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Foreign aid volatility and lifelong learning

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Abstract

This paper has put a demand-side empirical structure to the hypothesis that foreign aid volatility adversely affects choices to lifelong learning in recipient countries. Lifelong learning is measured as the combined knowledge acquired during primary, secondary and tertiary educational enrolments. Three types of aggregate foreign aid volatilities are computed in a twofold manner: baseline standard deviations and standard errors (standard deviations of residuals after first-order autoregressive processes). An endogeneity robust system GMM empirical strategy is employed. The findings broadly show that foreign aid volatility does not adversely affect the demand-side choices of lifelong learning in Africa. As a policy implication, when faced with aid uncertainty, the demand for education would increase. This may be explained by the need for more self-reliance in order to mitigate income risks or/and the use of education as means of coping with uncertainty. More policy implications are discussed.

Keywords: Lifelong learning; Foreign aid; Development; Africa

1. Introduction

The contemporary policy relevance of positioning an inquiry on the effect of foreign aid uncertainty on lifelong learning in Africa is at least fivefold, notably: (i) the startling contrast between the crucial role of lifelong learning in 21st century development with Africa's lagging global position in the drive towards knowledge-based economies; (ii) the Preece (2013) hypothesis on the role of foreign aid uncertainty[1] in the choice of lifelong learning policies by African countries; (iii) open debates on the effect of foreign aid in development outcomes; (iv) absence of a measurement of lifelong learning for African countries and (v) a paradigm shift towards human capability development owing to recent disturbing poverty trends on the continent. The first three strands are covered in the introduction while the last two are engaged in section 2.

First, as recently documented by Asongu and Tchamyou (2019), the relevance of lifelong leaning in Africa's quest for Knowledge Economy (KE) is crucial essentially because of the evidence that the continent's overall knowledge index has dropped compared to other regions of the world (Anyanwu, 2012; Asongu & Andrés, 2019). This policy syndrome is motivating a growing stream of literature on the need for learning approaches that are essential for knowledge-based economies on the continent (Oluwatobi et al., 2015; Tchamyou, 2017; Asongu & Nwachukwu, 2018; Kuada & Mensah, 2018; Oluwatobi et al., 2018; Tchamyou et al., 2019a).

Preece (2013) has recently established that international aid policies are likely to distort educational policies in African recipient countries. Unfortunately, the conclusions of Preece remain hypothetical because they have not been substantiated with empirical findings. This study aims to put an empirical structure to the textual analysis of Preece (2013) which could seriously influence debates in policy making and academic circles. The underlying paper has concluded:

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[1] The terms uncertainty and volatility are used interchangeably throughout this study.

"*This paper discusses the relationship between international agendas for lifelong learning and financial aid for low income countries, especially those on the African continent. It argues that there are subtle differences in terminology written by policymakers respectively in Europe and South Africa for lifelong learning but that international development agendas reinscribe lifelong learning for countries in receipt of development aid. Taking a postcolonial perspective the paper provides a textual analysis of case examples from policy documents in two African countries to demonstrate how international aid priorities negatively affect government choices and policies for lifelong learning, in spite of more regional analyses of the role of education and lifelong learning for the continent's development needs. It argues that the inclusion of indigenous worldviews from the south have potential to enhance a global agenda for the social purpose element of lifelong learning*" (Preece, 2013, p. 98). Moreover, the fall of the Berlin wall, the global financial crises, economic issues in donor countries and geopolitical interest (*inter alia*) have substantially affected the proportion of budget allocated to developing countries by developed nations (Asongu, 2015a, 2015b). The underlying changes in foreign aid disbursements to developing countries can logically affect lifelong learning outcomes in recipient countries since in the light of Preece (2013), lifelong learning is inscribed as a policy agenda of international development in aid-recipient countries. In other words, foreign aid changes or volatility can influence lifelong learning outcomes in aid-recipient countries partly because negative changes can limit availability of funding needed to implement lifelong policies in recipient countries. It is important to note that the paper is based on Preece (2013) which has concluded that foreign aid volatility adversely affects lifelong learning policies in developing countries. Hence it is relevant to provide verbatim articulation of how the positioning of the study builds on Preece (2013). Therefore, the basis that foreign aid volatility is linked to lifelong learning is hypothetical in the light of the

conclusions of Preece (2013). Moreover, the potential negative nexus is also hypothetical in relation to Preece (2013).

Positioning this research to investigate the conclusions of Preece (2013) have both scholarly and policy relevance. On the one hand, the scholarly premise of the study builds on the fact that, in order to advance scholarship, it is also worthwhile to assess if the established textual analysis withstands empirical scrutiny. Hence, we argue that applied econometrics is not only restricted to assessing whether existing theoretical models are valid or not. Accordingly, for the purpose of clarifying previous scholarship and findings, applied econometrics could also be tailored to assess if conclusions building on qualitative studies can be extended to quantitative research. On the other hand, the policy importance of investigating the conclusion of Preece (2013) rests on the premise that when policy makers are aware of how volatility in foreign aid affects domestic lifelong learning policies that are inscribed in the international development agenda, they can adopt counteractive measures in view of mobilizing other financial resources in order to meet domestic lifelong learning targets.

The assessment of Preece's findings in the light of demand-side choices of lifelong learning within the context of this study consists of investigating the following hypothesis: foreign aid volatility adversely affects demand-side choices of lifelong learning in Africa. This study assesses the hypothesis in three main steps. First, we define the multidimensional and complex phenomenon of lifelong learning as the combined knowledge acquired during primary, secondary and tertiary education. Hence, we employ principal component analysis to obtain a composite indictor for the measurement. This combination of knowledge is not the summation of all enrolments of primary, secondary, and tertiary schools. As clarified in Section 3.2.1 (i.e. a section dedicated to the measurement of lifelong learning), the composite index derived from the three

levels of education represents those who have passed through all three levels of education.

Second, we assess the effects of foreign aid and foreign aid volatility on all educational indicators under consideration. Third, we compare the impacts of foreign aid with those of foreign aid volatility to assess differences in magnitudes and signs in order to either validate or reject the hypothesis.

The third strand of literature motivating the inquiry builds on the open debate surrounding development outcomes of development assistance (Arvin & Barillas, 2002; Arvin et al., 2002). While recent evidence from the literature confirms the positive effects of foreign aid on economic growth (Gyimah-Brempong & Racine, 2014; Kargbo & Sen, 2014), there is a growing stream of studies consistently questioning the effectiveness of development assistance (Banuri, 2013; Ghosh, 2013; Krause, 2013; Marglin, 2013; Monni & Spaventa, 2013; Titumir & Kamal, 2013; Wamboye et al., 2013; Quartey & Afful-Mensah, 2014; Asongu, 2014a, 2015a, 2015b). According to Amin (2014), neo-colonialism has been the main motivating factor behind foreign aid in developing countries. Quartey and Afful-Mensah (2014) have concluded that African countries need to relinquish their overly reliance on development assistance and look for alternative sources of finance. The positions of Amin, Quartey and Afful-Mensah are consistent with Ndlovu-Gatsheni (2013) on Africa's entrapment in neo-colonial foreign aid webs of influence and Kindiki (2011) who has admonished African nations to strategically limit their dependence on international aid systems. Obeng-Odoom (2013) recommends that policies governing foreign aid should be based on the fundamental needs of citizens in recipient countries. A view confirmed by Arthur and Quartey (2008) on the imperative for a holistic approach that integrates all stakeholders in an international policy of migration management based on foreign aid. This inquiry also extends an interesting strand of studies on achieving development success based on learning from different

activities (Nyarko, 2013) or success strategies (Lee, 2009; Lee & Kim, 2009; Wa Gĩthĩnji & Adesida, 2011; Babatunde, 2012; Fosu, 2013).

The rest of the study is organized as follows. A review of extant literature is considered in Section 2 while section 3 discusses the data and the methodology. The empirical results are covered in Section 4. The research concludes in section 5 with caveats and future research directions.

2. Literature review

This section is discussed in four mains strands, notably: (i) the extant foreign aid literature; (ii) concerns pertaining to measuring lifelong learning in developing countries; (iii) contemporary paradigm shifts motivating the study and (iv) the extant contemporary literature on lifelong learning. These strands are expanded in the same chronology as they are presented.

First, we briefly engage some literature that is positioned along the same line of inquiry. Johnson and Quartey (2009) have investigated the effect of foreign aid on human development and welfare indicators to conclude that while bilateral aid does not significantly affect the underlying indicators, when aid is disaggregated into sector-specific programs, there is some significant impact on human development. This tendency of appealing findings on human development after disaggregating foreign aid is consistent with the Asongu (2014b) clarification of the questionable economics of development assistance in African countries advanced by Asongu (2014c). Asiedu and Nandwa (2007) have examined whether development assistance in education significantly affects growth to conclude that the effect of foreign aid is contingent on income-levels and the aid categories. Asiedu (2014) has extended Asiedu and Nandwa (2007) to establish that the effect of foreign aid further depends on the primary and post-primary education. The findings from Asiedu and Nandwa are consistent with Johnson, Quartey and Asongu on the need for incorporating heterogeneity when investigating the effects of development assistance.

Second, the longstanding absence of a relevant measurement of lifelong learning for Africa constitutes the fourth strand motivating this study. In essence, the study also contributes to the extant literature by introducing a hitherto unexplored measurement of lifelong learning in Africa. This introduction is motivated by the fact that, to the best of our knowledge, lifelong learning indicators for developing countries are scarce in the literature. As far as we have reviewed, the Tuijnman (2003) had concluded after exploring a substantial bulk of lifelong learning literature that, a lifelong learning indicator could only be comprehensively defined and measured in the distant future; "*But given the current state of play of the social sciences, and in particular of survey practice and indicator measurement, the time when a holistic and comprehensive framework of lifelong learning indicators can be proposed lies far in the future*" (p.471). Furthermore, "*To date only two macro level studies, i.e. the European Lifelong Learning Indicators (ELLI) instrument developed by the EU (2010) and the Composite Learning Index (CLI) instrument developed by the Canadian Council on Learning (undated.), have dealt with this issue*" (Luo, 2015, p.19). Whereas the CLI indicator is exclusively meant for Canada, the ELLI is used essentially on European countries. In accordance with Asongu and Tchamyou (2019) and Tchamyou (2020), the underlying indicators (CLI and ELLI) encompass lifelong learning dimensions like 'learning to live together', 'learning to be', 'learning to know' and 'learning to do'.

