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Foreign aid towards accelerated economic growth in Africa: the role of independent central banks, political institutions and monetary integration

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Abstract: We explore the impact of various dimensions of foreign aid and central bank independence (CBI) on economic growth in Africa. The aim is to highlight which types of aid and central bank reforms will be most beneficial for Africa. The study also examines the impact of monetary integration on aid and CBI's effectiveness. We achieve these using two stage GMM and error correction two stage least squares estimators with data spanning 1970–2017. We find that, aside economic, infrastructure and services aid, other forms of aid had a direct negative impact on economic growth. Goal, personal, instrument and financial independence did not have any significant impact on economic growth. CBI does not enhance the impact of foreign aid on economic growth except in the presence of high levels of political institutional quality. Financial independence had the strongest impact on enhancing aid effectiveness. Foreign aid has a stronger impact in fixed exchange regimes. CBI impacts economic growth more in the non-CFA Zone, reflecting the role of flexible exchange regimes in improving CBI effectiveness.

Keywords: foreign aid effectiveness; central bank independence; CBI; economic growth; monetary integration; institutions; developing countries; Africa.

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Biographical notes: Abel Mawuko Agoba holds a PhD in Finance, MPhil in Finance, BSc in Accounting and he is also a Senior Lecturer and researcher in Finance, Economics, and Accounting at the Leeds. He demonstrates in-depth knowledge in inter-disciplinary and multi-disciplinary research and content development. He has 16 publications in areas such as small and medium enterprises (SMEs), microfinance, central bank independence, institutional economics, monetary policy, corporate finance, financial inclusion,

international finance, risk and insurance, fiscal policy, foreign direct investments, all in astute journals including three in three-star journals and eight in two-star journals.

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1 Introduction

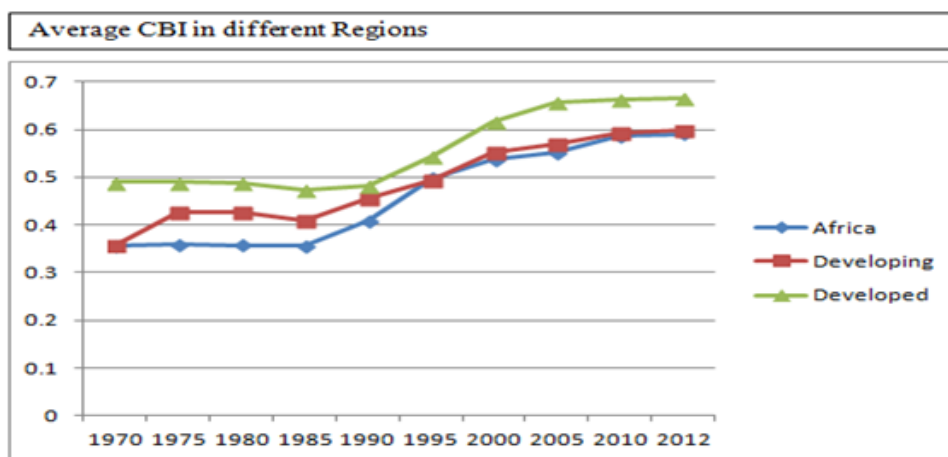
One of the most discussed topics in social sciences remains foreign aid as it is an effective tool to create development. Some economists claim that aid is effective (Maruta et al., 2019; Jena and Sethi, 2019; Kumi, 2020, Dash, 2021; Reinsberg, 2018; Duta and Williamson, 2016) and have cited countries like Korea, Taiwan, Indonesia, Uganda and Mozambique as successful aid recipients. Another minority finds that aid is directly harmful (Fashina et al, 2018; Younsi et al. 2019; Monkam 2012). Particularly for Africa, there has been an unending debate on aid failure in terms of its inability to reduce poverty and promote economic development (Park, 2019). This is on the backdrop that Africa has received and has been massive inflows of diverse types of foreign aid. The region also is noted for where official aid inflows outstrip private capital inflows by an exceptionally large margin. In fact, over the past 60 years, total value of foreign aid to Africa has exceeded \$1 trillion. Despite these, the evidence shows a decline in average annual GDP growth rate from 10.24% in 1970 to 4.13% in 2022. Similarly, a decrease in per capita GDP adjusted for purchasing power parity from \$1,770 in constant 1995 international dollars to \$1,479 was observed; and the blame has been put at the doorstep of FDI inflows.

