



Determinants of Growth in SADC Countries: A Fixed Effect Vector Decomposition Approach

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ABSTRACT

This paper studies the determinants of economic growth for the Southern African Development Community countries over the period of 1995-2011. A fixed effect vector decomposition estimator (FEVD), which allows the estimation of the coefficient of the time-invariant and account for unobserved heterogeneity is employed to estimate the determinants of economic growth. The analysis also applies a fixed effects two-stage least squares estimator to account for a possible endogeneity bias due to reverse causation between economic growth and government spending or other forms of endogeneity problem. Using the FEVD estimator we find that democracy, education - measured by enrolment rate, government expenditure, foreign direct investment, trade openness have the expected positive impact on economic growth. The results seem to hold fairly well when endogeneity of government spending is taken into account — the signs or directions of the above-mentioned estimated coefficients remain in line with our benchmark results.

Keywords: Endogeneity, Bias, Economic Growth, Unobserved Heterogeneity, Fixed Effect-two Stage Least Squares Fixed Effect Vector Decomposition

JEL Classifications: N17, O11, C26, H56

1. INTRODUCTION

Although Southern African Development Community (SADC) grew relatively faster (grew by an average of 4.7% annually) over the past years compared to the European Union's growth (grew by an average of about 2% per year), it has generally lagged behind other similar regions such as ASEAN (which grew at 7.4% per annum) over the same period (Regional Economic Integration Report, 2016). There is also variation in growth performance across SADC countries, with some countries growing faster than others. What makes SADC countries grow at the rate at which they are growing? What can be done to significantly improve their growth rate? While many studies Barro (1999; 2003), Burnside and Dollar (2000), Chen and Feng (2000), Radelet et al. (2001), Dollar (1992), Easterly and Levine (1997), Bhaskara-Rao and Hassan (2011), Chang and Mendy (2012), Anyanwu (2014) have attempted to answer similar questions in other countries (i.e., developed and developing countries), there is a limited number of studies (Mbulawa, 2015; Seleteng et al., 2016) investigating the determinants of growth in the SADC countries.

Moreover, the existing empirical literature exploring the determinants of growth has often applied a fixed effect model to panel data. However, this approach is problematic in that it does not permit estimating the effect of time-invariant covariates and does not account for the joint endogeneity of the growth and government spending (i.e., economic growth might determine government spending), possibly leading to biased results. In this paper, we apply appropriate panel data approaches designed to address such econometric issues: Heterogeneity, estimation of time-invariant variables and endogeneity biases. We implemented a fixed effect vector decomposition estimator (FEVD) to capture the effects of time-invariant variables and to account for unobserved heterogeneity. While the endogeneity bias was accounted for using a fixed effects two-stage least squares (FE-2SLS) estimator.

The paper proceeds as follows. In section two we review the existing empirical literature on the determinants of economic growth. Section three then, discusses the methods and describe the dataset used in this paper. Section 4 provides evidence on the determinants of economic growth in SADC. The last section provides some concluding remarks.

2. LITERATURE REVIEW

The process underlying economic growth has for decades received extensive attention both theoretically and empirically. The theoretical basis for the determinants of economic growth can be traced as far back from the periods of Solow (1956) to Romer (1986) to Krugman (1991) and Fujita et al. (1999) to mention a few for a detailed discussion on this, please see Renelt (1991) who offers a comprehensive review of the theoretical and empirical literature on growth. The theoretical literature has been accompanied by a growing number of empirical studies investigating the determinants of economic growth. Several factors have been identified as important determinants of economic growth.

An important determinant of growth highlighted in the literature is democracy (Barro, 1996; 1999; Tavares and Wacziarg, 2001; Acemoglu et al., 2014; Rodrik and Wacziarg, 2005). Using the fixed effect and various generalized method of moments (GMM) estimators, Acemoglu et al. (2014) found a significant positive effect of democracy on future gross domestic product (GDP) per capita. However, Barro (1996) and Tavares and Wacziarg (2001) work suggest a somewhat negative effect of democracy on growth.