In light of the above, employment of underlying indicators is not feasible because on the one hand lifelong learning variables for Africa are not available and on the other hand, the highlighted lifelong learning indicators are exclusively meant for Canada and European countries. Moreover, among the four highlighted dimensions, to the best of our knowledge only the 'learning to know' dimension is available for countries in Africa. Therefore, lifelong learning within the context of this paper is defined as the combined knowledge acquired during primary, secondary and tertiary educational levels.

Third, another strand motivating this inquiry is a paradigm shift towards human capability development owing to recent disturbing poverty trends on the continent. As sustained by Asongu and Tchamyou (2019), there is a new paradigm on 'soft economics' that is building on extreme poverty and foreign aid misallocation policy syndromes in Africa. In essence, an April 2015 World Bank report on achievement of Millennium Development Goals (MDGs) poverty targets has revealed that extreme poverty has been decreasing in all regions of the world with the exception of Africa (Caulderwood, 2015; World Bank, 2015; Tchamyou *et al.*, 2019b; Asongu & le Roux, 2017, 2019). The underlying trend sharply contrasts with evidence that the continent has been enjoying over two decades of growth resurgence that began in the mid 1990s (Fosu, 2015a, p.44; Tchamyou, 2019). The concern about immiserizing growth on the continent has motivated a recent stream of studies on 'paradigm shifts' and better foreign aid allocation. Notably, Kuada (2015) has proposed a new paradigm of 'soft economics' in a recent book in order to elicit development trends in Africa[2].

According to Kuada (2015), it is important to lay more emphasis on 'soft economics' or human capabilities development in order to understand Africa's poverty tragedy. This new paradigms steers clear of 'strong economics' or understanding of poverty trends based on structural adjustment policies which have been substantially devoted to understanding disturbing trends on the continent, notably: increasing poverty, exclusive growth and high unemployment. Kuada's narrative on poverty reduction, employment and inclusive growth in Africa is in accordance with a recent stream of African development literature that has been emphasizing the imperative of tailoring development assistance policies towards alternative channels in order to reduce poverty, boost employment and improve human resource quality (Page &

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[2] The concern about exclusive growth is also the focus of another book by Fosu (2015b, 2015c) that is devoted to elucidating: (i) myths behind Africa's recent growth resurgence and (ii) the role of institutions in the underlying growth resurgence.

Shimeles, 2015; Jones et al., 2015; Simpasa et al., 2015; Asongu, 2016; Page & Söderbom, 2015; Jones & Tarp, 2015).

Fourth, while there is a growing scholarly interest on the relevance of education and lifelong learning in development outcomes in Africa in the post-2015 development agenda (Chinyamurindi *et al.*, 2017; Dodd & Der Merwe, 2017; Kaseeram & Mahadea, 2018; El Husseiny & Amin, 2018; Yusuf, 2019), the extant contemporary literature on lifelong learning in Africa has failed to assess the problem statement being investigated in this study. Tchamyou (2020) has examined the relevance of financial access in moderating the impact of education and lifelong learning on inequality in Africa. The author shows that: (i) primary school enrolment interacts with financial access to reduce inequality and (ii) lifelong learning engenders a net negative impact on income inequality by means of the financial efficiency and deposit mechanisms. The focus on Tolliver et al. (2018) is on competency-based lifelong learning, education and adult students using insights from international partnerships between Southern Africa, East Africa and USA-based higher institutions of learning. The study raises concerns pertaining to curriculum and faculty development as well as the importance of acknowledging the role of cultural values in the nexuses. Lifelong learning challenges and prospects in the Southern African Development Community (SADC) are investigated by Biao and Maruatona (2018) who propose a number of policy measures that should be taken on board in order to promote lifelong learning in the region. Asongu and Tchamyou (2020) classify African countries in terms of knowledge economy dimensions using South Korea as the frontier country. Accordingly, gaps in knowledge economy are assessed by the authors before policy measures are proposed on how lagging countries can catch-up. In Another study, Asongu et al. (2020) engage an intra-African comparative assessment to establish "who is who in knowledge economy" on the continent. Hence, countries are classified in terms of leading nations in the knowledge economy dimensions before corresponding gaps are assessed in

view of providing policy measures that are relevant in enabling retarded countries to catch-up with their frontier counterparts. Lekoko and Nthomang (2018) propose the relevance of a non-formal approach to adult lifelong learning in Africa that takes on board both the cultural environment and the development challenges of the contingent while Dosunmu and Adeyemo (2018) offer perspectives into the notions of human capital development and lifelong learning in relation of the career advancement of the female gender.

3. Data and Methodology

3.1 Data

We investigate a sample of 53 African countries with annual data from World Development Indicators for the period 1996-2010. The periodicity begins from 1996 because of the interest of obtaining results with updated and more focused implications. The choice of Africa as scope of the study is consistent with the underlying study which is focused on countries in the continent. The dependent variable of lifelong learning is measured using principal component analysis (PCA). Accordingly, it is the first principal component of primary, secondary and tertiary school enrolment levels. For more subtlety in the analysis, we complement the dependent variable of interest with its constituent indicators. The intuition for this subtlety is that, in order to fully appreciate the effect on lifelong learning, the independent effects on various enrolment levels (constituting the lifelong learning variable) have to be assessed. In essence, some comparative perspective is needed to fully investigate the underpinning hypothesis. The PCA method used to measure the lifelong learning composite indicator is discussed in Section 2.2.1 below.

The principal independent variable of interest is net official development assistance (NODA) to which NODA from the Development Assistance Committee (DAC) countries and NODA from Multilateral Donors, are added for robustness purposes. Two measurements of volatility are employed: (1) a baseline 3-year non-overlapping intervals (NOI) simple standard deviations and

(2) an augmented measurement of volatility with standard errors or standard deviations of residuals saved after first-order autoregressive processes. The latter measurement, which is consistent with Kangoye (2013) is discussed in detail in Section 2.2.2.

There is a fourfold justification for the use of three-year non-overlapping intervals (NOI). First, data averages reduce business cycle or short-term disturbances that may substantially loom.

Second, the averages also ensure that the primary conditions for the employment of Generalized Methods of Moments (GMM) are met (N>T: 53>5). Third, three-year NOI limit instrument proliferation or restrict over-identification by ensuring that the number of instruments are less than the number of cross-sections. Fourth, there is a loss of one degree of freedom after the computation of residuals in the first-order autoregressive procedure and a minimum of two periods are essential for the computation of the corresponding standard deviations of the residuals to obtain standard errors.

In accordance with Andrés et al. (2015), we control for inflation, trade openness, economic prosperity and government expenditure. Whereas we expect GDP growth, trade openness and government expenditure to affect lifelong learning in a positive manner, inflation could have the opposite effect. In essence, if expenditure from government that is meant to promote lifelong learning is not tainted by corrupt practices and management inefficiency, it should have a positive effect on education. From the South Korean experience, we expect trade openness and economic prosperity to be conducive for learning (Asongu, 2017). Inflation could substantially mitigate expectations in educational return and therefore, reduce long-run investment in education-oriented projects.

The correlation analysis, summary statistics and definition of variables are presented in Appendix 3, Appendix 2 and Appendix 1 respectively. From the descriptive statistics, we can see that the indicators are quite comparable and

given the significant variations displayed, we can also be confident that reasonable estimated relationships would emerge. The purpose of the correlation matrix is the mitigate multicollinearity concerns that potentially exist among NODA variables.

3.2 Methodology

3.2.1 Principal component analysis

Given the complex and multidimensional character of lifelong learning, we measure it as the combined knowledge acquired in primary, secondary and tertiary schools. This is essentially because, whereas lifelong learning entails a process from birth to death, it can most objectively be measured only as the process of learning in formal education. We measure the phenomenon by using principal component analysis (PCA). PCA is a widely employed technique that is used to extract common information among a highly correlated set of variables. It consists of reducing the dimensions of highly correlated indicators into a few uncorrelated dimensions called principal components (PCs) that reflect specific information. Therefore, lifelong learning is measured as the first PC. In the choice of which PC to be retained, the Kaiser (1974) and Jolliffe (2002) criterion is employed to choose the common factor or information contained in the three educational levels. They have recommended retaining only PCs that have an eigenvalue greater than the mean or one. As shown in Table 1 below, the first PC has an eigenvalue of 1.955 with more than 65% of the combined information in primary, secondary and tertiary educations. From intuition this could be attributed to the number of students that study from the primary school through the tertiary level. Hence, consistent with Asongu and Nwachukwu (2016a), our new lifelong learning indicator is the composite index (*Educatex*).

"*Insert Table 1 here*"

The composite indicator that is derived from PCA is called *Educatex* and is the proxy for lifelong learning. This indicator has been recently employed in the African governance (Asongu & Nwachukwu, 2016a) and knowledge economy (Asongu & Nwachukwu, 2015; Asongu & Tchamyou, 2019; Tchamyou, 2020) literature. In accordance with the motivation of the study, *Educatex* is different from the two engaged lifelong learning measurements because, it exclusively focuses on the 'learning to know' dimension of ELLI and CLI for European countries and Canada respectively on the one hand and it is limited to developing countries on the other hand.

It is important to briefly discuss documented issues that are associated with PC-derived indicators. Consistent with Asongu and Nwachukwu (2016b), we justify the statistical relevance of PC-augmented indicators in two strands: general and specific. First, from a general perspective, an interesting analysis on the statistical relevance of using regressors from initial estimations has been documented by Pagan (1984, p. 242). According to the author, the underlying issue consists of concerns about the consistency, efficiency and inferential validity of underlying estimated parameters. The narrative sustains that while two-step estimators are reliable for the most part, few valid inferences can be established. The corresponding concern about inferential validity is consistent with a stream of more contemporary studies (Oxley & McAleer, 1993; McKenzie & McAleer, 1997; Ba & Ng, 2006; Westerlund & Urbain, 2013a).

Second, within the specific setting of this inquiry, concerns surrounding the PC-derived indicator of Educatex we are employing, have to the best of our knowledge been documented by Westerlund and Urbain (2012, 2013b). The authors have built on existing literature (already highlighted above) as well as more contemporary studies (Stock & Watson, 2002; Pesaran, 2006; Bai, 2009; Bai, 2003; Greenaway-McGrevy *et al.*, 2012), to establish that normal inferences are possible with PC-derived regressors if corresponding estimated coefficients converge towards their true values at the rate of $\sqrt{NT}$ (where N represents cross-

section observations and T denotes the number of time series). Furthermore, the authors have argued that the conditions for the underlying convergence are more feasible when the sample is large. Unfortunately, as far as we have reviewed, they do not elicit how 'large is large'. Narrowing down the perspective to our sample, we can neither increase T nor N for at least two reasons. First, we cannot further stretch N because we have engaged 53 of the existing 54 African countries, with the exception of South-Sudan for which data is unavailable before 2011. Second, as concerns T, we need to work with data averages or non-overlapping intervals in order to mitigate instrument proliferation or over-identification that could substantially bias Generalised Method of Moments (GMM) estimates.

