

## Assessing Macroeconomic Volatility on Economic Growth: The Case of Sub-Saharan African Economies

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### Abstract

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As in most low-income countries, sub-Saharan African (SSA) economies tend to have a higher degree of macroeconomic volatility and are likely to be more vulnerable when exposed to external shocks. This paper uses the pre-global financial and economic crisis of 2008-2009 and the recovery since 2010 to create a pooled cross-sectional dataset to explore and assess macroeconomic volatility on economic growth, taken into account economic vulnerability and policy responses and resilience of SSA's economies. A number of relevant macroeconomic variables are used to develop an index of macroeconomic resilience. The empirical results confirm that volatility in growth negatively affects growth of SSA's economies. It supports the view that initial economic conditions before adverse external shocks matter and macroeconomic resilience is positively correlated with economic growth

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**Key words:** economic growth and development, macroeconomic volatility, macroeconomic policy, sub-Saharan Africa.

**JEL Classification:** O10, O40, O55

### I. Introduction

Why are low-income countries more vulnerable to external shocks than developed, rich countries? Why is output or GDP growth more volatile in the former than in the latter? Though these are not new issues, recent events and several trends have contributed to a renewed interest. Among them are the recent global financial crisis, the Asian financial crisis in the late 1990s, the episodic growth patterns in Africa, and concerns over 'fragile states' recently emerge from conflicts or civil wars. In the context of sub-Saharan Africa – hereafter Africa<sup>2</sup> – where most low-income countries are, international development and financial institutions have recognized the importance of taking into account the risks of external shocks, macroeconomic instability, growth volatility, and vulnerability. Despite the heterogeneity in patterns of growth across the region, one common feature of African country-level growth pattern is its volatility (Arbache and Page 2007; Arbache, Go, and Page 2008; and Toh 2016).

The outlook of growth in the world economy together with the changing growth composition – for example, the rebalancing and slowing down of the Chinese economy – and declining commodity prices, oil, in particular, have become less favorable, especially for a number of oil-exporting countries in Africa.

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<sup>2</sup> Sub-Saharan Africa comprises 49 or 54 countries in Africa, excluding North African countries of Algeria, Egypt, Libya, Morocco, and Tunisia.

According to the latest projections by the IMF World Economic Outlook, “subdued demand” worldwide, especially in the advanced developed and large emerging market economies (China and Brazil, for example), has diminished growth prospects to about 3 percent (IMF, 2016a). In Africa as a whole, growth fell from an annual average of 6 percent between 2004 and 2014 to about 3 percent in the near term (IMF, 2016b).

While developing countries’ growing trade and financial linkages with the rest of the world can be beneficial through growth and investment, it can also increase their exposure to instability and costly spillovers. At the same time, a country’s underlying economic structure, institutions, and policies can amplify or reduce the impact of external shocks. The recent global financial crisis, the Great Recession, and the implications of slow growth prospects have made the concern about the management of macroeconomic vulnerability highly relevant. African economies generally are not as integrated into the world economy as developed and emerging market economies – especially in the financial sector. They, nonetheless, have been affected by external spillovers and volatility. It is in part a result of globalization – increased interconnectedness and interdependence – particularly in the real side of the economy through trade flows, foreign direct investment (FDI), remittances, terms of trade, and international aid. How vulnerable or resilient are African economies to external shocks and volatility? Have African economies the coping capacity to deal with macroeconomic vulnerability and growth volatility? Will the overall difficult external environment stall the region’s recent growth momentum?

The purpose of this paper is to attempt to shed light on these questions based on Africa’s growth experience since its turnaround in the mid-1990s. First, it analyzes the extent of macroeconomic vulnerability that African economies face, in particular the relationship between volatility in growth and economic growth. Second, the linkages among various structural factors are evaluated; growth volatility, trade openness, and export concentration and diversification, and the role of macroeconomic policies are evaluated. The next section briefly summarizes the relevant literature related to macroeconomic volatility, vulnerability and resilience. Section 3 analyzes empirical evidence of the relationship between volatility in growth and economic growth in the case SSA economies. Section 4 assesses the potential effect of macroeconomic volatility on economic growth. In particular, it tests the hypothesis that output fluctuations reflected in growth volatility affects growth negatively, taken into account the role played by initial economic conditions prior to external shocks and importance of macroeconomic resilience -- the economy’s capacity to cope or withstand the adverse effects from external shocks. Section 5 concludes with some policy implications.