Another important determinant of economic growth which has been long recognized in the literature is investment (Albulescu, 2015; Iamsiraroj, 2016; Hong, 2016). For example, Albulescu (2015) investigated the effect of foreign direct investment on economic growth in Central and East European for the period 2005-2012 using a panel data technique. He found that foreign direct investment has a significant positive impact on economic growth. In another similar study, Iamsiraroj (2016) investigated the relationship between foreign direct investment and economic growth using simultaneously system of equations. Using the cross-country data drawn from 124 countries from 1971 to 2010 he found that there was a bi-directional relationship between investment and economic growth.

A commonly used explanatory variable endorsed by both neoclassical and endogenous growth model is human capital (Su and Liu, 2016; Pritchett, 2001; Barrow, 1991; Hanuskek and Kimko, 2000). The empirical results on the importance of human capital in explaining growth are inconclusive. Some studies have found that human capital is important in explaining economic growth (Su and Liu, 2016; Barrow, 1991; Hanuskek and Kimko, 2000), while others found that human capital is not an important determinant of economic growth (Pritchett, 2001).

The importance of trade openness in explaining economic growth is also well-researched in the growth literature (Edwards, 1998; Rodrik, 1999; Dollar and Kraay, 2000; Lee et al., 2004; Fetahi-Vehapi et al., 2015). Besides receiving wide empirical analysis, the empirical results on the impact of trade openness on growth remain inconclusive. While there are studies that have found that trade openness have a significant positive impact on growth (Edwards, 1998; Dollar and Kraay, 2000; Fetahi-Vehapi et al., 2015) others have found that trade openness is not significant in explaining economic growth (Rodrik, 1999).

Other variables such as innovation, research and development have received intensive empirical analysis (Lichtenberg, 1992; Ulku, 2004; Akcali and Sismanoglu, 2015; Pece et al., 2015). Pece et al. (2015) used a multiple regression models to analyses whether economic growth is influenced by innovation. Using different proxies of innovation they found that there was a strong positive relationship between innovation and economic growth. Similarly, Akcali and Sismanoglu (2015) used research expenditure as a proxy for R and D and found that the expenditure on R and D has a significant positive impact on growth both in developed and developing countries.

Using the combination of the above mentioned candidate growth variables, many studies have empirically strived to identify the determinants of growth in sub-Saharan Africa. Using a IV-2SLS and IV-GMM. Anyanwu (2014) investigated the factors underlying growth in sub-Saharan Africa and China. He found that domestic investment, education and metal prices were important determinants of growth in sub-Saharan Africa while trade openness, initial level of income and share of population are important in explaining growth in China. Masanjala and Papageorgiou (2008) used a Bayesian moving average technique and found that mining, primary exports and initial primary education are important determinants of growth in sub-Saharan Africa. Contrary to the findings of Anyanwu (2014) and Masanjala and Papageorgiou (2008) found that sub-Saharan Africa growth can be explained by variables that are common to other regions in the world.

This paper uses a number of growth candidate variables to investigate the determinants of growth in SADC block. We are not the first to investigate the determinants of growth in SADC block. The few papers closely related to ours is by and Seleteng and Motelle (2016) and Mbulawa (2015) which investigated the determinants of growth in SADC.

3. DATA AND METHODOLOGY

Many panel data growth studies typically use fixed-effect and/or random-effects models. The latter model is used if the country specific effects are assumed to be uncorrelated with the error term, while the former model relaxes this assumption, by allowing the country specific effects and the error term, to be correlated. Hausman specification test was performed to ascertain whether the fixed-effects or random-effects models is more suitable. The results reported at the bottom of Table 1 rejects the random effects model in favour of the fixed effects. Therefore, employ the fixed effects model in assessing the determinants of economic growth.

However while, fixed effect estimation method yield consistent estimates of the time varying covariates it does not permit estimating the effect of time-invariant covariates (such as democracy which is used in this paper), since the fixed effect transformation removes all time-invariant covariates (Baltagi, 2008; Hsiao, 2003; Pesaran and Zhou, 2014). It also fails to estimate variables that have very little within variance such as institutions (Plumper and Troeger, 2007).