3.2.2 Computation of uncertainty

Consistent with the narrative in the data section, we use two measurements of volatility. Whereas the calculation of standard deviations is straight forward, we devote space to discussing the computation of uncertainty which is based on first autoregressive processes of aid variables. According to Lensink and Morrissey (2000), Asongu and Nnanna (2019), Kangoye (2013), Tchamyou and Asongu (2017a), Tchamyou et al. (2018) and Asongu et al. (2017), GARCH (Generalized Auto-Regressive Conditional Heteroskedasticity) models are inappropriate for estimating uncertainties because they are better fit for data of high frequency. Hence, they have recommended the employment of first-order autoregressive processes for the computation of uncertainty when using data of annual frequency. Therefore, for each country and for every sub-sample, we engage first-order autoregressions and save the corresponding residuals. This results in a loss of one degree of freedom for each sub-period. We then compute the standard deviations of the saved residuals to obtain standard errors or foreign aid uncertainties.

The computation of uncertainty is summarised by the following equation.

$$Aid_{i,t} = \alpha + \varphi Aid_{i,t-1} + \kappa T + \upsilon_{i,t} \qquad\qquad (1)$$

where $Aid_{i,t}$ is a foreign aid variable of country i at time t; $Aid_{i,t-1}$ is a foreign aid variable of country i at time $t-1$; T the time trend; α the constant; φ the lagged parameter and $\upsilon_{i,t}$ the forecast error.

Two points are worthy of note. First, the second measurement of uncertainty (based on standard errors) is meant to distinguish between simple variations captured by the first measurement of uncertainty. Hence, more unanticipated changes in foreign aid flows are captured by the second measurement of uncertainty. Second, we have based the computation of standard errors on two-year averages (after loss of one degree of freedom from first autoregressive processes). In essence, the low order of non-overlapping intervals enables us to limit the mitigation of business cycle or short-run disturbances that are needed to capture uncertainty as much as possible. Hence, contrary to the Kangoye (2013) computation, which based on ten-year data averages, the approach in this study limits the mitigation of the short-run disturbances it attempts to calibrate.

3.2.2 Estimation technique

We employ the dynamic *system* GMM estimation approach because of three main reasons: first, it does not eliminate cross-country regressions; second, it corrects small sample biases of the difference estimator; and it controls for endogeneity in all the regressors (Tchamyou & Asongu, 2017b). It is specifically for the second reason that we are in line with Bond et al. (2001, pp. 3-4) in preferring the *system* GMM approach (Arellano & Bover, 1995; Blundell & Bond, 1998) to the *difference* estimator (Arellano & Bond, 1991). In specifying the equations, a *two-step* procedure that is heteroscedasticity-consistent is also preferred to the *one-step* approach because the former is homoscedasticity-consistent. We perform two tests to assess the validity of the models: the Sargan over-identifying restrictions (OIR) test for instrument validity and; the Arellano &

Bond autocorrelation (AR(2)) test for the absence of autocorrelation in the residuals. The motivations for employing data averages (or 3-year NOI) have already been critically and exhaustively engaged in the data section.

The following equations in levels and first differences define the adopted GMM strategy.

$$Edu_{i,t} = \sigma_0 + \sigma_1 Edu_{i,t-1} + \sigma_2 T_{i,t} + \sigma_3 DAC_{i,t} + \sigma_4 MD_{i,t} + \sum_{j=1}^{4} \partial_j X_{i,t} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (2)$$

$$Edu_{i,t} - Edu_{i,t-1} = \sigma_1 (Edu_{i,t-1} - Edu_{i,t-2}) + \sigma_2 (T_{i,t} - T_{i,t-1}) + \sigma_3 (DAC_{i,t} - DAC_{i,t-1})$$

$$+ \sigma_4 (MD_{i,t} - MD_{i,t-1}) + \sum_{j=1}^{4} \partial_j (X_{i,t} - X_{i,t-1}) + (\xi_t - \xi_{t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}), \qquad (3)$$

where 't' represents the period and 'i' denotes a country. *Edu* is Education which constitutes, primary, secondary and tertiary schools as well as their composite index of lifelong learning ; T, Total NODA; DAC, NODA from DAC countries; MD, NODA from Multilateral Donors; X is the set of control variables (*Government expenditure*, *GDP growth*, *Trade openness* & *Inflation*); η_i is a country-specific effect; ξ_t is a time-specific constant and; $\varepsilon_{i,t}$ an error term. The estimation process entails jointly estimating the equations in levels (Eq. (2)) with those in first-difference (Eq. (3)), in order to exploit all the parallel or orthogonality conditions between the error term and the lagged endogenous variable. Moreover, the purpose of taking the first difference of Eq. (2) is to eliminate fixed effects which are a source of endogeneity because such fixed effects are correlated with the lagged dependent variable. The findings presented in Section 4 are therefore based on a system GMM which is a combination of Eq. (2) and Eq. (3).

Before presenting the findings, it important to devote some space to articulating how some potentially exogenous covariates are assessed by the adopted estimation strategy. Accordingly, an indicator like government expenditure could be perceived as exogenous, despite knowledge that the fundamental concern in development assistance is the substitution between

foreign aid and governance expenditure. The potentially exogenous character of government expenditure is tackled by specificities of the estimation strategy because lagged differences of government expenditure are used as instruments in the level equation and lagged levels of government expenditure are used as instruments in the difference equation. This enables the exploitation of all orthogonality conditions between errors terms and the lagged dependent variable, in order to address the concern of endogeneity.

4. Empirical results

The section assesses two main concerns: the effects of foreign aid on the four educational indicators and the effects of foreign aid volatility on the dependent variables. In essence, it is relevant to compare the independent incidences on the first-three school measurements in order to fully appreciate the impact on the lifelong learning measurement. Section 3.1 presents distortions as standard deviations of three-year NOI whereas Section 3.2 uses standard errors as a measurement of volatility. We notice consistently across the tables in the sections that, but for a few exceptions (in primary and secondary educational models) where the null hypothesis of the Sargan OIR is rejected, the models are overwhelmingly valid. This is essentially because the null hypotheses of the AR(2) and Sargan OIR tests are rejected for the most part[3]. It is also important to note that invalidity of some primary and secondary school specifications does not affect the main problem statement of the study which is the assess the effects of aid volatility on lifelong learning.

As an important note, in order to examine the validity of the models, we have performed two tests, notably: the Arellano and Bond autocorrelation test that assesses the null hypothesis of no autocorrelation and the Sargan-test that examines the over-identification restrictions. The latter test investigates if the instruments are not correlated with the error terms. The null hypothesis of this test is the stance that the instruments as a group are strictly exogenous. While the null hypothesis of the AR(2) is overwhelmingly rejected, the null of Sargan is not rejected in some cases of primary and secondary school enrolment modeling.

4.1 Volatility as standard deviations

Table 2 below investigates the effects foreign aid on the educational variables. It can be noticed that while foreign aid positively impacts primary school enrolment and lifelong learning, foreign aid volatility does not significantly affect lifelong learning. Hence, a decision cannot be drawn because foreign aid does not significantly affect lifelong learning. Most of the significant control variables (*GDP growth* and *government expenditure*) have the expected signs. The negative effect of trade on education can be explained from the perspective that, trade openness might provide 'school drop-out' incentives to engage in business activity (related to import or exports).

"*Insert Table 2 and Table 3 here*"

The findings of Table 3 above (especially those of Panel A on foreign aid from DAC countries) are broadly consistent with those of Table 2 with the following exceptions. First, from Panel A two results merit emphasis. A higher magnitude in the effect of foreign aid volatility rejects the investigated hypothesis. With regard to Panel B on foreign aid from Multilateral Donors, the insignificant effects of the volatility neither validate not invalidate the hypothesis. Most of the significant control variables (*GDP growth* and *government expenditure*) also have the expected signs.

4.2 Sensitivity analysis with volatility as standard errors

In order to robustly verify the findings of Tables 2-3 above, we perform a sensitivity analysis using standard errors (instead of baseline standard deviations) as measurements of the volatilities. The standard errors are standard deviations of residuals obtained from the first-order autoregressive processes of the foreign aid dynamics. While Table 4 is based on Total NODA, Table 5 is focused on NODA from DAC countries (Panel A) and Multilateral Donors (Panel B).

The findings of Table 4 below reject the underlying hypothesis because of the higher magnitude in the effect of foreign aid volatilities to lifelong learning

relative to the impact of foreign aid on the dependent variable. The results from Table 5 are a little ambiguous in Panel A. The hypothesis is not rejected in the lifelong learning regressions (owing to a lower positive magnitude in foreign aid volatilities relative to the foreign aid magnitude). However, there is a positive effect of the aid volatilities on tertiary school enrolment and a corresponding insignificant effect of foreign aid on the tertiary educational dependent variable. In Panel B, we cannot conclude due to the insignificant effects.

The results of Tables 4-5 do not enable us to absolutely reject or confirm the investigated hypothesis. Most of the significant control variables have the expected signs.

"*Insert Table 4 and Table 5 here*"

4.3 Further discussion of results and implications

Linking the results to the paradigm shifts we have engaged in the introduction; one may attempt to infer that more inclusive and sustainable growth may be achieved if foreign aid were to be tailored through channels such as lifelong learning. Therefore our findings in this light may be viewed to converge with the narrative of Kuada (2015) and stream of associated literature devoted to assessing mechanisms by which foreign aid can be properly tailored for the post-2015 development agenda, inter alia: Jones et al. (2015); Page and Shimeles (2015); Simpasa et al. (2015); Page and Söderbom (2015); Asongu (2016) and Jones and Tarp (2015). This inference is also in accordance with a recent stream of literature documenting the positive externalities in terms of economic growth (Gyimah-Brempong & Racine, 2014; Kargbo & Sen, 2014), especially if foreign aid is tailored through educational channels (Asiedu, 2014; Asiedu & Nandwa, 2007).

