Aid Volatility and Structural Economic Transformation in sub-Saharan Africa

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Abstract

This paper departs from the traditional aid–economic growth studies through its examination of the impact of aid and its volatility on sectoral growth relying on panel dataset of 37 sub-Saharan African (SSA) countries for the period 1980–2014. Findings from our system generalised methods of moments (GMM) show that, while foreign aid significantly drives economic transformation, aid volatility deteriorates sectoral value additions with huge impact on the non–tradable sector and a no apparent effect on the agricultural sector. However, the deleterious effect of aid volatility on structural economic transformation in SSA is weakened by a well–developed financial system with a large dampening impact on the tradable sector. Our evidence therefore provides unequivocal support for the notion that development of domestic financial markets enhances aid effectiveness.

Keywords: Aid, Sectoral growth, sub-Saharan Africa

1 Introduction

To what extent does Official Development Assistance (ODA) volatility affect sectoral growth in developing countries? Interrogating this question is crucial as sustained economic growth is a necessary condition for poverty reduction and other development outcomes. In many sub-Saharan African (SSA) countries, where government spending is less than Purchasing Power Parity (PPP) $500 per person per year, ODA continues to be an important resource. To this end, many sub-Saharan African countries are highly dependent on ODA and it therefore comes as no surprise that the sub-region is the largest recipient of ODA such as country programmable aid (CPA) in the world. For instance, the

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region receives about 35% of total ODA and hosts thirteen out of the twenty largest ODA recipients. In 2012, a total of US$ 49.5 billion representing 33% of gross ODA was given to SSA while CPA also increased significantly by 13% between 2012 and 2013 (Organization for Economic Cooperation and Development (OECD), 2015).

We define ODA as concessional assistance from official agencies to eligible developing countries or multilateral institutions with the purpose of promoting economic development and welfare of the citizenry of recipient countries. We acknowledge that there is much debate on the meaning and dimensions of aid with much of the debates being polarised. Many discussions have also focused on the altruistic values of official agencies to the neglect of their economic and political rationale for disbursing aid. Aid also constitute a bundle of things which can take the form of grants, debt reliefs, commodities and food, mixed project aid and technical cooperation. Thus aid to developing countries takes a combination of in-cash and in-kind transfers. Our conceptualisation of aid in this paper is in line with the different forms outlined.

Despite the burgeoning literature on ODA–volatility growth nexus, there is little agreement or fierce debate on the real effects of aid on economic growth. To some scholars, there is a marginal or negative relationship between ODA and economic growth (see Young and Sheehan, 2014) due partly to donor interests and inappropriate recipient policies. Others also demonstrate that ODA helps in the promotion of economic growth through increases in investments and capacity to import goods and technology, complement and supplement domestic resources and saving as well as augment capital productivity (Hatemi and Irandoust, 2005; Easterly, 2005; Duc, 2006; Armah and Carl, 2008; Minoiu and Reddy, 2010). Thus, ODA helps in bridging the saving-investment gap confronting many developing countries.

There is also a third of group of scholars who argue that the relationship between aid and economic growth is mixed. To these scholars, country-level factors such as policy environments play important role in shaping the effects of aid (Burnside and Dollar, 2000). Arguing along similar lines, other commentators maintain that in the short-run, aid promotes growth through investments and government spending while in the long-run, trade and financial depth has negative effects on growth (Adams and Atsu, 2014). Contrarily, Minou and Reddy (2010) have established that aid has beneficial effects both in the short and long-run. This notwithstanding, these studies have faced heavy methodological criticisms because of their emphasis on macroeconomic variables and economic growth.

Notwithstanding the ambiguities on aid–growth nexus in the literature, what is by far obvious is that country-specific factors or internal dynamics including financial markets, policy environments, quality of governance structures, resource endowment, culture and socio-economic characteristics are major determinants of the effectiveness or counter productiveness of aid to growth (Nkusu and Sayek, 2004; Hansen and Tarp 2001; De La Croix and Delavallade, 2013; Young and Sheehan, 2014; Winters and Martinez, 2015).

The burgeoning literature on aid has mostly focused on the totality of aid and

its effects on macroeconomic indicators such as economic growth to the neglect of the effects of aid volatility on specific sectors including agriculture, services and industry. Nonetheless, the discussion on aid sector volatility is important as it could have serious implications on growth. For example, aid volatility could force government to cut investments in areas including human capital development or boost government consumption (Celasun and Walliser, 2008). Rodrik (1990) argues that aid volatility may results in volatility of expenditure and policy instability especially among poor aid-dependent countries while Mosley and Suleiman (2007) also suggest that aid volatility reduces fiscal policies and coherent investment programmes in the public sector in recipient countries. Informed by these strands of view, some commentators have argued that aid volatility negatively affects the effectiveness of aid at the macro-economic level (Lensink and Morrissey, 2000) and it leads to macroeconomic instability (Chauvet and Guillaumont, 2009).

It is worthy of note that not all aid volatility is necessarily negative because of its association with aid windfalls and shortfalls. In this regard, Hudson and Mosley (2008) distinguish between negative and positive volatility with their effects on economic growth determined by factors such as the failure of recipient countries to adhere to donor conditionalities in safeguarding aid in addition to administrative delays, changing donor priorities which results in addition or subtraction (Celasun and Walliser, 2008). In the literature, it is often assumed that aid flow is predictable which makes it possible for recipient countries to factor such inflows into their development planning because of the close elision between aid commitment and disbursement. However, this assumption has been far from reality because disbursed aid volumes is much more complex and differ markedly from committed aid especially in most aid dependent countries (Hudson, 2013).

Our purpose in this paper is to go beyond the debates on aid volatility–growth nexus and to examine the effect of aid and aid volatility on sectoral outputs. Indeed, individual sectoral effects of aid volatility matters in the same manner as total aid volatility because merely regressing aid on economic growth is not instructive, hence the need for an in-depth knowledge and understanding into how individual sector is uniquely affected. In this paper, we focus on aid unpredictability disbursement relative to commitments. Negative volatility which refers to sudden decrease or decline in aid has effects on economic growth by leading to projects postponement and disruption of government budgetary planning (Hudson and Mosley, 2008). In this regard, the effects of aid and its volatility on structural economic transformation – defined as sectoral output value additions – deserve much scholarly attention.