FDI inflows, have been said to even be responsible for Africa's huge debt burden. Reasons for this have included the inflationary nature of aid that distorts economic growth (Adaramola and Dada, 2020; Mischenko et al., 2018). Second, inflows of aid allow governments and politicians to spend aid on popular, as opposed to productive, purposes, and to ignore structural problems for substantially longer than if benefits as well as costs accrued only to the country and its own decision-makers (Pavlik and Young, 2022; Sothan, 2018). As such, aid may undermine a number of political incentives and institutional reforms that would be beneficial to long-run growth (Bjørnskov, 2019a; Rwanmigisa et al., 2018). The problems of political incentives also relate to the issue of fungibility: that as aid inflows finance activities within the set of priorities of the government, politicians can rationally decide to reprioritise the budget allocation as aid merely finances something that would otherwise have been partly covered by ordinary budget means. Fungibility thus has the consequence that aid may contribute to activities well outside the donors' interests (Rana and Koch, 2021; Kaya and Kaya, 2020; Findley, 2018).

Research has emerged focusing on conditions that make aid effective (Guillaumont and Chauvet, 2019; Carnegie and Marinov, 2017; Bjørnskov, 2019b). The new wave of studies was partly sparked by the findings of Burnside and Dollar (2000), which was that aid works in good policy environments. This implied that, to achieve the economic

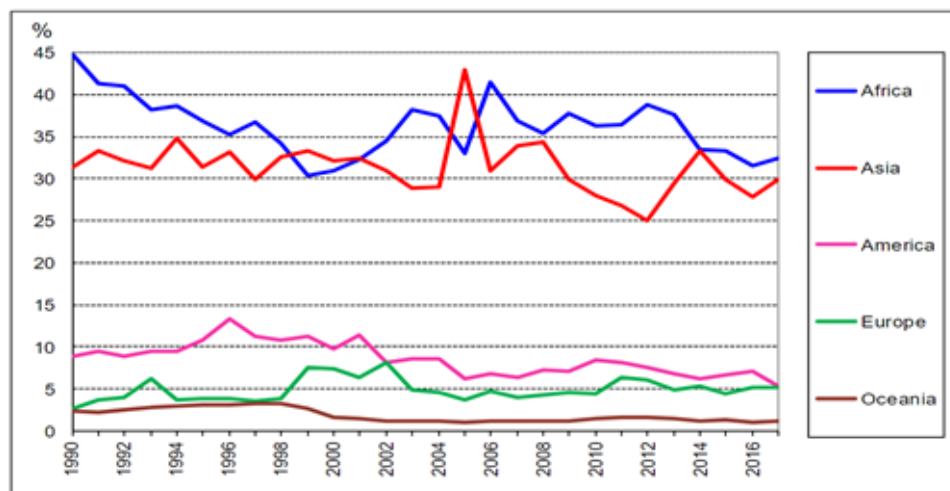
objective of aid, donors should target low-income countries with sound economic policies (Burnside and Dollar 2000). In a recent study by Appiah-Otoo et al. (2022), financial development was found to spur the impact of foreign aid on economic growth. However, whether the quality of host countries' monetary policy framework/architecture serves as a pre-condition for aid effectiveness remains underexplored in the aid-economic growth literature.

Figure 1 CBI trend 1970–2012 (see online version for colours)



Source: Garriga (2016)

Figure 2 Regional shares of total Net Oda (1990–2016) (see online version for colours)