Putting the above point into perspective, Fields (2015) has demonstrated that low skills or labour market supply deficiencies linked to the welfare of African

nations can be handled through foreign aid if effectively tailored via learning enhancement and improvement of skills. Furthermore, according to Filmer and Pritchett (1997), African countries have for a long time been confronted with educational concerns like missing textbooks and other important academic inputs. More contemporary evidences suggest concerns about brain drain, depleting knowledge infrastructure, low nexus between science and technology and outdated academic curricula (Asongu, 2017; Tchamyou, 2017). This confirms the downward trend in KE currently being experienced by the continent (Anyanwu, 2012). The declining environment for learning had earlier led Kamara et al. (2007) to recommend that Africa was going to lose in her attempts to catch-up in terms of development if bold measures were not taken to reinvigorate science and technology on the continent. From our findings we propose three policy recommendations that could improve the elements suggested by Kamara et al. (2007).

First, as documented by Asongu and Tchamyou (2019), the technology environment is increasingly changing. Hence, workers in African countries could adapt to evolving technological conditions if foreign aid is tailored towards consolidating technical and vocational learning and trainings within and without workplaces. This recommendation builds on the fact that, as African nations enhance their industrialization processes, competence in technology would be a crucial factor in determining human resources quality. Furthermore, for the above recommendation to be effective, foreign aid would need to be tailored towards favoring the nurturing of engineers and high-caliber scientists that are able to handle and face constraints in the frontiers of technology and science. As has been suggested by Asongu (2017) and Tchamyou (2017) in recent KE literature, such initiatives would have to be complemented with education and industrialization to enhance projected benefits. In light to this recommendation, development assistance could be used to favor sustainable development outcomes if foreign aid policies are consistent with the positions that: (i)

technological learning and industrialization are products of education and (ii) investment in lifelong learning increases as a result of industrialization which also boosts the demand for skilled labour.

Second, the nexus between innovation and education can be improved if foreign aid policies are also carefully oriented towards favoring conditions for reverse engineering. This is essentially because knowledge acquisition and learning processes in Africa have been documented to be adaptive and imitative in nature (Asongu, 2014d, p. 579). This recommendation which is in accordance with Bezmen and Depken (2004) has important practical implications for the continent because some Asian nations like South Korea achieved and sustained their breath-taking economic development by copying commodities that were technology-intensive from more advanced nations (Kim, 1997; Kim et al., 2012; Kim & Kim, 2014; Asongu & Tchamyou, 2019). It follows from the above narrative that development assistance policies destined to improving education, lifelong learning and long-term industrial development, could be articulated towards facilitating less tight intellectual property rights (IPRs) that are essential for the mastery of technology-intensive commodities, reverse engineering and informal transfer of technology, by African nations which are at the initial phase of industrialization. The above narratives align with recent African KE literature, which has established that less restrictive IPRs could mitigate poverty (Asongu, 2014e) and ultimately boost scientific publications (Asongu, 2014d) which is a proxy for innovation (Tchamyou, 2017). In this vein, employment of development assistance to encourage strategies of lifelong learning in African countries aligns with the fundamental goals of improving human development and standards of living in the post-2015 development agenda.

Third, in order to consolidate the first-two recommendations, it would be worthwhile if foreign aid is properly channeled towards increasing the ratio of research and development (R&D) to GDP in Africa. In essence, a nation's ability

to adopt sustainable lifelong learning strategies also depends on the consolidation of indigenous R&D platforms that are important for the development of core human resources and adaptation of learning processes to country-specific needs. In accordance with Lee (2009), these development assistance policies would need to be pushed-through in conjunction with other requirements that are essential for enhancing institutional quality in African nations, *inter alia*: the capacity and autonomy of local government in the implementation of the 'foreign-aid'-linked lifelong learning schemes.

5. Conclusion, caveats and further directions

This paper has put an empirical structure to the demand-side of the Preece (2013) findings. It has assessed whether foreign aid volatility adversely affects demand-side choices of lifelong learning in recipient countries. Lifelong learning is measured as the combined knowledge acquired during primary, secondary and tertiary educational enrolments. Three types of aggregate foreign aid volatilities are computed in a twofold manner: baseline standard deviations and standard errors (standard deviations of residuals after first-order autoregressive processes). An endogeneity robust dynamic system GMM empirical strategy is employed. The findings broadly show that foreign aid volatility does not adversely affect the demand-side choices of lifelong learning in Africa.

The positive effect of development assistance on education is consistent with the stream of literature on the rewards of foreign aid in economic prosperity (Gyimah-Brempong & Racine, 2014; Kargbo & Sen, 2014). This effect should be more apparent when foreign aid is channeled via the educational mechanism (Asiedu & Nandwa, 2007; Asiedu, 2014) possibly because: (i) education, especially in terms of lifelong-learning has been documented to promote non-violence and political stability in Africa countries (Asongu & Nwachukwu, 2016a) and (ii) a stable political climate is positive for economic growth because

investors prefer ambiguity-safe economic strategies (Kelsey & le Roux, 2017, 2018).

The fact that foreign aid volatility does not adversely influence demand-side choices of lifelong learning may imply that, when faced with aid uncertainty, the demand for education would increase. This may be explained by the need for more self-reliance in order to mitigate income risks or/and the use of education as means of coping with uncertainty. This interpretation is broadly in accordance with the stream of authors highlighted in the introduction on the need for more financial self-reliance and recently celebrated foreign aid literatures, notably: the Eubank (2012) Somaliland hypothesis which has been confirmed for the entire African continent (Asongu, 2015b), Moyo's (2009) Dead Aid and Collier's (2007) Bottom Billion.

Moreover, the findings indirectly confirm a stream of the literature sustaining that when faced with uncertainty in external financial flows, countries may recourse to promoting human resource development through lifelong learning and knowledge economy as a competitive advantage. This may also explain why countries, which have acknowledged scarcity in external financial flows from natural resources have done relatively better compared to their natural resource-rich counterparts (Amavilah, 2015).

The main caveat of this study is the fact that the proposed and applied lifelong learning indicator fails to account for moral and ethical conscientious learning that could be associated with development assistance. As sustained by Asongu and Nwachukwu (2016a), the process of lifelong learning is not limited to schooling but entails other practical realities in life that are also educative. For instance, the first few years of work are equally as educative as the schooling process. Unfortunately, consistent with motivation in the introduction, there are severe constraints in data availability. In the light of these caveats, future inquiries devoted to advancing scholarship in this area could focus on accounting for post-schooling variables in the lifelong learning indicator.

Moreover, this study which is clearly positioned on the findings of Preece (2013) builds on the fact that lifelong learning is inscribed in the international development agenda of donor countries and variations in foreign aid to developing countries affects domestic lifelong learning outcomes in the aid-dependent countries. The fact that due to data availability constraints at the time of study, distinctions between foreign aid types were not considered could be a caveat that should be taken on board in future studies. This is essentially because exclusive focus on education while investigating the Preece hypothesis could be both valid and problematic

because of two main reasons: (i) it makes abstraction of lifelong learning which is the main focus of the paper and (ii) it does not consider how education types can affect lifelong learning. Accordingly, total aid could be more susceptible to influencing lifelong learning than aid to the education sector. It is also reasonable to argue that the decision to enroll in schools is not exclusively contingent on the amount of aid allocated to the education sector. Total aid, which includes aid to various economic sectors, has some bearing on the decision of parents to send their kids to school.

The conception of lifelong learning in Preece (2013) is broader than education and hence, Preece (2013) does not clearly articulate education as the only component of lifelong learning. It is because of the unavailability of data on lifelong learning that this study specifically focuses on the three levels of education as indicators of lifelong learning. Hence, the focus should not exclusively be on "education and aid to education". The conception of the study is that total aid as discussed by Preece (2013) can affect lifelong learning, though the conception and measurement used in this study is the first principal component of the three levels of education. In the light of the above, the main context is lifelong learning. Other levels of education are involved in the analysis because they have been used in the computation of a lifelong learning indicator. Hence the focus of the paper is not on primary schooling, secondary

schooling and tertiary schooling, but on lifelong learning. As explained in the study, the computation of the lifelong learning indicator from the three levels of education is due to the absence of a measurement of lifelong learning for African countries.

Beyond learning outcomes, considerations of other measures of social welfare such as happiness are worthwhile. In this direction, scholarship devoted to assessing whether the established findings in this study withstand empirical scrutiny within the framework of happiness can build on Arvin and Lew (2010a, 2010b, 2011, 2012a, 2012b).

References

Anyanwu, J. C., (2012). "Developing Knowledge for the Economic Advancement of Africa", *International Journal of Academic Research in Economics and Management Sciences*, 1(2), pp. 73-111.

Amavilah, V. H., (2015). "Social Obstacles to Technology, Technological Change, and the Economic Growth of African Countries: Some Anecdotal Evidence from Economic History", *MPRA Paper* No. 63273, Munich.

Amin, S., (2014). "Aid for Development", *Springer Briefs on Pioneers in Science and Practice*, 16, pp. 125-137.

Andrés, A. R., Asongu, S. A., & Amavilah, V. H. S., (2015). "The Impact of Formal Institutions on Knowledge Economy", *Journal of the Knowledge Economy*, 6(4), pp. 1034-1062.

Arellano, M., & Bond, S. (1991). "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations" *The Review of Economic Studies* 58(2), pp. 277-297.

Arellano, M., & Bover, O. (1995). "Another look at the instrumental variable estimation of error-components models" *Journal of Econometrics* 68(1), pp. 29-52.

Arthur, P., & Quartey, P., (2008). "The Use of Aid to Manage Migration: the case of Ghana", *Ghana Journal of Development Studies*, 5(1), pp. 20-38.

Arvin, B.M. & Barillas, F. (2002). "Foreign aid, poverty reduction, and democracy". Applied Economics 34(17), pp. 2151–2156.

Arvin, B.M., Barillas, F., & Lew, B. (2002). Is democracy a component of donors' foreign aid policies? In B. Mak Arvin (ed.) New Perspectives on Foreign Aid and Economic Development (pp. 171–198). Westport, Connecticut: Praeger, 2002.

Arvin, B. M., & Lew, B., (2010a). "Aid and happiness: untangling the causal relationship in nine European donor countries". *Global Business and Economic Review*, 12(4), pp. 341–358.

Arvin, B.M., & Lew, B., (2010b). "Does happiness affect the bilateral aid flows between donor and recipient countries?" *The European Journal of Development Research*, 22(4), pp. 546–563.

Arvin, B.M., & Lew, B., (2011). "Are foreign aid and migrant remittances sources of happiness in recipient countries". International Journal of Public Policy, 7(4/5/6), pp. 282–300.

Arvin, B.M., & Lew, B., (2012a). "Do happiness and foreign aid affect bilateral migrant remittances?" *Journal of Economic Studies*, 39(2), pp. 212–230.

Arvin, B. M., & Lew, B., (2012b). "Development aid, corruption and the happiness of nations: analysis of 118 countries over the years 1996–2009". *Applied Econometrics and International Development*, 12(2), pp. 70–78.