It is imperative to contend that, a significant problem in aid–growth literature is the possibility of obtaining biased results stemming from potential endogeneity of aid in respect to growth. Indeed, donor countries may incentivize a recipient country with a high level of sectoral growth by providing huge foreign aid. Conversely, some donor countries may also wish to channel large aid flows to slow–growing poor countries (Hepp, 2008) and may also direct that a proportion of the inflows be channelled to a specific sector where they believe

intrinsically lag behind relative to other sectors. Thus, there might be a negative association between sectoral output value additions and aid inflows. Simultaneously, if some donor countries have higher appetite for directing more aid to fast–growing countries and more specifically certain sectors of the economy, we expect a positive correlation between sectoral output and aid. In such framework, one might anticipate the other variables perceived to influence structural economic transformation to potentially correlate with sectoral output. Apart from this, the majority of the active population of SSA's labour force is more probable to engage in agriculture thereby increasing its sectoral output and freeing resources/inputs to other sectors notably the manufacturing. Moreover, relatively efficient sector players may demand improved institutional quality to allow sound service delivery hence boosting income. These are potential threat to identification of the causal impact of agricultural output and institutions on structural economic transformation. We resolve these potential endogeneities by employing the system generalised methods of moments (GMM) where we instrument with two lags of the regressors in the first difference equation and a one lag of their first difference in the level equation while dealing with country–specific effects.

We contribute significantly to literature. Incorporating aid volatility into the standard aid–growth framework will provide an indication of the extent to which aid vagaries may have eroded sectoral output over the period under consideration, where the region has received substantial ODA. Undoubtedly, our study provides a strong alternative to examining aid–growth relationship in SSA. More specifically, our study focuses on sub-sector effects of aid and aid volatility and how financial sector development impact on volatility–sector output nexus. To the best of our knowledge, this is the first study attempting to quantify the unique impact of aid and its volatility of the various sectors of SSA. In doing so, we deal with the question of whether aid and its volatility have counteracting effect on each sector. Apart from this, our study empirically examine whether development of the financial sector which has been low in SSA relative to other emerging economies mitigates or amplifies the potential impact of volatility in the region's structural economic transformation process.

The paper is organised as follows: Section 2 presents some stylised facts on aid inflows in SSA while Section 3 examines the empirical literature on aid, volatility and growth nexus. Section 4 presents the data and empirical strategy while the penultimate section discusses the findings. Section 6 concludes the study with some implications for policy.

2 ODA–Volatility architecture in SSA: Some stylised facts

The growing emphasis on ODA in Africa can be best understood in the context of the increasing poverty and under-development in the sub-region. Poverty ranks as one of the region's most pressing development challenges. An estimated

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48.5% of SSA's population subsists on less than US$1.25 a day. With almost 910.4 million people, the region has, by far the highest poverty rate in the world with about 65% of the population being multidimensionally poor (UNDP, 2011; World Bank, 2012). This makes Africa the signifier of poverty and sometimes the connection with poverty often close to elision (Harrison, 2011). Moreover, countries in SSA occupy most of the bottom places in many human development indicators including life expectancy, maternal mortality and literacy rates (UNDP, 2015) while growth rates have recorded abysmal performance over the last four decades (Asongu, 2014).

This situation coupled with weak institutional and governance structures has created a 'development void' where foreign donors including bilateral and multilateral agencies have sought to fill through the provision of ODA. The institutionalisation of aid can also be seen as a mechanism for creating interaction between developed and less-developed countries. This is also not to downplay the fact that donor agencies may not necessarily allocate aid flow to the neediest regions or countries but are influenced in part by their political and strategic considerations including the rhetoric of better governance, fiscal sustainability and accountability (Collier and Dollar 2002; Harrigan et al., 2006). We argue here that conceptually aid to SSA countries can be considered as a necessary evil. This notwithstanding SSA has remained the major recipient of aid making aid to play a major role in the development of many countries. This has led to what many commentators consider as Africa's aid high dependence on donor funding leading to what is known as a 'dependency trap'.

Despite the rhetoric by the international donor community in ensuring aid effectiveness by making aid more predictable following the Paris Declaration of 2005, and two other subsequent commitments: the Accra Agenda for Action in 2008 and the Busan Partnership for Effective Development Co-operation of 2011, aid variability still continues to a major challenge more especially among aid-dependent countries in SSA, This is so because aid shortfalls have dire consequences for governments in reducing the level of investments. Moreover, Celasun and Walliser (2008) argue that aid volatility is most common among poor countries. In the same vein, Vargas (2005) notes that averagely, the difference between aid commitments and disbursements for SSA countries could be higher or lower by 20% of total aid commitments. In their analysis, they found that between 1975 and 2002, total disbursement to SSA countries fell short by 4.9%. It volatility especially in SSA countries could be influenced in part by donor countries' prevailing economic and political conditions while weak institutional structures in recipient countries also play major roles. For example, political unrest and economic meltdown in donor country could affect the smooth disbursement of aid to recipient countries and thereby lead to aid unpredictability. On the part of recipient countries, weak systems and low capacity in the public sector could also result in not meeting donor requirements which could also delay the disbursement process leading to unpredictability. Many SSA including Kenya has experienced relatively unpredictable flow of aid especially since the 1980s. For example while the period 1990-2000 witnessed a dramatic decline in bilateral aid, the 2001-2011 period saw an increase in bilateral flow due to

changes in regime. In this regard, commitments have been higher than disbursements (Ojiambo et al., 2015).

Turning to economic growth performance among SSA countries, the subregion has experienced considerable improvement over the years. For example, in 2013, SSA recorded an average growth rate of 5% compared to 3% for the global economy. This has led to an improvement in the region's medium-term growth prospects due in part to social and political stability at home as well as recovering global economic situations (AfDB, 2015). The growth experienced in recent years has led a new narrative of 'Africa rising', Africa emerges and 'African Growth Miracle' by some commentators (Young, 2012; Rotberg, 2013). However, Taylor (2016) cautions against such sweeping generations because they tend to ignore the deep structural challenges facing SSA including under development. He further maintains that beyond the growth figures, Africa is actually deepening its structural dependent position on the global economy while social exclusion and income inequality is also on the ascendency.