## 2. Literature Review

This paper draws on the following works in the literature. First, empirical research done under the auspices of the United Nations out of concerns about the economic vulnerability of Small Island Developing States (SIDS) in the mid-1990s. It provided a useful conceptual and empirical framework for understanding the concepts of economic vulnerability and resilience and for identifying relevant macroeconomic variables and indicators necessary for empirical research. The second strand of literature relates to studies on security and development and concerns about fragile states or “low-income countries under stress” (LICUS) as the World Bank phrases it. The third source is the empirical literature attempting to explain Africa’s episodic growth experience during the eras of structural adjustment and debt crisis in the 1980s and 1990s, and more recently, empirical research on Africa’s turnaround.

There are two approaches to economic vulnerability: microeconomic and macroeconomic perspectives. Earlier notions of vulnerability from a microeconomic perspective stemmed from studies in economics of poverty, food security, livelihoods sustainability, social safety nets, and disaster management. More recently, the concept of vulnerability has also been linked to poverty and social exclusion. Macroeconomic vulnerability deals with *ex-ante* (having a predictive quality) risks at the national level and how to manage these risks arising from different sources of vulnerability, such as export concentration, trade dependence, and economic openness.<sup>3</sup> Sources of vulnerability can be exogenous, the exposure of an economy to external shocks, a source that is largely beyond the control of individual countries.

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<sup>3</sup> Other sources of macro-level vulnerability can come from natural disaster, conflicts and wars.

The source of vulnerability can also be endogenous, arising from weak economic fundamentals, such as macroeconomic imbalances, public financial management, or from structural factors, such as expenditure rigidities, public debt, narrow revenue bases, or from weak institutions and governance.

There are two different strands of literature on macroeconomic vulnerability that emphasize different aspects of macroeconomic vulnerability. One approach is to focus on financial linkages and international capital flows. This approach emphasizes how macroeconomic imbalances, such as exchange rate or asset-pricing misalignments, lead to financial crises, whether in the forms of debt, currency, or banking crises. In this approach, macroeconomic vulnerability is considered to be linked to domestic economic conditions and policies, such as over-borrowing to finance unproductive spending, a fragile banking system or financial sector, or a rigid exchange rate system.<sup>4</sup> Several studies focus on developing indicators that serve as an early warning system to guide policy makers to adopt policies that will help prevent or reduce macroeconomic vulnerability. These indicators typically relate to the growth and instability of domestic credit, money supply, real effective exchange rates, foreign exchange reserves, and inflation.<sup>5</sup>

The other strand of the literature approaches macroeconomic vulnerability more broadly, emphasizing the structural conditions and transmission channels – predominantly trade and foreign direct investment (FDI) flows – through which an economy is exposed to both economic and financial shocks. This was initially championed in the context of Small Island Developing States (SIDS). In 1995, Briguglio developed the first vulnerability indices for the SIDS.<sup>6</sup> Briguglio, et al later expanded their work into a conceptual framework applicable to all countries.<sup>7</sup> They also introduced the concept of economic resilience. They define it as “the policy-induced ability of an economy to recover from or adjust to the negative impacts of adverse exogenous shocks and to benefit from positive shocks.” In short, resilience is the coping capacity analogous to the microeconomic approach in the food security literature.

The inclusion and emphasis on resilience as a complementary concept to vulnerability is important. It helps explain why some countries that have a high degree of exposure to external shocks and are economically vulnerable still manage to achieve growth and development. Briguglio, et al call this the “Singapore paradox”, referring to the seeming contradiction that Singapore, a country highly exposed to exogenous shocks and yet attains high growth and development. This is explained by the juxtaposition of economic vulnerability and resilience. The risk of a country being adversely affected by external shocks is thus a function of the difference between its macroeconomic vulnerability – its exposure to external shocks arising from intrinsic country characteristics – and its ability to cope with, withstand, or bounce back from external shocks; that is, its economic resilience.

As financial instability appears more frequently and with increasing severity in recent years, the IMF, as a lender of last resort to countries that cannot access private capital markets, has developed a systematic approach and a methodology both to assist emerging market and low-income developing countries to manage their macroeconomic and financial vulnerabilities and to build up resilience to economic shocks.<sup>8</sup> A key characteristic of the IMF approach is the nature and sources of economic shocks. In its conceptual framework, the IMF distinguishes between external risks and underlying vulnerabilities. According to the IMF, the importance of making this distinction is supported by the experiences of low-income countries in the recent global crisis and by empirical models built on the economic impacts of external shocks in these countries.