Asiedu, E., (2014). "Does Foreign Aid in Education Promote Economic Growth? Evidence From Sub-Saharan Africa", *Journal of African Development*, 16(1), pp. 37-59.

Asiedu, E., & Nandwa, B., (2007), "On the Impact of Foreign Aid in Education on Growth: How relevant is heterogeneity of aid flows and heterogeneity of aid recipients?", *Review of World Economics*, 143(4), pp. 631-649.

Asongu, S. A., (2014a). "Development thresholds of foreign aid effectiveness in Africa", *International Journal of Social Economics*, 41(11), pp. 1131-1155.

Asongu, S. A., (2014b). "A Brief Clarification to the Questionable Economics of Foreign Aid for Inclusive Human Development", *African Governance and Development Assistance* WP 28/14, Yaoundé.

Asongu, S. A., (2014c). "The Questionable Economics of Development Assistance in Africa: Hot-Fresh Evidence, 1996–2010", *The Review of Black Political Economy*, 41(4), pp. 455-480.

Asongu, S. A., (2014d). "Software Piracy and Scientific Publications: Knowledge Economy Evidence from Africa", *African Development Review*, 26(4), pp. 572-583.

Asongu, S. A., (2014e). "Software piracy, inequality and the poor: evidence from Africa", *Journal of Economic Studies*, 41(4), pp. 526-553.

Asongu, S. A., (2015a). "Institutional benchmarking of foreign aid effectiveness in Africa", *International Journal of Social Economics*, 42(6), pp.543-565.

Asongu, S. A., (2015b). "On taxation, political accountability and foreign aid: empirics to a celebrated literature", *South African Journal of Economics*, 83(2), pp. 180-198.

Asongu, S. A., (2017). "The Comparative Economics of Knowledge Economy in Africa: Policy Benchmarks, Syndromes and Implications", *Journal of the Knowledge Economy,* 8(2), pp 596–637.

Asongu, S. A., (2016). "Reinventing foreign aid for inclusive and sustainable development: Kuznets, Piketty and the great policy reversal", *Journal of Economic Surveys*, 30(4), pp. 736-755.

Asongu, S. A., & Andrés, A. R., (2019). "Trajectories of knowledge economy in SSA and MENA countries", *Technology in Society*, DOI: 10.1016/j.techsoc.2019.03.002.

Asongu, S. A., Koomson, I., & Tchamyou, V. S., (2017). "Financial globalisation uncertainty/instability is good for financial development", *Research in International Business and Finance*, 41(October), pp. 280-291.

Asongu, S. A., & le Roux S., (2017). "Enhancing ICT for inclusive human development in Sub-Saharan Africa", *Technological Forecasting and Social Change*, 118(May), pp. 44–54.

Asongu, S. A., & le Roux, S., (2019). "Understanding Sub-Saharan Africa's Extreme Poverty Tragedy", *International Journal of Public Administration*, 42(6), pp. 457-467.

Asongu, S. A., & Nnanna, J., (2019). "Foreign Aid, Instability, and Governance in Africa", *Politics & Policy*, 47(4), pp. 807-848.

Asongu, S. A, & Nwachuku, J. C., (2015). "The incremental effect of education on corruption: evidence of synergy from lifelong learning", *Economics Bulletin,* 35(4), pp. 2288-2308.

Asongu, S. A, & Nwachuku, J. C., (2016a). "The Role of Lifelong Learning in Political Stability and Non-violence: Evidence from Africa", *Journal of Economic Studies*, 43(1), 141-164.

Asongu, S. A, & Nwachuku, J. C., (2016b). "Revolution Empirics: Predicting the Arab Spring", *Empirical Economics*, 51(2), pp 439–482.

Asongu, S. A, & Nwachuku, J. C., (2018). "PhD by publication as an argument for innovation and technology transfer: With emphasis on Africa", *Higher Education Quarterly*, 72(1), pp. 15-28.

Asongu, S. A., & Tchamyou, V. S., (2019). "Foreign aid, education and lifelong learning in Africa", *Journal of the Knowledge Economy,* 10(1), pp. 126-146.

Asongu, S. A., & Tchamyou, V. S., (2020). "Human capital, knowledge creation, knowledge diffusion, institutions and economic incentives: South Korea versus Africa", *Contemporary Social Science*, DOI: 10.1080/21582041.2018.1457170

Asongu, S.A., Tchamyou, V. S. & Acha-Anyi, P. N., (2020). "Who Is Who in Knowledge Economy in Africa?", *Journal of the Knowledge Economy*. DOI: 10.1007/s13132-018-0547-8.

Ba, J., & Ng S (2006). "Confidence intervals for diffusion index forecasts and inference for factor-augmented regression", *Econometrica*, 74(4), pp. 1133-1150.

Babatunde, M. A., (2012). "Africa's Growth and Development Strategies: A Critical Review", African Development, *Africa Development*, XXXVII, (4), pp. 141-178.

Bai, J., (2003). "Inferential theory for factor models of large dimensions". *Econometrica,* 71 (1),pp.135-173.

Bai, J., (2009). "Panel data models with interactive fixed effects". *Econometrica,* 77(4), pp. 1229-1279.

Banuri, T., (2013). "Sustainable Development is the New Economic Paradigm", *Development*, 56(2), pp. 208-217.

Bezmen, T. L., & Depken, C. A., (2004). "The impact of software piracy on economic development", Working Paper. Francis Marion University.

Biao I., & Maruatona T., (2018). The Southern African Development Community: Challenges and Prospects in Lifelong Learning. In: Milana M., Webb S., Holford J., Waller R., Jarvis P. (eds) The Palgrave International Handbook on Adult and Lifelong Education and Learning. Palgrave Macmillan, London.

Blundell, R., & Bond, S., (1998). "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, 87(1), pp.115-143.

Bond, S., Hoeffler, A., & Tample, J., (2001). "GMM Estimation of Empirical Growth Models", University of Oxford, Oxford.

Collier, P. (2007). *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It?*, Oxford University Press.

Caulderwood, K., (2015) "Sub-Saharan Africa Falls Behind In Fight Against Extreme Poverty: World Bank Report", International Business Times (April 14th

2015). http://www.ibtimes.com/sub-saharan-africa-falls-behind-fight-against-extreme-povertyworldbank-report-1881460 (Accessed: 26/11/2015).

Chinyamurindi, W. T., Mahembe, B., Chimucheka, T., & Rungani, E., (2017). "Factors influencing student usage of an online learning community: the case of a rural South African university," *International Journal of Education Economics and Development*, 8(2/3), pp. 116-132.

Dodd, N. & Der Merwe, J. V., (2017). "Over the rainbow: the role of academics in a 'post-hope' South Africa," International Journal of Education Economics and Development, 8(2/3), pp. 133-143.

Dosunmu, A. G., & Adeyemo, K. S., (2018). "Lifelong learning, human capital development and the career advancement of women in the telecommunications industry in South Africa", *Industry and Higher Education*, DOI: 10.1177/0950422218765501.

El Husseiny, I. A., & Amin, K. Z., (2018). "Pre-university education outputs in Egypt: does money matter?," *International Journal of Education Economics and Development*, 9(3), pp. 210-235.

Eubank, N., (2012). "Taxation, Political Accountability and Foreign Aid: Lessons from Somaliland", *Journal of Development Studies*, 48(4), pp. 465-480.

Filmer, D., & Pritchett, L., (1997), "What Educational Production Functions Really Show: A Positive Theory of Education Spending", *World Bank Policy Research Paper* No. 1795, Washington.

Fosu, A., (2013), "Achieving development success: Strategies and lessons from the developing world", *UNU-WIDER Policy Brief* (November).

Fosu, A. K., (2015a). "Growth, Inequality and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context", *Oxford Development Studies*, 43(1), pp. 44-59.

Fosu, A. K. (2015b). Growth and Institutions in African Development, First edited by Augustin K. Fosu, , Routledge Studies in Development Economics: New York.

Fosu, A. K. (2015c). Growth and institutions in African Development, in Growth and Institutions in African Development, First edited by Augustin K. Fosu, 2015, Chapter 1, pp. 1-17, Routledge Studies in Development Economics: New York.

Ghosh, J., (2013). "Towards a Policy Framework for Reducing Inequalities", *Development*, 56(2), pp. 218-222.

Greenaway-McGrevy, R., Han, C., & Sul, D., (2012). "Asymptotic distribution of factor augmented estimators for panel regression". *Journal of Econometrics*, 169 (1), pp. 48-53.

Gyimah-Brempong, K., & Racine, J. S. (2014). "Aid and Economic Growth: A Robust Approach", *Journal of African Development*, 16(1), pp. 1-35.

Kangoye, T., (2013). "Does Aid Unpredictability Weaken Governance? Evidence from Developing Countries", *The Developing Economies*, 51(2), pp. 121-144.

Jolliffe, I. T., (2002). *Principal Component Analysis* (2ndEd.), New York: Springer.

Johnson A., & Quartey P (2009), "Foreign Aid and Human Development Indicators in sub-Saharan Africa", *Journal of Developing Societies*, 25(1), pp. 57-83.

Jones, S., Page, J., Shimeles, A., & Tarp, F., (2015). "Aid, Growth and Employment in Africa", *African Development Review*, Supplement: Special Issue on "Aid and Employment", 27,(S1), pp. 1–4.

Jones, S., & Tarp, F., (2015). "Priorities for Boosting Employment in Sub-Saharan Africa: Evidence for Mozambique", *African Development Review*, Supplement: Special Issue on "Aid and Employment", 27,(S1), pp. 56–70.

Kaiser, H. F., (1974). "An index of factorial simplicity". *Psychometrika*, 39, pp. 31-36.

Kamara, A. B., Bourish, L., & Nyende, M., (2007). "Growing a Knowledge-Based Economy: Evidence from Public Expenditure on Education in Africa", *Economic Research Working Paper* No. 88.

Kargbo, P. M., & Sen, K., (2014). "Aid Categories that Foster Pro-Poor Growth: The Case of Sierra Leone", *African Development Review*, 26(2), pp. 416-429.

Kaseeram, I., & Mahadea, D., (2018). "Examining the relationship between entrepreneurship, unemployment and education in South Africa using a VECM approach", *International Journal of Education Economics and Development*, 9(3), pp. 193-209.

Kim, E. M., (1997). Big Business, Strong State: Collusion and Conflict in South Korean Development, 1960-1990. State University of New York Press: New York.

