynamic response of employment rate to economic growth, this paper finds that the dynamic response of employment rate to change to economic growth indicates a very weak or neutral reaction of employment to economic growth. This phenomenon should justify the hypothesis of jobless growth in South Africa. The paper suggests that labor policy that addresses the issue of structural unemployment may contribute to South Africa experiencing a job creating growth.

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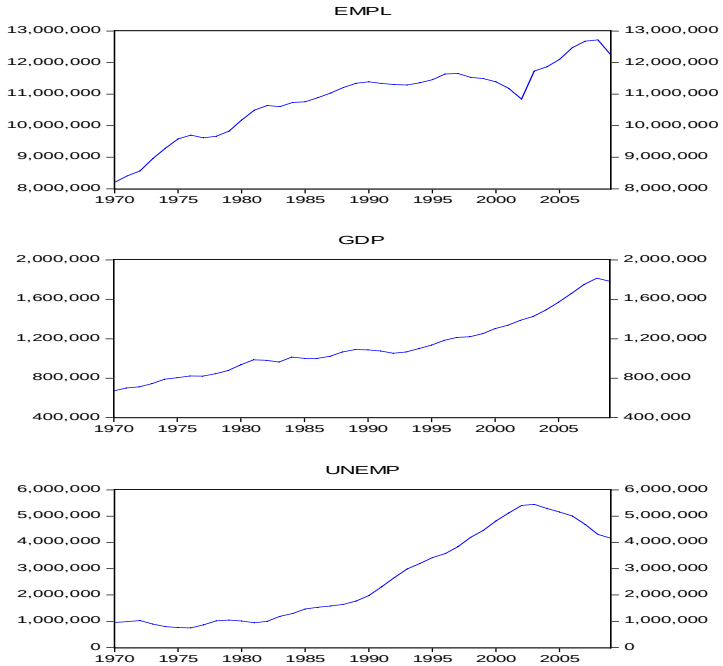
Appendix



Source: own construction from Quantec data.

Fig. 1. Employment, GDP and Unemployment in South Africa, 1970-2005