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<sup>4</sup> IMF (1998), *World Economic Outlook*, Chapter IV, “Financial Crises: Characteristics and Indicators of Vulnerability.” Washington, DC: International Monetary Fund.

<sup>5</sup> Herrera, S. & Garcia, C. (1999), User’s Guide to an Early Warning System for Macroeconomic Vulnerability in Latin American Countries. *Policy Research Working Paper, No. 2233*. Washington, DC: World Bank; Kaminsky, G.L., Lizondo, S., and Reinhart, C.M. (1997), Leading Indicators of Currency Crisis. *Policy Research Working Paper, No. 1852*, Washington, DC: World Bank.

<sup>6</sup> Briguglio, L. (1995), Small Island States and their Economic Vulnerability. *World Development*, 23(9), 1615-1632.

<sup>7</sup> Briguglio, L., Cordina, G., Farrugia, N. & Vella, S. (2009), Economic Vulnerability and Resilience: Concepts and Measurements, *Oxford Development Studies*, 37(3), 229-247.

<sup>8</sup> IMF (2011), *Managing Volatility: A Vulnerability Exercise for Low-Income Countries*, Washington, DC: International Monetary Fund; IMF (2010), *How Did Emerging Markets Cope in the Crisis?* Washington, DC: International Monetary Fund.

The distinction between risks and underlying vulnerabilities in the IMF conceptual and operational framework allows for more clarity in the analysis and assessment of the ability of a country to withstand and manage shocks. The framework provides a measure for the availability of policy space, identifies early warning signs, and suggests the kind of policy challenges that an LIC will face in unfavorable global environments.<sup>9</sup>In its latest Global Financial Stability Report (October 2015) the IMF suggests that as financial stability improves in advance economies.<sup>10</sup>This prospect in the changing global environment has implications for countries in sub-Saharan Africa, in particular those nascent emerging economies, which are increasingly integrated into the world economy. How they manage their particular risks during the likely global slowdown will affect their resilience and their ability to stay on course toward economic growth with transformation.

### 3. Macroeconomic Volatility and Economic Growth: What Do the Data Show?

In the literature on growth empirics, cross-country econometric studies attempt to find universal causal mechanisms that explain why some countries grow faster than the others. In the case of Africa, two distinct explanations emerged from this literature: “destiny factors”, particularly geography, and ethnic divisions; and factors arising from policy and institutions, such as macroeconomic policies, structural reforms, and good governance.<sup>11</sup>In a more recent study, covering 45 of the 49 countries in sub-Saharan Africa during the 2000-2014 period, Toh (2016) showed that 28 of the 45 countries in the sample experienced accelerated growth comparable to emerging economies in Asia. They are Africa’s emerging growth economies. The empirical findings indicate that growth is widespread across different dimensions of the “destiny factors” identified in the growth empiric’s literature: that is, a country’s geographic endowments – landlocked, tropical climate, and natural resources – and conflict affected or fractious ethnic divisions. The growth performance of Africa’s emerging growth economies during 2000-2014 was associated with better economic fundamentals, and the quality of policies, institutions, and governance. Moreover, growth volatility is another stylized fact of African economies.<sup>12</sup>

So, what is the relationship between growth volatility and growth performance? How significant is it? Modern macroeconomics explains growth volatility through the Real Business Cycle (RBC) theory. According to the RBC, fluctuations in output reflect changes in inputs, such as the desire and choice by workers between leisure and work; the relationship between inputs (labor and capital) and output; and technological shocks, such as the Schumpeterian “creative destruction” that can lead to output fluctuations and growth volatility. In an RBC world, output fluctuations are generally considered to be independent of economic growth. And according to Lucas (1987), the welfare costs of growth volatility were insignificant and short-term in nature not important for growth. This is in stark contrast to mainstream development economics. The negative correlation between volatility and its impact on economic growth is widely accepted in development economics.

The relationship and impact of volatility on growth in the end is an empirical question. Using a panel of 92 countries and a subset of developed (members of the Organization for Economic Cooperation and Development, OECD) countries, Ramey and Ramey (1995) showed that countries with greater volatility have lower growth after controlling for other variables of determinants of growth. Growth volatility is more significant than Lucas’s perfect competitive, textbook model. Easterly, Islam, and Stiglitz (2000) explored the relationship between volatility in economic growth and various institutional factors in an attempt to explain growth volatility. One of their empirical findings confirms the negative correlation between growth and volatility consistent with the Ramey and Ramey empirical findings. In their study, Easterly, et. al. also identified a number of macroeconomic variables that are associated with volatility in growth of GDP per capita.