Kim, E. M., & Kim, P. H., (2014). The South Korean Development Experience: Beyond Aid. Critical Studies of the Asia Pacific, Palgrave Macmillan.

Kindiki, M. M., (2011). "International Regime Governance and Apparel Labour Upgrading in Export Processing Zones in Urban Kenya", *African Review of Economics and Finance*, 3(1), pp. 26-40.

Kelsey D & le Roux, S., (2017). "Dragon Slaying with Ambiguity: Theory and Experiments", *Journal of Public Economic Theory*, 19(1), pp. 178–197.

Kelsey, D. & le Roux, S., (2018). "Strategic Ambiguity and Decision-making: An Experimental Study", *Theory & Decision*, 84(3), pp. 387–404.

Krause, U., (2013). "Innovation: The new Big Push or the Post-Development alternative?", *Development,* 56(2), pp. 223-226.

Kuada, J., (2015). *Private Enterprise-Led Economic Development in Sub-Saharan Africa The Human Side of Growth* First edition by Kuada, J, Palgrave Macmillan: New York.

Kuada, J., & Mensah, E., (2018). "Knowledge transfer in the emerging solar energy sector in Ghana", *Contemporary Social Science*, DOI: 10.1080/21582041.2018.1510132.

Lee, K., (2009), "How Can Korea be a Role Model for Catch-up Development? A 'Capability- based' View", *UN-WIDER Research Paper* No. 2009/34, Helsinki.

Lee, K., & Kim, B. Y., (2009), "Both Institutions and Policies Matter but Differently for Different Income Groups of Countries: Determinants of Long-Run Economic Growth Revisited", *World Development*, 37(3), 533-549.

Lekoko R.N., & Nthomang K. (2018). Lifelong Learning for Africa's Older Adults: The Role of Open Educational Resources and Indigenous Learning. In: Milana M., Webb S., Holford J., Waller R., Jarvis P. (eds) The Palgrave International Handbook on Adult and Lifelong Education and Learning. Palgrave Macmillan, London.

Lensink, R., & Morrissey, O., (2000). "Aid instability as a measure of uncertainty and the positive impact of aid on growth," *The Journal of Development Studies*, 36(3), pp. 31-49.

Luo, J., (2015). "Understanding the Implications of Ubiquitous Mobile Technology for Mature Adults in Post-PC Era Lifelong Learning", Concordia University, Master Thesis,

http://spectrum.library.concordia.ca/979960/1/Luo_MA_S2015.pdf   (Accessed: 26/11/2015).

Marglin, S. A. (2013). "Premises for a New Economy", *Development*, 56(2), pp. 149-154.

McKenzie C, R., & McAleer M (1997). "On efficient estimation and correct inference in models with generated regressors: A general approach." *Japanese Economic Review*, 48(4), pp. 368-389.

Monni, S., & Spaventa, A., (2013). "Beyond GDP and HDI: Shifting the focus from paradigms to politics", *Development*, 56(2), pp. 227-231.

Moyo, D., (2009). *Dead Aid: Why Aid Is Not Working and How There is Another Way for Africa*. New York: Farrar, Straus and Giroux.

Ndlovu-Gatsheni, S. J. (2013). "The Entrapment of African within the Global Colonial Matrices of Power: Eurocentrism, Coloniality and Deimperialieation in the Twenty-first century", *Journal of Developing Societies*, 29(4), pp. 331-353.

Nyarko, Y., (2013). "Sustaining High Economic Growth in Sub-Saharan Africa: Knowledge and the Structure of the Economy", *Journal of African Economies*, 22, suppl_1(January), pp: -i101.

Obeng-Odoom, F. (2013). "Africa's Failed Economic Development Trajectory: A Critique", *African Review of Economics and Finance*, 4(2), pp. 151-175.

Oluwatobi, S., Efobi, U.R., Olurinola, O.I., Alege, P. (2015), "Innovation in Africa: Why Institutions Matter", *South African Journal of Economics*, 83(3), pp. 390-410.

Oluwatobi, S., Olurinola, I., Alege, P., & Ogundipe, A., (2018). "Knowledge-driven economic growth: the case of Sub-Saharan Africa", *Contemporary Social Science*, DOI: 10.1080/21582041.2018.1510135.

Oxley L, & McAleer, M., (1993). "Econometric issues in macroeconomic models with generated regressors." *Journal of Economic Surveys*, 7(1), pp. 1-40.

Pagan, A., (1984). "Econometric issues in the analysis of regressions with generated regressors" *International Economic Review*, 25(1), pp. 221-247.

Page, J., & Shimeles, A., (2015). "Aid, Employment and Poverty Reduction in Africa", *African Development Review*, 27,(S1), pp. 17–30.

Page, J., & Söderbom, M., (2015). "Is Small Beautiful? Small Enterprise, Aid and Employment in Africa", *African Development Review*, 27,(S1), pp. 44–55.

Pesaran, M. H., (2006). "Estimation and inference in large heterogeneous panels with a multifactor error structure". *Econometrica* 74 (4), pp. 967-1012.

Preece, J., (2013). "Africa and international policy making for lifelong learning: textual revelations", *International Journal of Educational Development*, 33, pp. 98-105.

Quartey P., & Afful-Mensah, G., (2014), Foreign Aid to Africa: Flows, Patterns and Impact, in Monga C and Lin J (eds), *Oxford Handbook of Africa and Economics*, Volume 2: Policies and Practices, Oxford University Press, Oxford, UK.

Simpasa, A, Shimeles, A., & Salami, A. O., (2015). "Employment Effects of Multilateral Development Bank Support: The Case of the African Development Bank", *African Development Review*, 27,(S1), pp. 31–43.

Stock, J. H., & Watson, M. W., (2002). "Forecasting using principal components from a large number of predictors". *Journal of the American Statistical Association*, 97 (460), pp.1167-1179.

Tchamyou, V. S., (2017). "The Role of Knowledge Economy in African Business", *Journal of the Knowledge Economy*, 8(4), pp. 1189–1228.

Tchamyou, V. S., (2020). "Education, Lifelong learning, Inequality and Financial access: Evidence from African countries". *Contemporary Social Science*.
DOI: 10.1080/21582041.2018.1433314.

Tchamyou, V. S., (2019). "The Role of Information Sharing in Modulating the Effect of Financial Access on Inequality". *Journal of African Business*, 20(3), pp. 317-338.

Tchamyou, V. S., & Asongu, S. A., (2017a). "Conditional market timing in the mutual fund industry", *Research in International Business and Finance*, 42(December), pp. 1355-1366.

Tchamyou, V. S., & Asongu, S. A., (2017b). "Information Sharing and Financial Sector Development in Africa", *Journal of African Business*, 18(7), pp. 24-49.

Tchamyou, V. S., Asongu, S. A., & Nwachukwu, J. C., (2018). "Effects of asymmetric information on market timing in the mutual fund industry", *International Journal of Managerial Finance*, 14(5), pp.542-557.

Tchamyou, V. S., Asongu, S. A., & Odhiambo, N. M., (2019a). "The role of ICT in modulating the effect of education and lifelong learning on income inequality and economic growth in Africa", *African Development Review*, 31(3), pp. 261-274.

Tchamyou, V.S., Erreygers, G., & Cassimon, D., (2019b). "Inequality, ICT and Financial Access in Africa", *Technological Forecasting and Social Change*,139(February), pp. 169-184.

Tolliver, D. E., Martin, A., & Salome, N., (2018). "Competency-based Education, Lifelong Learning andAdult Students: Insights from International Partnerships between East Africa, Southern Africa and USA-based Institutions of Higher Education", *Africology: The Journal of Pan African Studies*, 12(1), pp. 123-144.

Tuijnman, A., (2003). "Measuring Lifelong Learning for the New Economy", *Compare: A Journal of Comparative and International Education*, 33(4), pp. 471-482.

Titumir, R. A. M., & Kamal, M. (2013). "Growing Together Sustainably: A zero-poverty post 2015 development framework", *Development*, 56(2), pp. 172-184.

Wa Gĩthĩnji, M., & Adesida, O., (2011). Industrialization, Exports and the Developmental State in Africa: The Case for Tran sformation", University of Massachusetts Amberst, Department of Economics Working Paper, No. 2011-18.

Wamboye, E., Adekola, A., & Sergi, B. S. (2013). "Economic Growth and the Role of Foreign Aid in Selected African Countries", *Development*, 56(2), pp. 155-171.

Westerlund, J., & Urbain, J-P., (2013a). "On the estimation and inference in factor-augmented panel regressions with correlated loadings", *Economic Letters*, 119(3), pp. 247-250.

Westerlund, J., & Urbain, J-P., (2013b). "On the implementation and use of factor-augmented regressions in panel data", *Journal of Asian Economics*, 28(C), pp. 3-11.

Westerlund, J., & Urbain, J-P., (2012). "Cross-sectional averages versus principal components", Maastricht University, RM/11/053, Maastricht.

World Bank (2015). "World Development Indicators', World Bank Publications http://www.gopa.de/fr/news/world-bank-release-world-development-indicators-2015 (Accessed: 26/11/2015).

Yusuf, M. A., (2019). "ECOWAS agenda and regional integration development in West Africa: any role for all-inclusive education?" *International Journal of Education Economics and Development*, 10(1), pp. 76-93.

Table 1: Principal Component Analysis for educational index (Educatex)

	Component Loadings			Cumulative		
	PSE	SSE	TSE	Proportion	Proportion	Eigen value
First PC	0.443	0.659	0.607	0.651	0.651	1.955
Second PC	0.868	-0.147	-0.474	0.267	0.918	0.801
Third PC	-0.223	0.737	-0.638	0.081	1.000	0.243

PC: Principal Component. PSE: Primary School Enrolment. SSE: Secondary School Enrolment. TSE: Tertiary School Enrolment.