3 ODA–Volatility–Growth Nexus: Situating the debates and ambiguities

In this paper, although a comprehensive review of the literature on ODA-volatility-growth is beyond the scope, we however, review some key contributors. The results on aid-growth nexus have been mixed without any robust and conclusive evidence.[1] For the purpose of this paper, we classify the literature into three strands. This is a departure from the polarised literature.

Most studies examining the effects of aid on growth points find that aid has positive effects on the economic growth of recipient countries (Clemens et al., 2012; Bruckner, 2013). This positive impact of aid on growth is achieved through domestic capital formation supplementation (Hansen and Tarp, 2001), public investment and human capital development. According to Morrissey (2001) and McGillivray (2009), aid contributes to economic development by way of increasing physical and human capital investment and also provides an opportunity to import capital goods and technology in recipient countries. In many SSA countries where the relatively lack of growth is partly due to shortage of capital, foreign aid plays much important role by bridging the gap between savings and investments as well as imports and exports (Chervin and van Wijnbergen, 2010).

An aspect of the aid-growth literature that has recent little attention relates to the effects of sectoral aid growth. This notwithstanding, Kaya et al. (2008) using a dataset of 112 developing countries between 1974 to 2005 found that aid to the agricultural sector resulted in value addition which significantly increased economic growth. For some scholars, aid contributes to effective governance and democratic structures (Heckelman and Knack, 2008). Poor governance is also found to negatively affects aid flows (Young and Sheehan, 2014; Winters and

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[1] See for example Clemens et al. (2004) for details on the literature on aid-growth nexus.

Martinez, 2015). It is worth noting that the extent of aid effectiveness depends in part on good economic and governance policies of recipient countries. Thus, prevailing policy environments play major role in determining aid effectiveness. However, this assumption has received a number of critiques (Hansen and Tarp, 2001; Hudson and Mosley, 2001). For instance, Hansen and Tarp (2001) argue that aid increases economic growth but with diminishing returns irrespective of the policy environment.

On the other hand, other commentators argue that aid is detrimental to economic growth because of its tendency to create a 'dependency trap' for recipient countries. In some context, it could also lead to crowding out the development of the private sector in addition to lowering competitiveness through the Dutch disease. This results in negative impact especially on traded goods and growth in in recipient countries (Rajan and Subramanian, 2011). Arguing along similar lines, Duc (2006) using a sample of 39 developing between 1975 and 2000 found a significant negative relationship between aid and economic growth. Some scholars even go further to dismiss completely the effects of aid on growth because of ineffectiveness caused in part by aid fungibility. The reverse causality effect of aid on growth has received copious treatment in the literature (see Rajan and Subramanian, 2008). As mentioned earlier, aid dependency has a greater tendency of undermining institutional quality and increasing collusive and rent seeking behaviour in recipient countries (Asongu, 2012; 2013). To this end, the negative result is largely explained by political economy dynamics. Another important factor has to do with the usage of the aid money (i.e. consumption or investment). For example, Bearce (2008) maintains that in countries where aid is consumed rather than invested, the effects tend to negative. Similarly, Arellano et al. (2009) examined the effects of aid volatility on consumption, investment and structure of production and found that the continuous inflows of aid were used for consumption which resulted in significant welfare losses. The results of the effect of aid on investment have also received mixed results in the literature (see Easterly, 1999; Hansen and Tarp, 2001; Clements et al., 2004).

An aspect of aid volatility that has received little attention in the literature relates its sector specific effects. Hudson (2012) maintains that most studies tend to focus the totality of aid or its macro level effects. For example, some of the few studies point to a significant negative effect on macro level variables including growth. According to Kodama (2012), aid unpredictability leads to about one-fifth of aid being wasted while Bulir and Hamann (2008) using a sample of 76 countries between 1975 to 2003 maintain that aid volatility is much bigger than GDP volatility, increases over time and is unpredictable. Hudson and Mosley (2008) argue that aid volatility negatively affects economic growth of recipient countries depending on the level of aid. For this reason, they distinguish between negative and positive volatility. Bulir and Hamann (2008) also found that in both heavily and less heavily aid-dependent countries, aid volatility inflow makes it difficult in managing the macro economy. Due to the procyclical nature of aid, it has failed to either act as a macroeconomic stabilizer or an insurance mechanism. Contrary, Hudson and Mosley (2008) found no evidence of high

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aid volatility in heavily aid-dependent countries but volatility declines as aid-to-revenue ratio increases. The impact of aid volatility on economic growth is much more complex and extends beyond the income-consumption nexus to include other aspects such as policy maker's decision and wage levels.

It is worth noting that although the vast literature on aid volatility is silent on sectoral effects, it is only recent that Hudson (2015) has examined the effects of aid and aid volatility on specific sectors using database of 50 sectors from the OECD Creditor Reporting System. He found that when debt and humanitarian aid are ignored, the most volatile sectors are linked to government and industry but other social sectors including health and education have low volatilities. This notwithstanding, much of the literature tends to forget that aid is meant to target specific projects or sectors. In worst scenarios, they treat all aid as the same but this has been criticized at great length by Clements et al (2004). For this reason Wolf (2007) in analysing the effects of aid volatility and its volume on health, education and water and sanitation sectors found that the share of aid on these sector specific outcomes was positive but overall aid impact was negative.

Ferro et al. (2014) have also studied the effects of aid to the services sector and its effects on manufacturing exports. They found that in general aid to the services sector (especially transports and energy) has positive effects on downstream manufacturing exports for developing countries.