<sup>9</sup> Countries with high degree of vulnerabilities may face low risks of economic disruption in a favorable environment. Countries with low vulnerabilities may face low risks, even in an adverse environment.

<sup>10</sup> IMF (2015), Vulnerabilities, Legacies, and Policy Challenges: Risks Rotating to Emerging Markets, *Global Financial Stability Report, October 2015*, Washington, DC: International Monetary Fund.

<sup>11</sup> For a summary review of this literature, see for example Collier, P. (1999), Why Has Africa Grown Slowly, *The Journal of Economic Perspective*, Summer 13:3, 3-22; Kenny, C. & William (2000), What Do We Know About Economic Growth? Or, Why Don’t We Know Very Much? *World Development*, 29:1, 1-22.

<sup>12</sup> See, for example Toh (2016), Table 1. It shows the heterogeneity in country-level growth and its volatility. Volatility, measured by the standard deviation, ranges from 1.0 to 17.5 and its coefficient of variation from -42.1 to 19.

These macroeconomic variables include financial variables, such as stock market, credit to private sector, and debt. Other macroeconomic variables are openness to trade, terms of trade fluctuations and capital flows. They found that all these variables are empirically significant in explaining growth volatility. Using more recent data of a panel of 121 countries, including both developed (OECD countries) and developing countries, Dabusinskas, Kulikov, and Randveer (2012) confirmed the Ramey and Ramey empirical findings. They found that macroeconomic volatility is negatively related to economic growth. Aghion and Banerjee (2005) using the same model found the negative relationship, but its volatility coefficient is no longer statistically significant for the OECD sub-sample, suggesting that there are income-level and regional differences. They argued that theoretically endogenous growth models would suggest that volatility should affect growth positively. Since the prediction of a positive relationship and volatility is not supported by their empirical results, they believe that one of the missing links is the role of financial markets and credit. They suggest that macroeconomic volatility on growth should be weaker in countries with greater depth of financial intermediation.