Table 2: The effects of foreign aid on lifelong learning

	Dependent variable: Education							
	Primary Schooling		Secondary Schooling		Tertiary Schooling		Lifelong Schooling (Educatex)	
Education (-1)	1.227***	1.170***	1.047***	1.058***	1.153***	1.175***	1.139***	1.120***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-17.746	-9.984	1.510	2.270	-0.876	-0.629	0.199	0.310**
	(0.153)	(0.516)	(0.484)	(0.229)	(0.402)	(0.287)	(0.130)	(0.026)
NODA (Total)	0.781***	---	0.119	---	0.058	---	0.014*	---
	(0.000)		(0.300)		(0.445)		(0.098)	
NODASD1 (Total)	---	0.763*	---	0.076	---	0.082	---	0.018
		(0.061)		(0.680)		(0.332)		(0.209)
Gov. Expenditure	0.092	0.191	-0.008	-0.019	0.057	0.062**	0.006	0.006
	(0.408)	(0.225)	(0.918)	(0.800)	(0.113)	(0.023)	(0.268)	(0.250)
GDP growth	0.360	0.574**	0.180	0.215	-0.021	0.002	0.005	0.007**
	(0.193)	(0.029)	(0.505)	(0.395)	(0.587)	(0.935)	(0.291)	(0.043)
Trade	-0.045	-0.058	-0.022	-0.029*	0.006	0.003	-0.001**	-0.001**
	(0.315)	(0.214)	(0.105)	(0.073)	(0.514)	(0.682)	(0.036)	(0.012)
Inflation	-0.076	0.209	-0.156	-0.131	-0.067	-0.055	-0.001	0.001
	(0.819)	(0.350)	(0.428)	(0.527)	(0.223)	(0.352)	(0.853)	(0.844)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	(0.158)	(0.138)	(0.846)	(0.866)	(0.597)	(0.554)	(0.131)	(0.199)
Sargan OIR	(0.134)	(0.029)	(0.089)	(0.096)	(0.329)	(0.408)	(0.638)	(0.703)
Wald (joint)	100.43***	61.95***	3761***	1991.7***	385.57***	270.06***	402.35***	464.37***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Instruments	18	18	18	18	18	18	18	18
Countries	33	33	28	28	25	25	22	22
Observations	113	113	87	87	80	80	61	61

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. AR(2): Second Order Autocorrelation test. OIR: Overidentifying Restrictions test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(2) tests and; b) the validity of the instruments in the Sargan OIR test. P-values in bracket. Gov: Government. NODA: Total Net Official Development Assistance. NODASD1 (Total): Total NODA volatility as Simple Standard Deviations.

Table 3: Robustness checks with foreign aid from DAC countries and Multilateral Donors

Dependent variable: Education
Panel A: Foreign Aid from the Development Assistance Committee (DAC) Countries

	Primary Schooling		Secondary Schooling		Tertiary Schooling		Lifelong Schooling (Educatex)	
Education (-1)	1.202***	1.208***	1.057***	1.066***	1.150***	1.165***	1.140***	1.124***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-15.936	-12.360	1.361	2.045	-0.955	-0.648	0.181	0.291**
	(0.196)	(0.357)	(0.583)	(0.317)	(0.309)	(0.211)	(0.240)	(0.031)
NODADAC	1.172**	---	0.174	---	0.104	---	0.024*	---
	(0.024)		(0.420)		(0.263)		(0.054)	
NODADACSD1	---	1.198*	---	0.124	---	0.141**	---	0.027*
		(0.086)		(0.661)		(0.018)		(0.054)
Gov. Expenditure	0.120	0.227	-0.001	-0.013	0.060*	0.068***	0.007	0.007
	(0.286)	(0.232)	(0.989)	(0.871)	(0.084)	(0.003)	(0.193)	(0.151)
GDP growth	0.399	0.601**	0.189	0.226	-0.025	-0.0001	0.005	0.008**
	(0.162)	(0.038)	(0.472)	(0.366)	(0.471)	(0.995)	(0.290)	(0.030)
Trade	-0.037	-0.061	-0.023*	-0.030*	0.007	0.004	-0.001	-0.001**
	(0.385)	(0.171)	(0.097)	(0.082)	(0.460)	(0.604)	(0.154)	(0.022)
Inflation	0.006	0.141	-0.150	-0.145	-0.069	-0.069	-0.001	-0.0001
	(0.983)	(0.588)	(0.457)	(0.514)	(0.257)	(0.248)	(0.860)	(0.984)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	(0.158)	(0.161)	(0.851)	(0.899)	(0.598)	(0.569)	(0.132)	(0.159)
Sargan OIR	(0.126)	(0.036)	(0.091)	(0.098)	(0.301)	(0.358)	(0.599)	(0.721)
Wald (joint)	106.63***	75.797***	3043***	1659.7***	583.33***	259.88***	470.44***	543.66***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Instruments	18	18	18	18	18	18	18	18
Countries	33	33	27	27	25	25	22	22
Observations	113	113	87	87	80	80	61	61

Panel B: Foreign Aid from Multilateral Donors

	Primary Schooling		Secondary Schooling		Tertiary Schooling		Lifelong Schooling (Educatex)	
Education (-1)	1.235***	1.079***	1.036***	1.045***	1.155***	1.177***	1.126***	1.098***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-15.450	-2.469	2.010	2.442	-0.366	-0.367	0.277**	0.323**
	(0.248)	(0.901)	(0.266)	(0.184)	(0.649)	(0.565)	(0.011)	(0.015)
NODAMD	1.335**	---	0.262	---	0.029	---	0.020	---
	(0.029)		(0.229)		(0.850)		(0.292)	
NODAMDSD1	---	0.967	---	0.235	---	-0.026	---	0.009
		(0.505)		(0.614)		(0.888)		(0.811)
Gov. Expenditure	0.062	0.098	-0.024	-0.027	0.054	0.054	0.004	0.004
	(0.620)	(0.368)	(0.745)	(0.715)	(0.153)	(0.120)	(0.486)	(0.480)
GDP growth	0.414	0.512**	0.174	0.202	-0.008	-0.002	0.007	0.008*
	(0.156)	(0.036)	(0.511)	(0.440)	(0.826)	(0.934)	(0.119)	(0.055)
Trade	-0.065	-0.051	-0.023	-0.027*	0.003	0.001	-0.001***	-0.002**
	(0.175)	(0.329)	(0.125)	(0.088)	(0.756)	(0.843)	(0.004)	(0.019)
Inflation	0.007	0.280	-0.154	-0.123	-0.049	-0.036	0.0004	0.002
	(0.980)	(0.184)	(0.437)	(0.522)	(0.349)	(0.529)	(0.948)	(0.723)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	(0.133)	(0.120)	(0.848)	(0.859)	(0.603)	(0.548)	(0.142)	(0.168)
Sargan OIR	(0.072)	(0.022)	(0.087)	(0.093)	(0.385)	(0.453)	(0.643)	(0.634)

Wald (joint)	85.511***	71.22***	3607***	3083.8***	283.66***	335.76***	323.54***	305.44***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Instruments	18	18	18	18	18	18	18	18
Countries	33	33	28	28	25	25	22	22
Observations	113	113	87	87	80	80	61	61

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. AR(2): Second Order Autocorrelation test. OIR: Overidentifying Restrictions test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(2) tests and; b) the validity of the instruments in the Sargan OIR test. P-values in bracket. Gov: Government. NODADAC: Net Official Development Assistance from the Development Assistance Committee. NODAMD: Net Official Development Assistance from Multilateral Donors. NODADACSD1: NODADAC volatility as Simple Standard Deviations.   NODAMDSD1: NODAMD volatility as Standard Deviations of the Residuals after first-order autoregressive processes.

Table 4: The effects of foreign aid on lifelong learning

	Dependent variable: Education							
	Primary Schooling		Secondary Schooling		Tertiary Schooling		Lifelong (Educatex)	Schooling
Education (-1)	1.227***	1.152***	1.047***	1.065***	1.153***	1.171***	1.139***	1.128***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-17.746	-7.945	1.510	2.127	-0.876	-0.635	0.199	0.305**
	(0.153)	(0.645)	(0.484)	(0.283)	(0.402)	(0.262)	(0.130)	(0.019)
NODA (Total)	0.781***	---	0.119	---	0.058	---	0.014*	---
	(0.000)		(0.300)		(0.445)		(0.098)	
NODA SD2 (Total)	---	0.434	---	0.069	---	0.079	---	0.017**
		(0.254)		(0.607)		(0.100)		(0.037)
Gov. Expenditure	0.092	0.163	-0.008	-0.015	0.057	0.065**	0.006	0.007
	(0.408)	(0.298)	(0.918)	(0.851)	(0.113)	(0.011)	(0.268)	(0.166)
GDP growth	0.360	0.576**	0.180	0.220	-0.021	0.0004	0.005	0.008**
	(0.193)	(0.025)	(0.505)	(0.370)	(0.587)	(0.986)	(0.291)	(0.024)
Trade	-0.045	-0.057	-0.022	-0.030*	0.006	0.004	-0.001**	-0.001**
	(0.315)	(0.241)	(0.105)	(0.073)	(0.514)	(0.614)	(0.036)	(0.016)
Inflation	-0.076	0.206	-0.156	-0.138	-0.067	-0.064	-0.001	0.000
	(0.819)	(0.381)	(0.428)	(0.522)	(0.223)	(0.300)	(0.853)	(0.989)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	(0.158)	(0.115)	(0.846)	(0.855)	(0.597)	(0.551)	(0.131)	(0.215)
Sargan OIR	(0.134)	(0.028)	(0.089)	(0.099)	(0.329)	(0.406)	(0.638)	(0.668)
Wald (joint)	100.43***	73.21***	3761***	1910.2***	385.57***	304.38***	402.35***	444.09***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Instruments	18	18	18	18	18	18	18	18
Countries	33	33	28	28	25	25	22	22
Observations	113	113	87	87	80	80	61	61

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. AR(2): Second Order Autocorrelation test. OIR:
Overidentifying Restrictions test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(2) tests and; b) the validity of the instruments in the Sargan OIR test. P-values in bracket. Gov: Government. NODA: Total Net Official Development Assistance. NODASD2 (Total): Total NODA volatility as Standard Deviations of the Residuals after first-order autoregressive processes.