Table 1: FEVD estimates of the determinants of growth in SADC countries, 1995-2011

Economic growth	Coefficient	Standard error	t
Govt expend	0.183812	[0.017677]	***
Enrolment rate	0.260059	[0.06214]	***
Foreign direct investment	0.032783	[0.00702]	***
Inflation rate	-0.00767	[0.002413]	***
Openness	0.054641	[0.075665]	
Fertility rate	-0.86889	[0.223706]	***
Democracy index_2	1.243624	[0.258758]	***
Democracy index_5	0.506773	[0.167344]	***
Democracy index_6	0.352118	[0.110728]	***
Democracy index_7	0.307901	[0.102932]	**
Democracy index_8	0.26	[0.060039]	***
Democracy index_9	2.054067	[0.265069]	***
Time fixed effect	yes		
Country fixed effect	yes		
Hausman test (RE vs. FE)	0.000		

Standard errors are reported in parentheses with *****, ** and * denoting significance at the 1%, 5%, and 10% levels, respectively, SADC: Southern African Development Community, FAVD: Fixed effect vector decomposition

Given that this paper uses both time-variant and time-invariant variables (for example democracy), we employ a FEVD estimator proposed by Plumper and Troeger (2007), which not only allows the estimation of the coefficient of the time-invariant coefficient but also more efficient than the standard fixed effect method. The FEVD comprise three stages: Stage 1: Estimates a fixed effects regression without time-invariant variables, Stage 2: Uses the ordinary least squares (OLS) to regress the fixed effect vector on the time-invariant variables and Stage 3: Estimates the pooled OLS regression by incorporating the invariant variables, time-invariant variables and the time-invariant residual. The FEVD can be expressed as follows:

$$Y_{it} = \alpha + \sum_{k=1}^k \beta_k X_{kit} + \sum_{m=1}^m \gamma_m Z_{mi} + \varphi_i + \mu_{it} \tag{1}$$

Where i and t indicate country and year respectively, X_{kit} represent a set of time-variant variables (such as government expenditure, education - measured by enrolment rate, foreign direct investment, inflation rate, trade openness and fertility rate), Z_{mi} are time-invariant (such as democracy) or rarely-changing variables, φ_i represent the fixed effects, μ_{it} is an unobservable error term and α and β are the coefficients to be estimated.

The FEVD is unfortunately not without some deficiencies. Perhaps a major weakness of this approach for our study is that it does not account for the joint endogeneity of the growth and government spending (i.e., economic growth might determine government spending). As a matter of fact, there is a well-known theory (called Wagner’s law) which suggests that economic growth stimulates growth in public expenditure we address this issue by using the FE-2SLS estimator. Specifically, we use the lagged value of government spending as an instrument, consistent with the work of Yakovlev (2007).

We employ annual data for the period 1995-2011 for seven SADC countries. The sample encompass a representative panel of SADC countries covering South Africa, Botswana, Malawi, Namibia,

Swaziland, Mozambique and Tanzania. The time period and the number of countries used in this paper is carefully chosen based on the availability of data. Thus countries for which many data series were not available are omitted from the paper. Most of the variables used in this paper is sourced from the World Development Indicators of the World Bank. In addition to the dependent variables (economic growth), we use several control variables in our econometric analysis. We use as independent variables several factors identified in the literature as important determinants: Government expenditure, education - measured by enrolment rate, foreign direct investment, inflation rate, trade openness and fertility rate and democracy (measured by Institutionalized Democracy¹).

4. EMPIRICAL ANALYSIS

Figures 1 and 2 plot the economic growth variable against the log of government spending and log of foreign direct investment. The graphs appear to suggest a fairly strong positive relationship between these variables (government spending foreign direct investment) and economic growth. Figure 3 plots the relation between the inflation rates against the economic growth. Perhaps unsurprisingly, the figure demonstrates a fairly strong negative relationship between these variables. While the scatter plots provides a quantitative measure of overall relationship between the two variables, it is only suggestive. The subsequent section will empirically investigate the robustness of these scatter plots.

We commence the discussion by presenting empirical estimates (reported in Table 1) carried out using the FEVD discussed in the previous sections. All variables have been converted into logarithmic form for the empirical estimation with the exception of the democracy variable. Although we report results of all the models, our preferred approach is FE-2SLS which is reported in Table 2. As is evident from the results Table 1, almost all coefficients of the independent variables are statistically significant at 1%, with expected signs. For example, the coefficient of the government expenditure variable has the theoretically expected positive sign and it is highly statistically significant, implying that the higher the government expenditure, the higher the growth rate. As expected the education coefficient (measured by enrolment rate) appear to be an important factor for economic growth (the coefficient positive and highly statistically significant). This finding is collaborated by Anyanwu (2014) who found that education was important determinants of growth in sub-Saharan Africa.