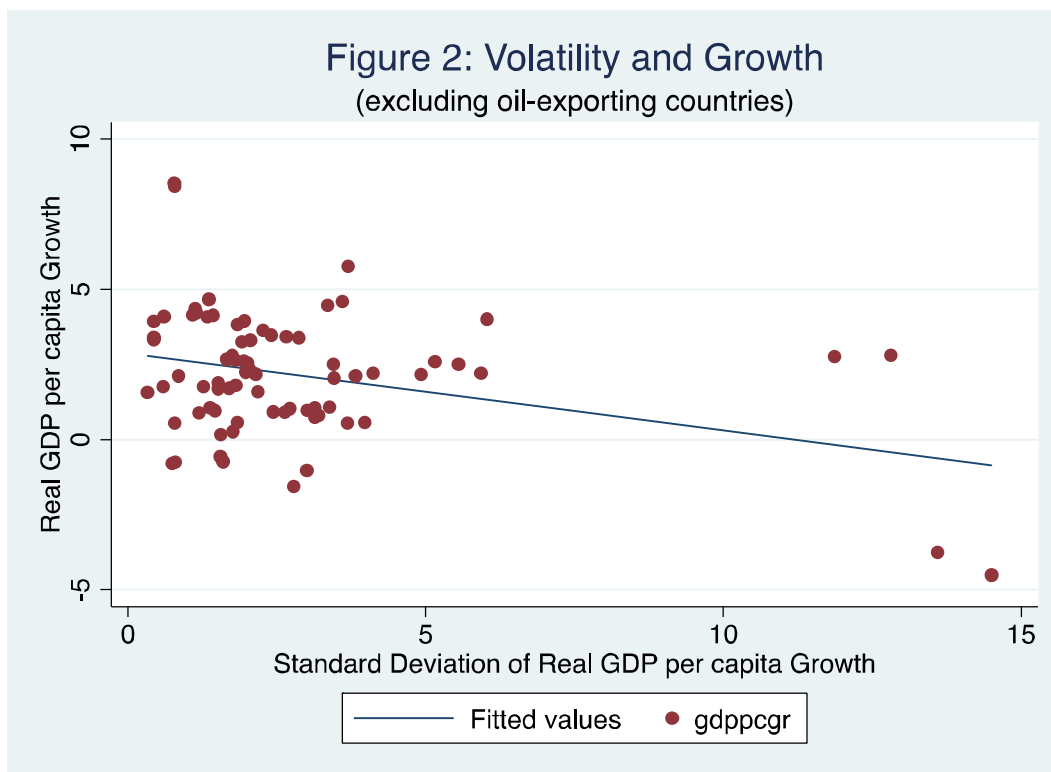
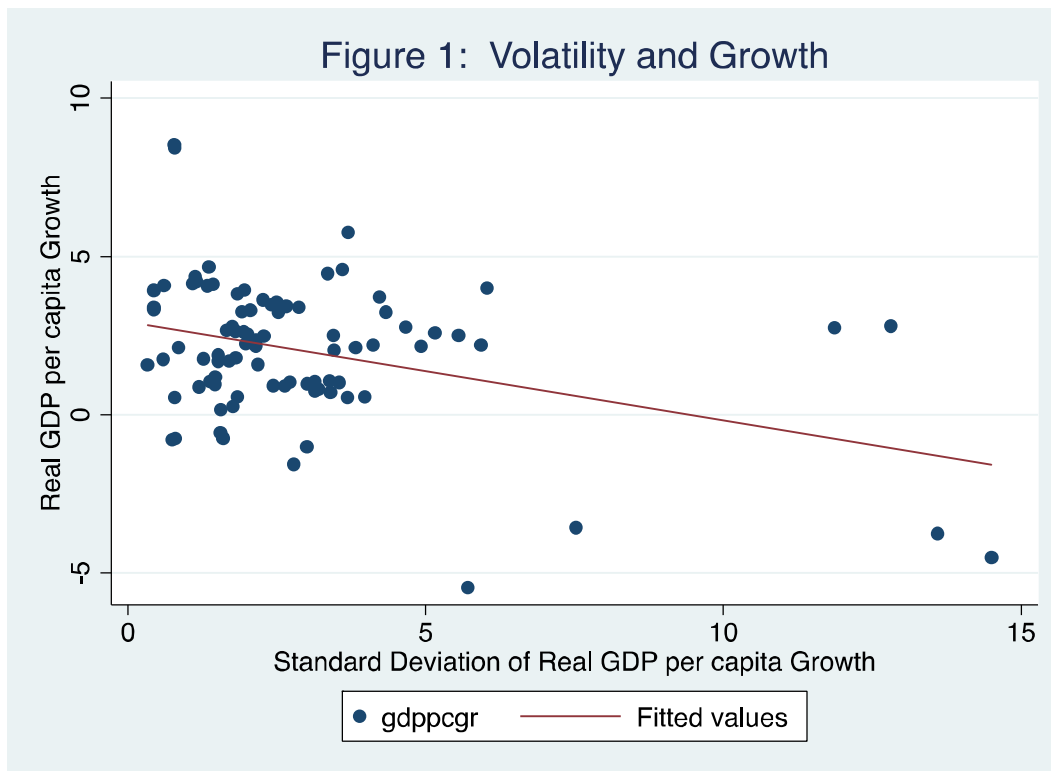
The data in all of the above studies are global, across different regions of the world and different levels of development, from OECD and other developed countries to middle- and low-income developing countries. Descriptive statistics of the data indicate noticeable differences in volatility and levels of economic development across regions and income levels (for example, Easterly, et. al., 2000, and Toh, 2016). Concerning Africa, only a very small number of countries is included in these global studies. Since the turnaround in the mid-1990s, more than half of the economies in Africa have experienced relatively quick recovery from the 2008-2009 financial crises. However, growth has slowed down since the recovery. Africa's emerging growth economies had benefited from a long period of favorable global environment, which included a commodity boom in oil and non-oil commodity prices. Despite the quick recovery, there are signs that the favorable environment ended in 2014 and 2015, and has been replaced by declining oil and non-oil commodity prices (IMF 2016). Most African economies are relatively small, open, developing economies. Will spillovers from external shocks amplify output fluctuations and growth volatility and negatively impact growth negatively the studies mentioned above suggest? What do the data show in the case of Africa?

To investigate the relationship between growth volatility and economic growth, I used the data from the latest IMF Regional Economic Outlook dataset (IMF, 2016), which covers the period from 2000 to 2015. The 2000-2015 period is divided into two sub-periods. The first sub-period, between 2004 and 2008, represents a five-year period prior to the financial crisis. The second, between 2009 and 2015, represents the post-crisis period. This allows the use of panel data to incorporate the difference between the pre- and post-crisis periods. Economic growth is measured by average annual growth rate of GDP per capita in each respective sub-period. Growth volatility is measured by the standard deviation of GDP per capita growth.