In summary, the results of the extant studies on aid-growth nexus are still inconclusive due to the use of aggregate growth measure. However, we argue that such measurements are not informative as aid and its volatility potentially impact on growth through the various sectors. Put differently, while earlier studies have provided evidence of aid–growth nexus, little is known on how aid and its associated vagaries uniquely impact on each sectoral output. It is therefore imperative to separate the different sectoral effect of aid and how each sector is affected by fluctuations in aid inflows. Given this, the study hypothesizes that deeper financial sector should dampen the negative effect of aid volatility of output. More specifically, well–developed financial sectors if associated with healthy levels of private credit can play a critical role in mitigating the possible crowding–out effects of aid on emanating from excessive aid fluctuations.

4 Data and Methodology

4.1 *Data*

To test our hypothesis, we construct a panel dataset of 37 SSA countries for the period 1980–2014.[2] The choice of these countries is based entirely on data avail-

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[2] These countries are Benin, Botswana, Burkina Faso, Cape Verde, Cameroon, Burundi, Congo, Rep., Cote d'Ivoire, Central African Republic, Chad, Congo, Dem. Rep., Ethiopia, Gabon, Ghana, Gambia, The, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mali, Mauritius, Malawi, Nigeria, Niger, Namibia, Mozambique, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Togo, Uganda, Zimbabwe, Zambia.

ability for a sufficiently longer time period. Annual data for all the variables were gleaned from the World Development Indicators (WDI) of the World Bank. We used ODA to GDP ratio to proxy foreign aid. We follow Dabla–Norris et al. (2013) and proxy the degree of economic transformation by the real value added output in agriculture, service and manufacturing. Specifically, value addition in the agricultural sector is the net output of a sector after adding up all outputs and subtracting intermediate inputs while that of the service sector include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. Industrial sector value added which comprises of value additions in manufacturing, mining, construction, electricity, water and gas. Indeed, sectoral value additions are computed as the net output of a sector after summing all outputs and subtracting intermediate inputs. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3 and annual growth rate for all sectors are based on constant 2005 U.S. dollars. We present the distribution of aid and the various sectoral outputs in the Appendix. We used credit provided by financial sector to the private sector as percentage of GDP to proxy the quality of financial development. Our control variables are based on the standard neoclassical growth theory and include inflation, investment rate, government expenditure, institutional quality, labour and trade openness. The inflation variable is the annual percentage change in the consumer price index and used to proxy macroeconomic (in)stability. This is expected to negatively impact on economic transformation. We use gross fixed capital formation as a percentage of GDP to proxy investment rates and this is expected to positively influence structural economic transformation. Government expenditure expressed as a percentage of GDP measures final government consumption expenditure and used to measure government size. The institutional quality variable is a continuous variable ranging from 0 to 4, with a higher score indicating a better quality. Obtained from the International Country Risk Guide (ICRG), this is used to measure the quality of government institutions that affect property rights or the ability to conduct business. Labour is proxied by the percentage of economically active population aged 15 to 64 years.

4.2   *Modelling aid volatility*

Some authors (see for instance, Chervin and van Wijnbergen, 2010; Markandya et al., 2010; Ojiambo et al., 2015) have used the standard deviations where aid volatility is measured according to the degree to it deviates along the mean trend. However, this measure assumes that, aid inflows is normally distributed empirically and obscures the distribution between unpredictable elements of the aid process hence failing to capture the past information of aid inflow. We therefore estimate a time–varying volatility on account of the weaknesses of the traditional standard deviation measure. In this study, we rely on the generalised autoregressive conditional heteroskedasticity (GARCH) developed by Bollerslev (1986) largely because it captures past values of the aid and corrects

for the intrinsic weaknesses of the traditional measure. Similar to Alagidede and Ibrahim (2016), we allow the log of aid to depend on its previous value for the mean equation, we derive our GARCH model as follows:

$$InAID_t = \alpha_1 + \beta^| InAID_{t-1} + \varepsilon_t \tag{1}$$
$$\varepsilon_t \mid \Omega_t \sim iidN(0, \vartheta_t)$$

$$\vartheta_t = \aleph_0 + \tau\mu_{t-1}^2 + \theta\vartheta_{t-1} \tag{2}$$

where $\aleph_0 > 0, \tau \geq 0$ and $\theta \geq 0$

Therefore, our conditional variance h_t captures the mean ($\aleph_0$), information about the previous volatility, ε_{t-1}^2 (ARCH term) and the past forecast error variance, ϑ_{t-1} (GARCH term). Our GARCH model permits the error term to assume a time–varying variance contingent on the past behaviour of aid inflows.

4.3 Empirical strategy

Empirically, regression models are used to study the relationship between aid and growth. Following this, we specify equation (3) below where sectoral growth depends on the level of aid inflows and other conditioning variables.

$$SEC_{it} = f(AID_{it}, VOL_{it}, Z_{it}, \varepsilon_{it} \tag{3}$$

where SEC_{it} is sector growth of country i at time t; AID_{it}, is aid; VOL_{it} is aid volatility Z_{it} is a vector of control variables; ε_{it} is the error term while t and i are time and country indices respectively.

We examine the sectoral effect of aid and aid volatility by setting a baseline model where sector growth depends on its one period lag, aid and its volatility and a set of controls estimated in equation (4) below;

$$SEC_{it} = \beta_0 SEC_{it-1} + \beta_1 AID_{it} + \beta_2 VOL_{it} + \beta_3 Z_{it} + \gamma_i + \mu_t + \varepsilon_{it} \tag{4}$$

where SEC_{it-1} is the sector growth lag representing the initial conditions; γ_i is the country–specific fixed effects; μ_t is the time effects while ε_{it} is the idiosyncratic error term. We estimate equation (4) above by emplying the system generalized methods of moments (GMM) dynamic pooled estimator as it resolves the econometric problems inspired by endogeneity of the lagged dependent (SEC_{it-1}) as well as potential unobserved country–specific effects. Since all the regressors may be endogenous, we instrument with two lags of themselves in the first difference equation, and a one lag of their first difference in the level equation. We investigate the channels through which financial development magnifies or dampens aid volatility effect on sector growth by including a multiplicative interaction term of VOL_{it} and financial development. Consequently, we specify our general system GMM framework from equation (4) as:

$$SEC_{it} = \sum_{k=1}^{p} \gamma_k SEC_{it-k} + \alpha_1 AID_{it} + \alpha_1 VOL_{it} + \alpha_1(VOL_{it} \times FD_{it}) \quad (5)$$

$$+Z_{it}\beta + \epsilon_{it}$$

$$t = p+1,\ldots\ldots,T; i = 1,2,\ldots\ldots$$

$$\epsilon_{it} = \gamma_i + \mu_t + \varepsilon_{it}$$

where β is the vector of parameters associated with each explanatory variable; p is the maximum lag in the model; FD_{it} is financial development. The other variable remain as previously defined.