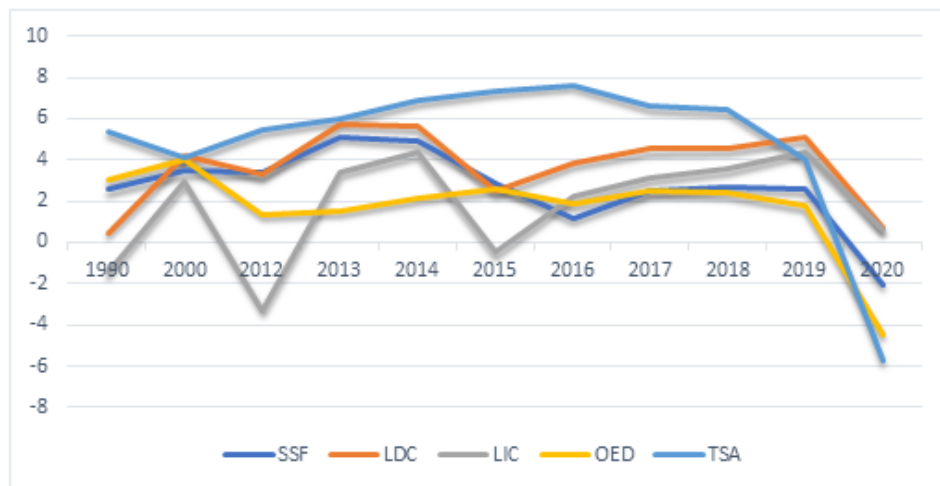


Source: OECD (2019)

African countries have reformed their central banks, granting them more independence (see Figure 1) with the objectives of attaining single digit inflation and fiscal deficits below 4% of GDP (Marcussen 2017; Bodea and Hicks, 2012). The main argument for

central bank independence (CBI) is in ensuring price stability. The occurrence of persistent price instability does harm to economic growth. Inflation/price instability distorts the distribution of income, creates uncertainty in business and economic decision making and implementation. It also leads to lower investment, low output and subsequently lower profits. This reduces tax revenues resulting in higher fiscal deficits (Heald and Hodges, 2020). This study seeks to propose that CBI mitigates inflation caused by foreign aid, controls government spending and encourages the productive use of foreign aid thereby resulting in a positive impact of foreign aid on economic growth.

Figure 3 Real GDP growth 1990–2020 (see online version for colours)



Source: World Bank (2021)

First, since inflation reduces the value of money balances, resulting in lower real balances in the economy, an independent central bank that ensures price stability should lead to the preservation of the real value of foreign aid received. This would translate into more productive use of aid in terms of paying for more labour, capital and technology, leading to higher economic growth. In addition, having an independent central bank would mean the threat of foreign aid to inflation is curtailed to a considerable extent, thereby mitigating the negative impact of aid on economic growth through inflation.

Secondly, with regards to the argument that inflows of aid allow governments and politicians to spend aid on popular, as opposed to productive purposes, having an independent central bank acts as a check on governments' fiscal behaviour with central banks being able to use monetary policy to counter government's fiscal misdemeanours through interest rate hikes and restrictions on government funding should money be needed by governments to spend on critical aspects of the economy after they have misused donor funds. When governments know, they cannot run to the central bank for financing beyond the legal required limits, then aid would be used judiciously for productive purposes to spur economic growth.

Thirdly, CBI has been known to improve financial development through effective supervision and regulation of financial institutions, preservation of bank balances and reduction in cost of loans through stability in interest rates. By being able to transfer funds from the surplus units to deficit units (Appiah-Otoo and Song, 2021), financial

development facilitates savings and investment, thereby advancing economic growth (Appiah-Otoo and Song, 2022). Financial intermediaries also bring borrowers and lenders together and reduce the problem of risks associated with the transfer of funds (Ang, 2008). Thus, the financial system reduces transactions cost and information asymmetry problems (Ang, 2008). Financial intermediaries also provide monitoring and corporate governance leading to economic growth (Botev et al., 2019). This implies that countries with a developed financial system which is as a result of having an independent central bank, will successfully allocate aid inflows to firms and households. With an improved financial sector, aid should be transferred into more productive sectors of the economy.

Finally, independent central banks signal the overall quality of institutions in an economy. Strong institutions are known to have impact on economic growth through political stability which ensures a productive environment for economic activities to take place. So, with an independent central bank, in addition to macroeconomic stability which it provides, political stability is also ensured to enhance the effective and corrupt-free usage of aid to be channelled into productive sectors of the economy to spur economic growth.

Most empirical research about CBI and economic growth, however, have had inconclusive results. For example, while Akinci et al. (2015) found a positive influence of CBI on economic growth, de Medonca (2006) found no relationship. This has been widely attributed to omitted variables and as well as the inability of these studies to consider differences between samples in terms of income, institutional quality and level of monetary integration. Though most researchers agree that independence is theoretically desirable, they however disagree as to what constitutes independence in practice. Consequently, studies that use an index to measure independence might produce skewed results. Most indices count the number of aspects of independence present in a central bank's charter and add them together. This technique implicitly assumes that each aspect contributes equally to the effect of independence on macroeconomic variables. Certainly, these aspects of independence are bound to have a greater or lesser effect than others. Focusing, however, on the distinction between political and operational CBI shows a different picture. While most academic work looked at composite CBI, Debelle and Fischer (1994) showed that only the operational component of CBI was important for advanced economies over the 1970s and 1980s.