Using a panel of 44 sub-Saharan African economies and two sub-periods, 2004-2008 and 2009-2015, corresponding to the pre-financial crisis and post-crisis periods, Figure 1 below shows the correlation between volatility and economic growth. Figure 2, shows the same correlation but excludes eight oil-exporting countries that were likely to be affected by declining oil prices more than the non-oil exporting countries. The IMF list of Africa's oil exporters includes: Angola, Cameroon, Chad, Republic of Congo, Equatorial Guinea, Gabon, Nigeria, and South Sudan. South Sudan is absent from the 44-country sample because of insufficient data. Both groups show a weak negative correlation and are statistically significant.<sup>13</sup> There is very little difference in the correlation coefficient between the two groups. This not only supports the results of previous (global) studies that yield a negative correlation between volatility and growth, but also the concern of the pernicious effect of macroeconomic volatility on sustained economic growth of developing countries. It is contrary to the Real Business Cycle theory. It also suggests that neither declining oil prices nor terms of trade are the only factors that affect volatility in growth. There are other common factors behind the region's output fluctuations.

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<sup>13</sup>The correlation coefficients for both samples are respectively negative 0.37 and negative 0.34 and statistically significant with p-value of less than 0.01.



## 4. Assessing Macroeconomic Volatility on Economic Growth

### 4.1 Volatility, Vulnerability, and Resilience: Concept and Measurement

Macroeconomic volatility has different dimensions. For the purpose of this study, it focuses on fluctuations in the growth rate of output, as measured by the standard deviation of output growth per capita. There are two sources of macroeconomic volatility: exogenous and endogenous. Exogenous sources are linked to international trade and capital flows, terms of trade, international credit and interest rate, global economic environment, and natural disaster. Exogenous forms of volatility are generally considered to be sources of economic vulnerability. They tend to be associated with a country's resource or factor endowment and its inherent structural characteristics. In the literature, three indicators are typically used to measure structural economic vulnerability: economic openness, export concentration or diversification, and dependence on strategic imports, energy, and food, for example. The ratio of trade (merchandise and services exports plus imports) to GDP can be a proxy variable for economic openness. The United Nations Conference on Trade and Development (UNCTADSTAT, Online) publishes indicators of export concentration (the Herfindahl-Hirschmann Index) and the number of products exported. The latter can be interpreted as a proxy variable for the extent of diversification. Fluctuations in commodity prices and terms of trade are also a source of macroeconomic vulnerability.

Endogenous sources are related to such factors as macroeconomic management, (such as in the areas of monetary, fiscal, current account, and debt), structural reforms, and governance. Endogenous sources stem from volatility in economic policy, institutions, and political conditions. One can view policy and institutions as what a country does to respond to vulnerability: they can either mitigate or exacerbate it. This might be called resilience – the policy-induced capability of an economy to withstand or adjust and respond to the negative impact of adverse exogenous shocks (Briguglio, L., G. Cordina, N. Farrugia and S. Vella, 2008). Montoro and Rojas-Suarez (2012) characterize macroeconomic resilience to external shocks as having two dimensions: the economy's capacity to *withstand* the impact of an adverse external shock and the government's capacity to implement effectively policies to mitigate the effects of shock on macroeconomic and financial stability.

The first dimension involves cost and availability of external financing for adjustment policies. Adverse external shocks engender deterioration of the country's prospects for growth, lower return on investment, and increase the risk of default in servicing the country's debt. This raises the cost and lowers the availability of external financing, a major source of financing for developing countries, especially low-income developing countries, such as most in Africa. The relevant macroeconomic variables are: the current account balance, measured as a ratio of GDP; total external debt to GDP; and short-term external debt to gross international reserves. The second dimension of resilience involves the ability of the country to respond. It includes the fiscal space available to the government and the flexibility of monetary and credit policy available to the central bank. Relevant macroeconomic variables are: government fiscal policy balance as a ratio to GDP; the ratio of government debt to GDP; and the rate of inflation, which can affect monetary policy and private sector credit stance. To provide an overall picture of relative macroeconomic resilience, a resilience index, which comprises the six macroeconomic variables described above, has been constructed. The chosen variables reflect the cost and availability of external financing and ability of the country to respond. To make the variables comparable, each variable is standardized.<sup>14</sup> The index is the average value of the six standardized variables: current account balance, external debt, short-term external debt, fiscal balance, government debt, and rate of inflation.