In order for the equation to be estimable, there is a restriction on the serial correlation of the error term which requires it to be uncorrelated with the explanatory variables. This condition has both economic and statistical meaning. Economically, it means that the instrumental variables only affect sectoral growth through their effect on the explanatory variables. Statistically, the condition means that our set of explanatory variables are weakly exogenous. In other words, they can be affected by current and past realizations of sector vale additions but must not be correlated with the future realizations of the error term. Thus, from equation (5), we write an arbitrary time period T for a random country i as:

$$SEC_i = V_i\psi + \lambda_i\gamma_i + \epsilon_{it} \quad (6)$$

where ψ is a vector of γ_i's, α_k's and $\beta's$; V_i is a vector containing the initial conditions and all the explanatory variables (M's) while λ_i is a $T \times 1$ vectors of unity.

By employing the dynamic pooled panel, we compute the linear GMM estimators of ψ with a general form equation specified in equation (7) below:

$$\hat{\psi} = \left[\left(\sum_i V_i^{*|}X_i\right)M_N\left(\sum_i XV_i^*\right)\right]^{-1}\left(\sum_i V_i^{*|}X_i\right)M_N\left(\sum_i X_i^{|}y_i^*\right) \quad (7)$$

$$where \ M_N = \left(\sum_i X_i^{|}\Gamma_i X_i\right)^{-1}$$

V_i^* and y_i^* are transformations of V_i and γ_i's, a_k's and β's; V_i and y_i respectively; X_i is a matrix of instrumental variables while Γ_i is the country–specific weighting matrix.

Our panel estimator relying on pooled cross–country and time series properties while utilizing additional information provided by the variations in the level of sectoral growth and associated factors influencing it. Thus, the added information from this property by far provides more precision in the estimations as well as correcting for biases beset with existing studies on the aid–growth nexus. Thus, the added information from this property by far provides more

precision in the estimations as well as correcting for biases beset with existing literature on aid–growth effects. Following from this approach, equation (5) can be estimated using the first difference or system GMM and consequently, from equation (5), we rewrite the sectoral growth model as:

$$SEC_{it} = \theta_1 SEC_{it-1} + \theta_2 W_{it} + e_{it} \tag{8}$$

Since the unobserved country–specific (γ_i) effect contained in e_{it} may be correlated with other explanatory variables, we first difference equation (8) to eliminate this effect thus giving equation (9) below:

$$\triangle SEC_{it} = \theta_1(\triangle SEC_{it}) + \theta_2(\triangle W_{it}) + (\triangle e_{it}) \tag{9}$$

By assuming uncorrelated error terms and weak exogeneity property of the explanatory variables, for our GMM dynamic panel estimations, we use the system GMM to of yield consistent and unbiased estimates because the first difference GMM has very poor finite properties both in terms of bias and precision especially when the explanatory variables are persistent overtime as their lagged values are weak instruments and predictors of endogenous changes (Arellano and Bover, 1995; Blundell and Bond, 1998). By using the system GMM, we employ extra moment conditions for the regression in levels are given as follows:

$$E[SEC_{it-s} - SEC_{it-s-1}(\gamma_i + \varepsilon_{it})] = 0 \quad \text{for } s = 1 \tag{10}$$

$$E[W_{it-s} - W_{it-s-1}(\gamma_i + \varepsilon_{it})] = 0 \quad \text{for } s = 1 \tag{11}$$

We address the validity of the instruments by using two (2) formal tests: serial correlation test and Sargan's test for over–identifying restriction. While the serial correlation test examines the null hypothesis that the error term is serially uncorrelated (whether first, AR(1) or second order, AR(2)), the Sargan's test examines the exogeneity of the instruments with the null hypothesis that over–identifying restrictions are valid.

5   Results and Discussions

This section presents the empirical findings on aid–volatility–sectoral value additions nexus. Specifically, we regress structural economic transformations proxied by real value additions of agriculture, service and industrial sector on their one period lag together with aid, aid volatility and other standard controls selected with recourse to standard literature. We also include the multiplicative interactive term of aid volatility and financial sector development. To eliminate time and country level heterogeneity in the structural economic transformation process, our estimations include time and country effect dummies and results from the system GMM are presented in Table 1 below.

Conditional convergence hypothesizes that economies have a penchant of converging toward a steady–state path (Solow, 1956). In this study, we argue

that sectoral output growth in SSA will depend on the initial value additions. Following this logic, we capture the conditional convergence effects by including the initial/lagged output levels of agriculture, service and manufacturing sectors in their respective models. From Table 1, the coefficient of the respective lagged dependent of each sector is negative and significant at conventional levels predicting a convergence of sectoral output to a stable equilibrium.

Columns 1 and 2 present findings on how the independent variables affect real value additions of the agriculture sector. The coefficient of gross fixed capital formation is positive for all sectors but its effect on agricultural value addition is not significant. With regard to the service sector, our finding suggests that a unit percentage increase in investment rate increases its value addition by 0.078% compared to 0.081% of the manufacturing sector. This finding is unsurprising as investment in capital build up is expected to boost infrastructure thus paving way for the expansion in both sectors. The effect of fiscal policy proxied by government expenditure is positive albeit insignificantly suggesting that government expenditure does not matter in economic transformation.

This argument is well illustrated in Ibrahim and Alagidede (2016, forthcoming) where the authors opine that government expenditure in SSA is often on boondoggles and white elephants. More importantly, award of government contracts are usually based on corrupt relationships rather than on merit culminating in shoddy works with no impact on economic growth.