Foreign direct investment has significant positive impact on growth rate in conformity with the findings of Albuлесcu,

1 “Institutionalized Democracy: Democracy is conceived as three essential, interdependent elements. One is the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders. Second is the existence of institutionalized constraints on the exercise of power by the executive. Third is the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation. Other aspects of plural democracy, such as the rule of law, systems of checks and balances, freedom of the press, and so on are means to, or specific manifestations of, these general principles. We do not include coded data on civil liberties. The Democracy indicator is an additive eleven-point scale (0-10).” (world development indicators, 2016).

2015; Iamsiraroj, 2016; Hong, 2016. Consistent with previous research (Bittencourt et al., 2012; Biyase and Zwane, 2016) we also found that the estimated coefficient on inflation presents an expected negative and statistically significant estimates on growth. Interestingly, the estimated coefficient on democracy have the expected signs and statistically significant, implying that democratic countries (countries with a positive democracy

indicator point scale) are likely to be better off than their counterpart (countries with a zero democracy indicator point scale). This finding is supported by an influential work in this field such as Acemoglu et al. (2014) that found evidence to suggest that countries that change from non-democracy to democracy achieves about 20% higher GDP per capita in the long run (over roughly the next 30 years).

Figure 1: Foreign direct investment and economic growth in Southern African Development Community countries, 1995-2011

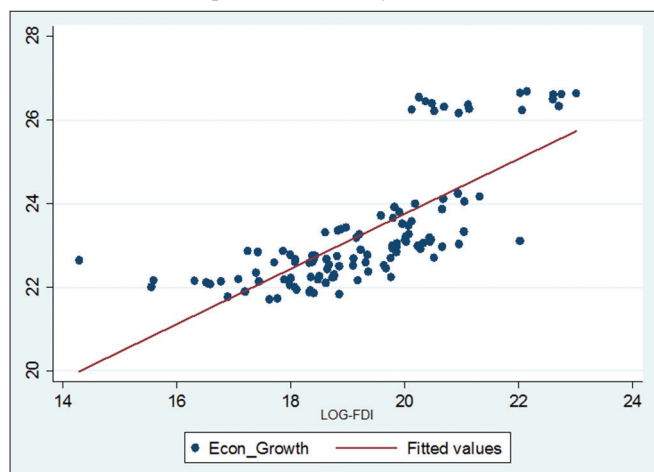


Figure 2: Government spending and economic growth in Southern African Development Community countries, 1995-2011

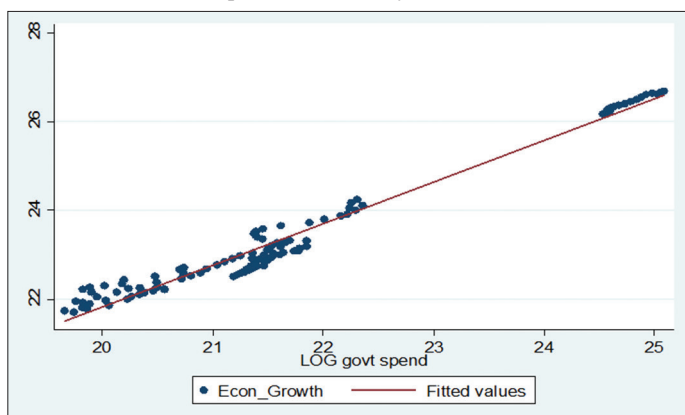


Figure 3: Inflation and economic growth in Southern African Development Community countries, 1995-2011