### 4.2 Empirical Results

The empirical analysis builds on the premise that volatility in growth affects growth performance in Africa. It examines the effect of macroeconomic volatility and resilience on growth using a pooled cross-sectional panel of 44 SSA countries over the period 2004 to 2015.

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<sup>14</sup> This is done by subtracting the cross-country mean and dividing by the standard deviation.

In assessing the potential impact of macroeconomic volatility on economic growth, the bivariate correlation results shown in the previous section are not sufficient. Macroeconomic variables that reflect economic vulnerability and resilience should be included. Economic resilience through appropriate macroeconomic management and policies can mitigate the impact of external shocks and contribute to positive growth performance; on the other hand, inappropriate macroeconomic management (or reduced resilience) can have the opposite effect. Structural economic vulnerability, such as export concentration or lack of diversification, is expected to be negatively correlated to growth. There is however no consensus on economic openness. Economic theories suggest that openness to trade enhances growth. The empirical literature on the small island developing countries (Briguglio, et. al., 2008, and Guillaumont, 2010) suggests a negative association between growth and openness. Easterly, et. al. (2000), on the other hand, found that openness might increase volatility. Aghion and Banerjee argued that theoretically, endogenous growth models would suggest that volatility should affect growth positively.

Table 1 below shows the framework for analyzing the empirical relationship between economic growth and macroeconomic volatility. The dependent variable for economic growth performance is the average annual growth rate of GDP per capita of each sub-period. The explanatory variables suggested in various previous empirical studies discussed above include: level of GDP per capita, growth volatility measured by the standard deviation of the growth rate of GDP per capita, the index of macroeconomic resilience, economic openness measured by the ratio of the sum of merchandise and services exports and imports to GDP, and export concentration measured by the UNCTAD Herfindahl-Hirschmann index.

**Table 1: Empirical Link between Growth and Macroeconomic Volatility**

Explanatory variables	Macroeconomic variables	Expected empirical relationship to economic growth
Initial condition (per capita income)	GDP per capita	negative
Volatility in growth	Standard deviation of growth of GDP per capita	negative
Macroeconomic resilience	Index of standardized macroeconomic variables	positive
Economic Vulnerability:		
Economic openness	Ratio of trade to GDP	ambiguous*
Export concentration	UNCTAD Herfindahl-Hirschmann Index	negative
*Endogenous growth theory suggests a positive relationship; but there is no general consensus.		

Unless otherwise noted, the data came from three sources: the IMF *World Economic Outlook* databank; the World Bank *World Development Indicator*; and the *United Nations Conference on Trade and Development* (UNCTAD). All of them are accessible online. A pooled cross-sectional dataset was created. The 12-year period between 2004 and 2015 is divided into two sub-periods, which correspond approximately to the differences in the external environment between the period prior to the financial crisis and the Great Recession (2004-2008) and the period (2009-2015) following the crisis. The dataset includes 44 of the 49 countries in the SSA region.

Four different model specifications were estimated using the robust regression method. Table 2 below shows the results from the robust regression analysis. Model I simply relates economic growth to the volatility of growth with the initial condition measured by GDP per capita. The coefficients for both are statistically significant and have the expected sign.

Model II add macroeconomic resilience and structural vulnerability (trade openness and export concentration) variables to the model. Macroeconomic resilience is positively correlated with growth performance as expected and is statistically significant. Trade openness as a proxy variable for structural vulnerability is also statistically significant and its coefficient is positive.



This does not support the view that economic openness increases vulnerability, raises volatility and thus adversely affects growth. However, the positive correlation between openness and growth is consistent with the view implied by endogenous growth theoretical arguments (Aghion and Banerjee, 2005). It is possible that the proxy variable may not be adequate, since it does not take into account vulnerability that might come from the interaction between imperfections in the functioning of financial markets and volatility and depth in the financial sector. The export concentration variable in the model is not significant. The coefficients for per capita GDP and volatility remain statistically significant. The adjusted  $R^2$  in model II increases noticeably from 0.15 to 0.31.