In terms of the effect of macroeconomic instability proxied by inflation, our results indicate that increases in inflation is associated with reduced value additions in all the sectors. While macroeconomic instability is generally unhealthy, the effect on manufacturing value additions is dire given the rather high (in absolute) elasticity of manufacturing value additions with respect to fluctuations in inflation. This result in practice appears plausible. Increases in inflation decrease the purchasing power of individuals therefore reducing their demand for goods and services with a concomitant effect on supply side production. This ultimately is expected to reduce values additions thwarting the process of economic transformation. Turning to the effect of international openness on structural economic transformation, our findings suggest that, de-restricting trade barriers can potentially increase value additions in all sectors with large effects in the manufacturing (column 5). Our finding follows the fact that the booming industrial sector in SSA is largely attributed to the rising competition stemming from higher trade openness which has paved the way for trading in goods and services thereby increasing output in each sector. Perhaps, the increasing competition among sector players in SSA and the rest of the world has promoted innovation among sectors in the region. Indeed, the likelihood of sectors to leap-frog in terms of technology also permits their production at reduced cost thereby reducing their cost of production and increasing sectoral output.

The effect of labour in output growth is positive and statistically significant suggesting that increasing population in region is associated with higher economic transformation. Further findings show that higher institutional quality is output-enhancing. Specifically, increase in the quality of institutions promotes

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value additions in agriculture, service and the manufacturing sectors. Apart from enhancing capacity, improvement in institutions alleviates structural bottlenecks inhibiting sectoral productivity ultimately spurring output.

On aid–sectoral growth nexus, we find a positive and statistically significant effect of aid on agricultural output suggesting that aid inflows to SSA propels agricultural output. Similarly, foreign aid is also associated with higher service and manufacturing output. Thus, foreign aid inflows propel structural economic transmission and may well reveal the interdependence of the various sectors in the production process. While the agricultural sector provides the inputs necessary for production while service sector provides the intermediation role by creating a sound enabling the environment for manufacturing to thrive. Indeed, those manufacturing industries that rely more heavily on service sector benefit from the efficient transportation services, ICT, energy and other service provision thereby spurring manufacturing output. Thus, apart from propelling agricultural sector production, the positive impact of aid suggests improvement in service provision permitting downstream users of these services. Notice that the effect of aid on agricultural output is large and increases substantially with a rather reduced magnitude on manufacturing. We attribute this to the high concentration of agriculture where additional resources potentially increase production. Defined as an income transfer to governments, to the extent that foreign aid permits increased public spending and investment, these findings are particularly apt as efficiency in services (dis)proportionally benefits all sectors although the output–enhancing effect on manufacturing is low perhaps due to the nascent manufacturing sector.

We control for the direct effect of aid volatility on sectoral output and results are shown in columns 2, 4 and 6. Our findings show a negative impact of aid volatility on agricultural, service and manufacturing output. The implication is that while aid promotes growth in these sectors, excessive vagaries in aid dampen its enhancing–effect. However, this effect is statistically insignificant in the agricultural sector. Although the coefficient of aid volatility is negative and significant (at 5%) for service and manufacturing sectors, its effect is huge in the former. These findings suggest that revenue volatility deteriorates output and can potentially present severe problems to developing economies like those in SSA. As argued by Mosley and Suleiman (2007), government of recipient country's capacity to execute productive investments and fiscal policies is inhibited by excessive aid fluctuations. With the revenue inflows of which a high proportion goes to poor countries as aid, fluctuations in aid may result in volatility of expenditure and instability of policy (Rodrick, 1990). Overall, our findings could explain why countries in SSA have made little progress transforming their structure despite the ODA inflows.

While this holds, evidence from our study suggests that volatility effect of aid on agriculture is insignificant. Thus, relative to service and manufacturing, the agricultural sector is immune from the adverse effects of unpredictable pattern of aid. This finding is akin to Chauvet and Guillaumont (2009). The author's show that aid, even if aid is volatile, it is not as procyclical as is often argued, and, even if procyclical, it is not necessarily destabilizing with the (de)stabilizing

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nature of aid measured by the difference in the volatility of (i) exports and (ii) aid plus export flows. To the extent that agricultural sector in SSA is not into mainstream exports but provides inputs for other sectors in the processing and exporting sector perhaps explains the subtle effect of volatility. On the policy front, this finding highlights the need to not assume that aid volatility will have the same effects across different sectors of the economy. While volatility may not have significant effect on one sector (such as agriculture), it may have a relatively smaller negative effect on one sector (such as service) hindering its improvement, while at the same time have negative and large effect on other sectors (such as manufacturing).

Given the negative effects of volatility on economic transformation in SSA, this study hypothesizes that, improvements in domestic financial sector falters aid vagaries. We test this hypothesis by including a multiplicative interactive term of volatility and financial development proxied by credit to the private sector. Consistent with our hypothesis, we find a negative coefficient of the interactive term suggesting that countries with well–developed financial sectors are associated with lower volatility. This finding is somewhat akin to Nkusu and Sayek (2004). A plausible explanation from this study may be that, because aid provides more resources to governments of the recipient countries reduces their appetite to compete with the private sector for credit from the domestic financial sector thereby freeing credit to the private sector. However, dampening effect of financial development is insignificant in the agricultural sector. Indeed, countries in SSA have high comparative advantage in agriculture (see Collier and Venables, 2007) and with majority of the agriculture-based economies having agriculture contribution to GDP and manufacturing sector output respectively averaging 34% (Hayami, 2005) and 61% (GAIF, 2008).

This notwithstanding, commercial banks in SSA lend less than 10% of their total credit to the agricultural sector with the exception of Malawi, Tanzania and Uganda (Mhlanga, 2010). However, manufacturing and industrial sectors are seen as sound destinations for bank lending because they are insulated from the inherent challenges faced by the agriculture sector. Agriculture creates special challenges for financial institutions due to its spatial and risk characteristics (see Meyer, 2011; Antonaci et al., 2014). However, financial sector programmes aimed at ameliorating these problems produced disappointing results (Meyer, 2015) on the back of under–developed financial sector (Ibrahim and Alagidede, 2016, forthcoming). Thus, the inability of the region's financial sector development to tame volatility in the agricultural sector is unsurprising.