Table 5: Robustness checks with foreign aid from DAC countries and Multilateral Donors

Dependent variable: Education
Panel A: Foreign Aid from the Development Assistance Committee (DAC) Countries

	Primary Schooling		Secondary Schooling		Tertiary Schooling		Lifelong Schooling (Educatex)	
Education (-1)	1.202***	1.177***	1.057***	1.066***	1.150***	1.164***	1.140***	1.122***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-15.936	-9.739	1.361	2.087	-0.955	-0.626	0.181	0.289**
	(0.196)	(0.524)	(0.583)	(0.317)	(0.309)	(0.244)	(0.240)	(0.028)
NODADAC	1.172**	---	0.174	---	0.104	---	0.024*	---
	(0.024)		(0.420)		(0.263)		(0.054)	
NODADAC SD2	---	0.719	---	0.077	---	0.123***	---	0.023**
		(0.194)		(0.724)		(0.006)		(0.037)
Gov. Expenditure	0.120	0.202	-0.001	-0.016	0.060*	0.070**	0.007	0.008
	(0.286)	(0.286)	(0.989)	(0.851)	(0.084)	(0.002)	(0.193)	(0.135)
GDP growth	0.399	0.573**	0.189	0.224	-0.025	-0.005	0.005	0.008*
	(0.162)	(0.033)	(0.472)	(0.367)	(0.471)	(0.860)	(0.290)	(0.055)
Trade	-0.037	-0.058	-0.023*	-0.030*	0.007	0.004	-0.001	-0.001**
	(0.385)	(0.212)	(0.097)	(0.081)	(0.460)	(0.585)	(0.154)	(0.028)
Inflation	0.006	0.185	-0.150	-0.140	-0.069	-0.069	-0.001	-0.0004
	(0.983)	(0.451)	(0.457)	(0.522)	(0.257)	(0.253)	(0.860)	(0.947)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	(0.158)	(0.122)	(0.851)	(0.891)	(0.598)	(0.556)	(0.132)	(0.166)
Sargan OIR	(0.126)	(0.030)	(0.091)	(0.098)	(0.301)	(0.381)	(0.599)	(0.689)
Wald (joint)	106.63***	67.04***	3043***	1699.9***	583.33***	283.91***	470.44***	577.79***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Instruments	18	18	18	18	18	18	18	18
Countries	33	33	27	27	25	25	22	22
Observations	113	113	87	87	80	80	61	61

Panel B: Foreign Aid from Multilateral Donors

	Primary Schooling		Secondary Schooling		Tertiary Schooling		Lifelong Schooling (Educatex)	
Education (-1)	1.235***	1.132***	1.036***	1.053***	1.155***	1.172***	1.126***	1.096***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-15.450	-6.629	2.010	2.080	-0.366	-0.454	0.277**	0.279**
	(0.248)	(0.737)	(0.266)	(0.273)	(0.649)	(0.490)	(0.011)	(0.018)
NODAMD	1.335**	---	0.262	---	0.029	---	0.020	---
	(0.029)		(0.229)		(0.850)		(0.292)	
NODAMD SD2	---	1.034	---	0.408	---	0.040	---	0.034
		(0.450)		(0.319)		(0.789)		(0.496)
Gov. Expenditure	0.062	0.092	-0.024	-0.020	0.054	0.054	0.004	0.005
	(0.620)	(0.417)	(0.745)	(0.787)	(0.153)	(0.106)	(0.486)	(0.337)
GDP growth	0.414	0.533**	0.174	0.194	-0.008	-0.003	0.007	0.007*
	(0.156)	(0.035)	(0.511)	(0.452)	(0.826)	(0.909)	(0.119)	(0.082)
Trade	-0.065	-0.057	-0.023	-0.028*	0.003	0.002	-0.001***	-0.002**
	(0.175)	(0.266)	(0.125)	(0.071)	(0.756)	(0.782)	(0.004)	(0.013)
Inflation	0.007	0.231	-0.154	-0.146	-0.049	-0.043	0.0004	0.001
	(0.980)	(0.311)	(0.437)	(0.468)	(0.349)	(0.444)	(0.948)	(0.880)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	(0.133)	(0.111)	(0.848)	(0.870)	(0.603)	(0.553)	(0.142)	(0.177)

Sargan OIR	(0.072)	(0.023)	(0.087)	(0.095)	**(0.385)**	**(0.422)**	**(0.643)**	**(0.623)**
Wald (joint)	**85.511***	**85.16***	**3607***	**3112***	**283.66**	**353.57**	**323.54***	**303.79**
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Instruments	18	18	18	18	18	18	18	18
Countries	33	33	28	28	25	25	22	22
Observations	113	113	87	87	80	80	61	61

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. AR(2): Second Order Autocorrelation test. OIR: Overidentifying Restrictions test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(2) tests and; b) the validity of the instruments in the Sargan OIR test. P-values in bracket. Gov: Government. NODADAC: Net Official Development Assistance from the Development Assistance Committee. NODAMD: Net Official Development Assistance from Multilateral Donors. NODADACSD2: NODADAC volatility as Standard Deviations of the Residuals after first-order autoregressive processes. NODAMDSD2: NODAMD volatility as Standard Deviation of the Residuals after first-order autoregressive processes.

Appendices
Appendix 1: Definitions of variables

Variable(s)	Definition(s)	Source(s)
Aid1: NODA (Total)	Total Net Official Development Assistance (% of GDP)	World Bank (WDI)
Aid 2: NODADAC	Net Official Development Assistance for the Development Assistance Committee (% of GDP)	World Bank (WDI)
Aid 3: NODAMD	Net Official Development Assistance from Multilateral Donors (% of GDP)	World Bank (WDI)
Aid1: NODASD1 (Total)	Volatility of Total NODA by Simple Standard Deviation	Author
Aid 2: NODADACSD1	Volatility of NODADAC by Simple Standard Deviation.	Author
Aid 3: NODAMDSD1	Volatility of NODAMD by Simple Standard Deviation	Author
Aid1: NODASD2 (Total)	Volatility of Total NODA by Standard Deviation of the Residuals after first-order autoregressive process.	Author
Aid 2: NODADACSD2	Volatility of NODADAC by Standard Deviation of the Residuals after first-order autoregressive process.	Author
Aid 3: NODAMDSD2	Volatility of NODAMD by Standard Deviation of the Residuals after first-order autoregressive process.	Author
Primary Schooling (PS)	Primary School Enrolment (% of Gross)	World Bank (WDI)
Secondary Schooling (SS)	Secondary School Enrolment (% of Gross)	World Bank (WDI)
Tertiary Schooling (TS)	Tertiary School Enrolment (% of Gross)	World Bank (WDI)
Educational index	First principal component of PS, SS & TS	PCA
GDP growth	Gross Domestic Product growth rate (annual %)	World Bank (WDI)
Trade Openness	Exports plus Imports of Commodities (% of GDP)	World Bank (WDI)
Government Expenditure	Government Final Consumption Expenditure (% of GDP)	World Bank (WDI)
Inflation	Consumer Price Index (annual %)	World Bank (WDI)

WDI: World Bank Development Indicators. GDP: Gross Domestic Product. PCA: Principal Component Analysis. NODA: Net Official Development Assistance. NODADAC: NODA from the Development Assistance Committee (DAC) countries. NODAMD: NODA from Multilateral Donors. SD1: Distortions by Simple Standard Deviations. SD2: Distortions by Standard Deviations of the Residuals after first-order autoregressive processes.

Appendix 2: Summary statistics

	Mean	S.D	Min	Max	Obs.
Total Net Official Development Assistance	10.889	12.029	0.015	102.97	253
NODA from DAC countries	6.278	7.303	-0.003	68.063	253
NODA from Multilateral Donors	4.525	5.083	0.004	33.249	253
First Volatility from Total NODA	2.841	6.460	0.001	64.113	250
First Volatility from Total NODADAC	1.868	4.790	0.0005	44.404	250
First Volatility from Total NODADMD	1.397	2.712	0.0006	29.353	250
Second Volatility from Total NODA	3.409	8.106	0.005	91.927	250
Second Volatility from Total NODADAC	2.201	6.333	0.001	68.826	250
Second Volatility from Total NODADMD	1.678	2.714	0.000	29.906	250
Primary School Enrolment	94.414	25.647	28.298	149.70	237
Secondary School Enrolment	38.683	26.489	5.372	115.03	199
Tertiary School Enrolment	6.228	8.489	0.241	53.867	183
Educational index	-0.070	1.327	-2.103	5.527	152
GDP growth	4.755	5.587	-11.272	49.367	254
Trade Openness	78.340	39.979	20.980	250.95	247
Government Expenditure	4.495	8.064	-17.387	49.275	164
Inflation	56.191	575.70	-45.335	8603.3	230

S.D: Standard Deviation. Min: Minimum. Max: Maximum. Obs: Observations. NODA: Net Official Development Assistance. DAC: Development Assistance Committee. SD1: Volatility by Simple Standard Deviations. SD2: Volatility by Standard Deviations of the Residuals after first-order autoregressive processes.

Appendix 3: Correlation Matrix

GDPg	Trade	Gov.E	Inflation	Aid1	Aid2	Aid3	SD1Aid1	SD1Aid2	SD1Aid3	SD2Aid1	SD2Aid2	SD2Aid3	PSE	SSE	TSE	Educatex	
1.000	0.179	0.254	-0.132	0.114	0.109	0.111	0.219	0.193	0.166	0.145	0.091	0.109	0.095	-0.078	-0.036	-0.006	GDPg
	1.000	-0.070	0.024	-0.083	-0.061	-0.114	0.082	0.050	0.047	0.101	0.091	-0.032	0.261	0.389	0.057	0.283	Trade
		1.000	-0.024	0.078	0.077	0.060	0.014	0.024	0.072	0.028	0.028	0.051	0.019	0.013	0.092	0.087	Gov. E
			1.000	-0.023	0.011	0.035	-0.004	0.011	-0.016	-0.003	0.0006	0.016	-0.064	-0.100	-0.081	-0.106	Inflation
				1.000	0.975	0.946	0.770	0.681	0.752	0.756	0.685	0.735	-0.055	-0.488	-0.454	-0.456	Aid1
					1.000	0.854	0.805	0.756	0.706	0.809	0.767	0.692	-0.064	-0.449	-0.440	-0.452	Aid2
						1.000	0.646	0.507	0.750	0.608	0.500	0.734	-0.026	-0.481	-0.422	-0.409	Aid3
							1.000	0.921	0.793	0.949	0.878	0.678	-0.067	-0.239	-0.286	-0.290	SD1Aid1
								1.000	0.528	0.901	0.946	0.459	-0.078	-0.167	-0.250	-0.271	SD1Aid2
									1.000	0.718	0.515	0.902	-0.056	-0.340	-0.333	-0.340	SD1Aid3
										1.000	0.945	0.650	-0.044	-0.217	-0.267	-0.236	SD2Aid1
											1.000	0.452	-0.052	-0.152	-0.228	-0.229	SD2Aid2
												1.000	-0.018	-0.355	-0.360	-0.310	SD2Aid3
													1.000	0.452	0.257	0.635	PSE
														1.000	0.725	0.919	SSE
															1.000	0.843	TSE
																1.000	Educatex

GDPg: GDP growth rate. Gov. E: Government Expenditure. Aid1: Total Net Official Development Assistance (NODA). Aid2: NODA from the DAC countries. Aid3: NODA from Multilateral Donors. PSE: Primary School Enrolment. SSE: Secondary School Enrolment. TSE: Tertiary School Enrolment. Educatex: educational index. SD1: Volatility by Simple Standard Deviations. SD2: Volatility by Standard Deviations of the Residuals after first-order autoregressive processes.