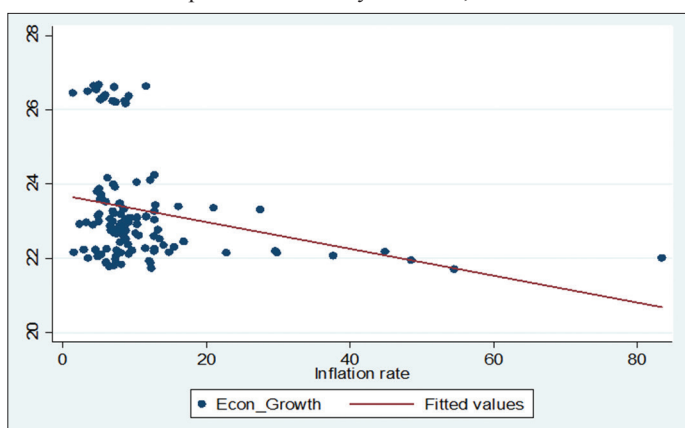


Table 2 presents the FE-2SLS results which account for endogeneity among the variables. As noted in section 3, we use the lagged value of government spending as an instrument. We first check if our instrument is valid (i.e., the lagged value of government spending is correlated with the dependent variable). The rule of thumb is that the Cragg-Donald Wald F statistic and Kleibergen-Paap Wald F statistic test in FE-2SLS results should exceed a value of 10 for the instrument to be valid. Our results of these specification tests (the Cragg-Donald Wald F statistic and Kleibergen-Paap Wald F statistic test) reject the hypothesis that the endogenous variable is weakly identified and are both above the value of 10 (see bottom of Table 2). As regards the effects of explanatory variables on growth, the FE-2SLS results (which accounts for endogeneity among the variables) appear to resemble the results of the FEVD estimates. Specifically, coefficients for government expenditure, education (measured by enrolment rate), foreign direct investment, remain an important determinant of economic growth — enters positively and significantly in both specifications. In line with the FEVD, coefficients for inflation and fertility rate once again matter in explaining economic growth and enter with predicted negative signs. Contrary to the FEVD estimates, trade openness coefficient in the FE-2SLS table is now positively and statistically significant determinant of growth. This suggests as confirmed by many studies in this field Fetahi-Vehapi et al. (2015) that trade openness is good for growth.

Table 2: FE-2SLS estimates of the determinants of growth in SADC countries, 1995-2011

Economic growth	Coefficient	Robust standard error	t
Government expenditure	6.44E-12	[3.25E-12]	*
Education (enrolment rate)	0.2854317	[0.027178]	***
Foreign direct investment	0.0279075	[0.00836]	***
Inflation rate	-0.0107269	[0.003104]	***
Openness	0.1336279	[0.063797]	***
Fertility rate	-1.081017	[0.223318]	***
Democracy index_2			
Democracy index_5			
Democracy index_6			
Democracy index_7			
Democracy index_8			
Democracy index_9			
Time fixed effect	Yes		
Country fixed effect	Yes		
Cragg-Donald F stat	41.67		
Kleibergen-Paap Wald rk	10.03		
F statistic			
Chi-square (1) P value	0.0373		

Standard errors are reported in parentheses with *****, ** and * denoting significance at the 1%, 5%, and 10% levels, respectively, SADC: Southern African Development Community, FE-2SLS: Fixed effect vector decomposition estimator

5. CONCLUSION

This article examined the determinants of economic growth for the SADC countries for the period 1995-2011. We used panel data approaches designed to address common econometric concerns such as heterogeneity, estimation of time-invariant variables and endogeneity biases. We implemented a FEVD estimator to capture the effects of time-invariant variables and to account for unobserved heterogeneity. While the endogeneity bias was accounted for using a FE-2SLS estimator. The results of our investigations provide valuable insights into the determinants of economic growth in SADC countries. We found a number of variables are significant determinants of economic growth in SADC countries. Specifically, democracy, education - measured by enrolment rate, government expenditure, foreign direct investment, trade openness have the expected positive impact on economic growth, while, inflation rate and fertility rate were found to have negatively on economic growth in the SADC countries. Similar result have being observed in a previous growth studies in the SADC block (Mbulawa, 2015; Seleteng and Motelle, 2016) and other related studies such as Bittencourt (2013) and Biyase and Zwane (2016).

The econometric analysis undertaken in this study offers some interesting policy implications which have been echoed by many previous influential studies. These results suggest that investing in education and the commitment to becoming matured democratic states should continue to be a major focus of growth promoting efforts in SADC countries. Glewwe and Kremer (2009) offers a practical advice on how education can be improved by Sub-Saharan African countries in general. They write: "Better school management methods, such as providing incentives that reward teachers for student performance, may have more potential."

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