This paper subsequently addresses the problem of aid and CBI diversity and explores the dimensionality of foreign aid disbursements and CBI and the consequences of treating foreign aid as a multi-dimensional international transfer. The paper addresses one particular potential problem stressed by Roodman (2007): that substantial multicollinearity can create the appearance of significance, which may be a substantial problem if specific types cannot be meaningfully separated. If types of aid in general are disbursed together, studies of the effectiveness of specific types may not count all relevant disbursements and thus underestimate the effect. Separating types of foreign aid thus allows for substantially more precise estimates of the consequences of aid. Similarly, the proper method for analysing independence is to examine each aspect independently.

The results of this paper should provide a more accurate picture than past research does, of how foreign aid and CBI affect macroeconomic variables. It should also indicate which institutional features of CBI would be the most desirable features to include in a central bank's charter, which would have the greatest direct and indirect effect on economic growth. We also consider the impact of the level of monetary integration on

these relationships as the effectiveness of central bank monetary policy tools could be different under different regimes.

The rest of the paper is structured as follows. Section 2 briefly outlines the theoretical and empirical literature; Section 3 focuses on the methodology; that is the data and estimation strategies. Section 4 reports and discusses the results of our estimations, and we conclude in Section 5.

2 Literature review

2.1 Theory of aid and economic growth

As noted by Aghion and Howitt (2009), the primary reference in growth economics remains the neoclassical growth models. Neoclassical growth theory argues that irrespective of the initial savings rate, the economy tends to a steady-state growth path. The progress of an exogenously technological process explains the long-run growth that is beyond the steady state growth. The model shows that the lack of technological developments propels the effects of diminishing returns to cause economic growth to discontinue. In fact, each additional unit of capital would yield fewer returns. Succinctly, the building block of neoclassical growth theory is the cumulative production function with constant returns to capital and labour. Aghion and Howitt (2009) showed the aggregate production function (APF) is a function of capital. The equation depicts how many outputs can be generated from the accumulated capital stock, given the available techniques, knowledge, labour, and capital. Based on assumption, capital accumulation is the only driver of growth and will have declining returns to growth. Thus, at the persistent increase of capital with rising labour supply, the economy will be saturated and there will be no growth increase as additional capital employed becomes redundant.

2.1.2 Theory of CBI and economic growth

According to de Haan et al. (2018), CBI theoretically rests on opposing inflationary biases that may occur for diverse motives in the dearth of an independent central bank. From the empirical literature, it was revealed that CBI is more active when there are strong political institutions as it guarantees lower corruption, rule of law, and protection of property rights (Agoba et al, 2017; Agoba et al., 2019). Bearing in mind the credibility linked with independence, a credible and independent Central Bank affects other agents' decision and expectations (de Mendonça and de Moraes, 2018). For an economy that is performing well, private planning capacity improvement can spur the private activity level. Nevertheless, if private agents fail to believe economic fundamentals, their activity level will diminish as it can generate investment risk loathing.

Moreover, a high inflation wears down income and savings by promoting high nominal interest rates and decreasing their value. This in turn, for the economy leads to a short-term risk capital inflow with probable destructive effects for it. As noted by Ferguson (2006), Central Banker should promote stable and low inflation rates, lessening the possibility of the financial system having shocks, and boosting savings and investment returns which should enhance economic growth. While lower inflation increases economic and political confidence, high inflation is associated with institutional failure. Consequently, the nation's international trade relations and economic growth is

hampered by an independent Central Banker, distinguished by inflation-averse preferences. Obben (2008) also describes how CBI is related to economic growth. If inflation is high and if the monetary authority decides to decrease money supply to reduce it, the real interest rate will increase, the interest payment responsibility regarding Government debt will increase and, finally, investment will decrease. The exchange rate appreciates, decreasing a country's competitiveness. So, an independent Central Banker, characterised by inflation-averse preferences, might harm the international trade relations of a country and then also its economic growth. Issing (2006), grounded on Alesina et al. (2002) and Issing (2006), agrees with this view, arguing that a relationship of dependence (policy cooperation) between the Central Bank and other policymakers, namely the fiscal authorities, is reflected by an *ex ante* policy coordination, which, in turn, can make the private agents and the financial markets consider the Central Bank as non-credible and communication problems can also arise, harming a country's stability as well as the economy.