**Table 2: Robust Regression Results: Macroeconomic Volatility, Resilience, and Economic Growth**

	<b>Model I</b>	<b>Model II</b>	<b>Model III</b>	<b>Model IV</b>
Independent variables	Growth	Growth	Growth	Growth
GDP per capita	-0.000082*	-0.00013**	-0.00012**	-0.00012**
	(-2.53)	(-3.35)	(-3.22)	(-3.13)
Volatility of growth rate	-0.252**	-0.443***	-0.439***	-0.440***
	(-3.08)	(-4.86)	(-4.83)	(-4.76)
Macroeconomic resilience		0.895*	0.891*	0.874*
		(2.23)	(2.19)	(2.07)
Economic openness		0.0130*		
		(2.26)		
Concentration of exports		0.559		
		(0.60)		
Export diversification and openness			0.0086*	0.0085*
			(2.10)	(2.04)
Oil-exporting countries				0.092
				(0.14)
R-squared adjusted	0.15	0.31	0.3	0.24
Number of observations	88	82	82	82
Notes: Robust regression results from pooled cross-sectional data from 44 countries, 2004-2015.				
t statistics are in parentheses; *p<0.05; **p<0.01; and ***p<0.001				

In Model III, the study explores the possible interaction between economic openness and export concentration. In the existing empirical literature of small and open economies (Briguglio, et. al., 2008, and Guillaumont, 2010), economic openness and export concentration, through its effect on terms of trade fluctuations, can have a major effect on growth volatility, but export concentration is considered to play a minor role. Openness has a more direct effect on volatility in this literature. However, in small and open economies, which many African countries are, reducing export concentration or increasing export diversification and reducing volatility have potentially a positive effect on growth. The coefficient of the interactive variable of openness and export diversification in Model III is positive and statistically significant. Since most African countries have a high degree of openness and limited export diversification or high degree of export concentration, the positive coefficient of the interactive variable lends support to the view in the existing literature. Other variables remain significant and have the correct sign.

Model IV examines whether there is a difference between oil and non-oil exporting economies. The latter tend to be subject to more commodity price fluctuations than the former, especially when export earnings rely heavily on a few major commodity exports such as oil. In the model, a dummy variable differentiating oil and non-oil exporting economies is included. The coefficient is not statistically significant. Other variables remain significant.

## 5. Conclusion

The analysis in this study contributes to the existing empirical literature concerning the potential impact of growth volatility on economic growth performance in the case of African economies. Standard macroeconomic models explain volatility in growth through the Real Business Cycle theory. In these models, growth volatility has little or no negative effect on long-term growth and may even be positively related to growth. On the other hand, empirical findings that include developing countries suggest that output fluctuations and growth volatility are negatively correlated with economic growth. The empirical results of this study support the view that volatility in growth can have significant cost in terms of lower economic growth. In the case of African economies, the study shows that an increase in one-half standard deviation of volatility reduces growth by an estimated 0.4 percent.

The study includes macroeconomic policy indicators, representing the resilience of an economy to withstand or cope with instability, and two structural characteristics, reflecting potential economic vulnerability to external shocks, namely, economic openness and export concentration or lack of diversification. The empirical findings consistently show that macroeconomic resilience is positively related to economic growth performance and statistically significant in all the models. While economic openness is positively correlated to growth and statistically significant, export concentration is not. However, the variable of interaction between export diversification – using the UNCTAD-constructed indicator measuring the number of products exported – and economic openness is positively correlated with economic growth and statistically significant.

With the recent decline in commodity prices and the slowdown of the world economy, the issue of growth volatility on economic growth performance is again high on the international development agenda. This is particularly the case for developing economies whose exports are highly concentrated in a few commodities, as in the case of many African economies. Many of them are also considered “fragile states” by international development institutions. State fragility is characterized by institutional and policy weaknesses with limited capacity to absorb effectively international assistance. Growth volatility thus can be an impediment for attaining the post-MDGs (Millennium Development Goals) development agenda. Since most of the fragile states are highly aid dependent, addressing the structural vulnerability and enhancing resilience is complementary in the rethinking of foreign aid allocation, programming, and instruments for delivery of aid.<sup>15</sup>

Lastly, macroeconomic resilience implies that conditions prior to external shocks matter. For example, if there is more fiscal space, such as a lower fiscal deficit, strong revenue base, lower external debt burden, the government has more room to respond and cope with the volatility. It should also be pointed out that the index of resilience in this study is limited. It mainly focused on macroeconomic resilience and did not take into account other dimensions of economic resilience, such as microeconomic reforms to support structural transformation, financial market developments, and good governance.

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<sup>15</sup> See, for example, Toh and Kasturi (2014) for policy implications related to fragile states.

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