Turning to the other independent variables, after controlling for volatility and indirect channels, investment does not appear to impact on agricultural output (column 2) but has a robust positive effect on service and manufacturing sectors (columns 4 and 6). The effect of government expenditure on sectoral growth is largely positive albeit insignificantly expect in the service sector which is slightly significant at 10%. Macroeconomic instability is damages economic transformation given the negative and robust effect on sectoral output. This finding suggests that maintaining a stable macroeconomic environment is crucial in structural economic transformation in SSA. The effect of trade openness

is insensitive to model specification given the robust positive effect on output. Beyond promoting competition, openness to international markets allows technological transfer permitting sectors to produce goods and services at lower unit costs. Labour as an input in production process is maintains its positive sign whether or not we control for volatility and interaction term of finance and volatility. Institutional quality is strong and positive re–emphasizing the importance of improved institutional capacity and frameworks in transformational growth and development in SSA.

We turn to the reliability of the results. More specifically, the p–values of the Wald chi square statistic shows jointly significance of the all the regressors in the each model. Results from our diagnostic checks rejected the null hypotheses for the Sagan's tests thus supporting the validity of the instruments. Our test s for first [AR(1)] and second [AR(2)] order–correlation show absence of first–order serial correlation and the presence of AR(2) given the high (low) p–values (z–values). Conclusively, our findings provide consistent and unbiased estimates given the valid instruments.

5.0.1 Conclusion and Policy Implication

Our purpose in this paper is to go beyond the debates on aid volatility–growth nexus and to examine the effect of aid and aid vagaries on structural economic transformations proxied by sectoral value additions. More importantly, individual sectoral effect of aid volatility matters in the same manner as total aid volatility because merely regressing aid on economic growth is not instructive. This paper therefore examines the effect of aid and its volatility on structural economic transformation in SSA using on a panel dataset of 37 countries for the period 1980–2014. We resolve potential endogeneities in aid–sectoral growth nexus by employing the system generalised methods of moments (GMM) while dealing with country-specific effects. Our findings show a positive and significant impact of aid on agricultural, service and manufacturing output suggesting that aid inflows to SSA propels economic transformation. In other words, foreign inflows spur both the tradable and non–tradable sectors revealing some degree of interdependence. This notwithstanding, aid volatility deteriorates sectoral value additions with huge impact on the non–tradable sector. However, excessive aid vagaries do not appear to impact on the agricultural sector. The immunity of this sector from the ravages of the unpredictable pattern of aid can be attributed to the comparative advantage the region already enjoys hence any volatility in aid inflows does not seem to matter for agricultural output. Consistent with our hypothesis, the damaging effect of aid volatility on structural economic transformation in SSA is weakened by a well-developed financial system with a large dampening impact on the tradable sector (such as manufacturing) and a no apparent influence on agriculture. To the extent that aid provides more resources to governments of the recipient countries by far reduces the crowding out of the private sector stemming from government borrowing from financial sector consequently freeing credit to the private sector.

The main thrust of this paper is that, aid can generate positive economic

transformation conditioned on the level of local financial sector. Our empirical evidence provides unequivocal support for the notion that development of domestic financial markets by far enhances aid effectiveness. With this, the paper unearths critical findings that call for further development of local financial systems. What is needed is for Central banks of SSA countries to identify the threshold of financial development consistent with sectoral growth

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Table 1: Aid, Aid Volatility and sectoral growth effects

Variables	Agriculture		Service		Manufacturing	
	1	**2**	**3**	**4**	**5**	**6**
Lagged dependent	−1.412(0.191)*	−1.222(0.294)*	−1.019(0.311)*	−1.537(0.275)*	−1.102(0.129)*	−1.871(0.231)*
Investment	0.052(0.033)	0.043(0.039)	0.071(0.023)**	0.078(0.029)**	0.081(0.033)**	0.093(0.071)*
Government size	0.021(0.017)	0.019(0.013)	0.051(0.041)	0.062(0.031)***	0.077(0.058)	0.061(0.049)
Inflation	−0.009(0.002)*	−0.018(0.006)**	−0.016(0.004)*	−0.022(0.003)*	−0.071(0.011)*	−0.062(0.009)*
Trade openness	0.151(0.069)**	0.172(0.040)*	0.193(0.070)**	0.110(0.050)***	0.241(0.041)*	0.216(0.035)*
Labour	0.090(0.028)*	0.079(0.039)**	0.071(0.034)**	0.082(0.041)**	0.086(0.043)***	0.129(0.063)**
Institutional quality	0.099(0.016)*	0.171(0.028)*	0.073(0.031)**	0.091(0.020)*	0.087(0.019)*	0.096(0.022)*
Aid	0.109(0.010)*	0.175(0.037)*	0.016(0.008)***	0.0970(0.046)**	0.026(0.009)**	0.033(0.012)**
Aid volatility		−0.018(0.014)	–	−0.051(0.019)**	–	−0.041(0.013)**
Channels:						
Volatility and fin. dev't		−0.031(0.024)		−0.048(0.017)**		−0.055(0.013)*
Diagnostics:						
No. of countries	37	37	37	37	37	37
Country fixed effects	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES
AR(1) z–value [p–value]	−3.023 [0.009]	−3.129[0.005]	−3.209[0.002]	−3.514 [0.001]	−3.477 [0.009]	−3.096 [0.004]
AR(2) z–value [p–value]	−1.319 [0.317]	−1.422[0.419]	−1.111[0.731]	−1.931[0.549]	−1.501 [0.301]	−1.152[0.211]
Sagan chi-square [p–value]	10.091[0.241]	11.715[0.312]	14.018[0.414]	10.192[0.327]	12.312[0.410]	15.442[0.291]
Wald chi-square [p–value]	0.0000	0.0000	0.000	0.000	0.000	0.000