2.2 Empirical literature on aid, CBI, and economic growth

Yiew and Lau (2018) empirically investigate the role and the impact of foreign aid on economic growth using 95 developing countries as the sample. The control variables used were foreign direct investment and population. Their study showed a U-shape relationship between foreign aid and economic growth. They mentioned that foreign aid initially had a negative impact growth and over a period, it positively contributed to economic growth. Dash (2021) analysed the effectiveness of foreign aid on economic growth of eight South Asian countries, from 1996 to 2018. Using the panel fully modified least squares (FMOLS) model, the study finds a long-run equilibrium relationship between economic growth, trade openness, foreign aid, gross fixed capital formation, financial sector development, and inflation. Furthermore, a positive association between foreign aid and economic growth in both the short-run and long-run is found. In another study, Adams and Atsu (2014) examined the impact of foreign aid on economic growth in Ghana for the period 1970-2011. Using autoregressive distributed lag (ARDL), the authors found that foreign aid has a positive effect on growth in the short run, but the effect was negative in the long run. According to the authors, the short run positive effect may be explained as due to inflow of aid that adds to the initial level of output.

Using 36 Sub-Saharan African (SSA) countries, Juselius et al. (2014) conducted a study that provides a broad and statistically established effect of aid on macro economy. Foreign aid was found to have a significant positive impact on either GDP or investment, or both in 27 of the 36 SSA countries. This finding implies that aid, mostly has a long run direct impact on GDP and investment. Amazingly, it was found that there is certainly no support for aid having a negative effect on investment and growth. Likewise, using a dynamic spatial framework, Nwaogu and Ryan (2015) examined the effect of foreign aid, foreign direct investment, and remittances on economic growth of the African developing countries, Latin America, and the Caribbean. Findings from this study reveals that foreign aid and FDI have a statistically significant impact on economic growth in Africa. The effect of contemporaneous CBI on European Union member countries was examined by Akinici et al. (2015) using ARDL model from 1995 to 2011. The short and long-term relationship affirms a positive relationship between the two variables. Finally, Casinhas (2019) investigated CBI and Economic Growth in Portugal and found a negative impact

of irregular central bank governors' turnover on growth whilst the legal independence has no statistically significant impact on growth.

2.2.1 Conditions for aid effectiveness

Maruta et al. (2020) examined the effect of sectoral foreign aid and institutional quality on the economic growth of 74 developing countries from Africa, Asia and South America, covering the period 1980–2016. Their study considered bilateral aid flows into three sectors, namely education, health and agriculture, and found that among the three types of aid, education aid was more effective for aid-receiving countries. The effect was conditional on the current level of institutional quality and varied substantially across regions. While education aid was more effective in South America, health aid was more effective in Asia and agricultural aid was more effective in Africa. As the level of institutional quality improved, the gap between the marginal effect of education, health and agricultural aids widened. Their study showed that it was more desirable to shift aid flows towards the education sector as the level of institutional quality improved. Younsi et al. (2019) examined the relationship between foreign aid and income inequality (IIQ) reduction for 16 African countries using unbalanced panel data covering the period 1990–2011. The study's findings indicated that foreign aid had a positive and statistically significant effect on income inequality whilst government spending and inflation had a negative and statistically significant effect on income inequality. The results also showed that a 1% increase in inflation, led to a 0.073% increase in income inequality; implying that minimising inflation would improve the effectiveness of foreign aid on inequality.

3 Methodology

3.1 Data and sample

Data on aid, from 1970–2017, for 48 African countries is sourced from the Organisation for Economic Cooperation and Development (OECD), Garriga (2016) and Romeli (2022). These represent the most up to date data on CBI available for our sample countries. We explore five dimensions of foreign aid namely health (*Health.Aid*), education (*Edu.Aid*), agriculture (*Agric.Aid*), economic, infrastructure and service (*EIS.Aid*) humanitarian (*Hum.Aid*) aid. The dependent variable is economic growth (GDP) which is measured as the yearly percentage GDP growth rate.