Notes: *, ** and *** denote significance at 1, 5 and 10% level. All variables are estimated in logs and coefficients are their respective elasticities.
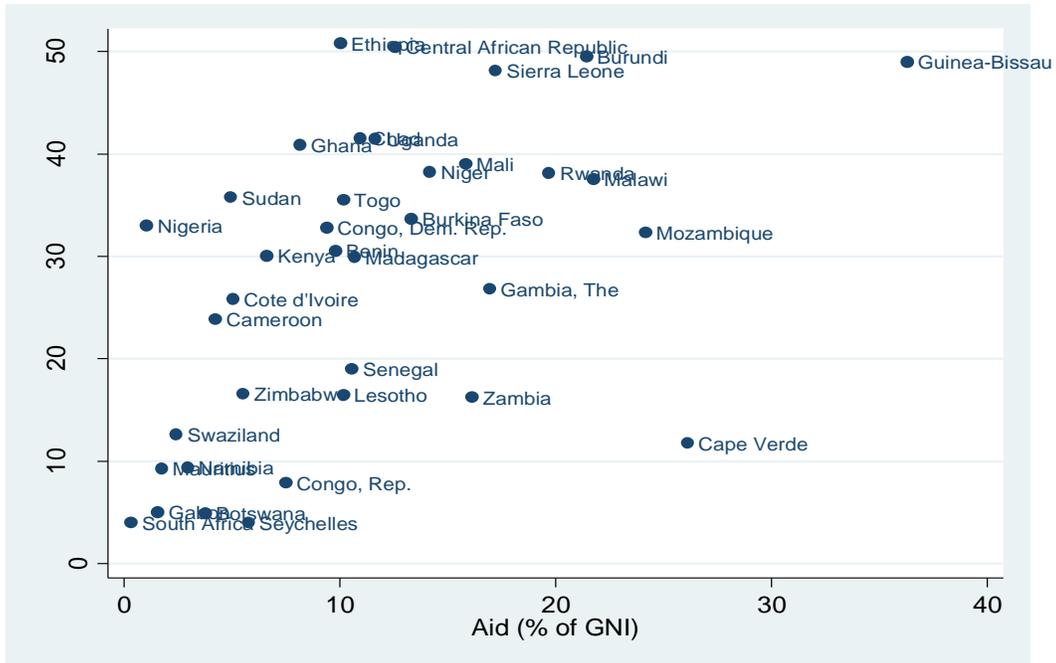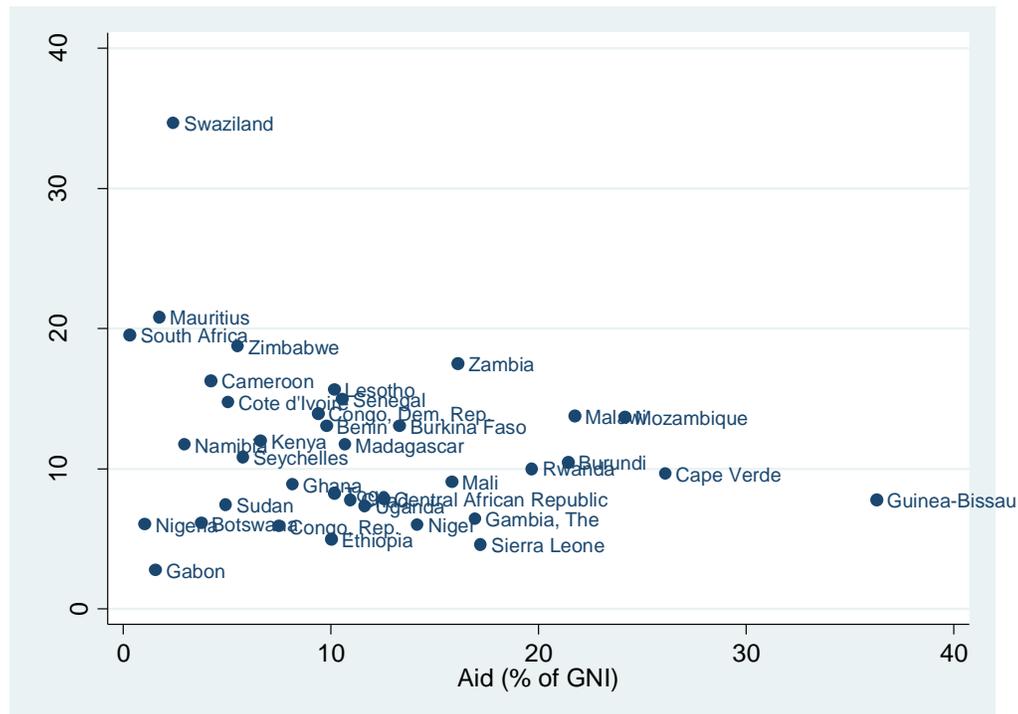
Figure 1: Foreign aid volatility
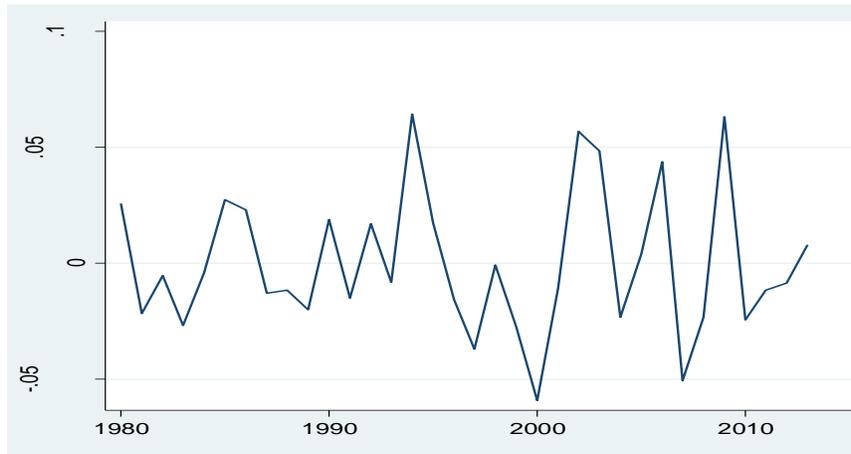
Source: Authors' construct using WDI.

Appendices

Appendix A: Foreign aid and agricultural sector [Average: 1983 – 2014]

Appendix B: Foreign aid and manufacturing sector [Average: 1983 – 2014]

Appendix C: Foreign aid and service sector [Average: 1983 – 2014]