3.2 Model and estimation technique

3.2.1 Model

This study has two central objectives. First is to re-examine the impact of foreign aid and CBI on economic growth and secondly to explore the role CBI plays in moderating the impact of foreign aid on economic growth. A third objective is to analyse the impact of institutional quality and monetary integration on the AID, CBI, and Economic growth nexus. In developing our model, we make some theoretical considerations and subsequently develop some hypothesis to be tested. We rely on Solow (1956) APF, which establishes a relationship between production inputs and outputs (Peprah et al., 2019; Appiah-Otoo and Song, 2021).

The model is as follows:

$$Y_{it} = A_{it} * f(k_{it}, l_{it}) \quad (1)$$

where Y_{it} is output, k_{it} is stock of capital/investment and l_{it} is represents total factor productivity/labour (TFP), for country i at time t . Due to lack of capitals stock data for our sample countries, the study uses an extensively used variable in economic growth studies; which is investment as a percentage of GDP, to capture capital stock (see Peprah et al., 2019; Maruta et al., 2020; Appiah-Otoo and Song, 2021; Albiman, 2016).

To examine the two objectives, we substitute foreign aid, CBI, the interaction between foreign aid and CBI and a set of control variables, X_{it} for A_{it} in equation (2). This gives us:

$$Y_{it} = f(aid_{it}, cbi_{it}, aid_{it} * cbi_{it}, X_{it}) \quad (2)$$

Subsequently, if we substitute (2) into (1), we have equation (3) as follows:

$$Y_{it} = f(k_{it}, l_{it}, aid_{it}, cbi_{it}, aid_{it} * cbi_{it}, X_{it}) \quad (3)$$

This can be rewritten as:

$$y_{it} = \beta_0 + \beta_1 k_{it-1} + \beta_2 l_{it} + \beta_3 Aid_{it} + \beta_4 CBI_{it} + \beta_5 (Aid_{it} * CBI_{it}) + X_{it} + \varepsilon_{it} \quad (4)$$

If we employ the growth equation, we have

$$\begin{aligned} GDP = & \beta_0 + \beta_1 Investments_{it-1} + \beta_2 Labour_{it} + \beta_3 Aid_{it} \\ & + \beta_4 CBI_{it} + \beta_5 Aid_{it} * CBI_{it} + X_{it} + \varepsilon_{it} \end{aligned} \quad (5)$$

The effect of a change in foreign aid on our growth, is given by:

$$\frac{\partial GDP_{it}}{\partial \Delta Aid_{it}} = \beta_3 + \beta_5 CBI_{it} \quad (6)$$

We test the following conditional hypotheses:

- If $\beta_3 > 0$ and $\beta_5 > 0$, foreign aid measured by health, education, agriculture, humanitarian, and economic infrastructure and services; positively impacts economic growth and CBI measured by CBI Index, personal independence, goal independence, institutional independence, financial independence, and rescaled central bank governor turnover; enhances that impact.
- If $\beta_3 > 0$ and $\beta_5 < 0$, foreign aid enhances economic growth whilst CBI dampens this impact.
- If $\beta_3 < 0$ and $\beta_5 > 0$, foreign aid harms economic growth, whilst CBI mitigates the negative effect.
- If $\beta_3 < 0$ and $\beta_5 < 0$, foreign aid negatively impacts economic growth, and this is aggravated by CBI.

3.2.2 Explanation and measurement of dependent and independent variables

We measure CBI, as the annual legal CBI index computed by Garriga (2016). This was done for 182 countries for 1970–2014. The index represents the most comprehensive data

on CBI that spans the longest period and covers the greatest number of countries, useful for conducting a panel study. Garriga (2016)'s index uses the Cukierman, Webb, and Neyapti's (CWN) criteria for calculating the level of legal CBI. It ranges between 0 and 1. The higher the index, the more independent the central bank is and vice versa. The CWN CBI index is determined as a weighted sum of 16 legal indicators placed in four categories, namely:

- 1 the central bank governor's tenure
- 2 the central bank's level of participation in policy economic policy
- 3 central bank objectives
- 4 lending to government restrictions on the central.

For the central bank governor tenure also referred to as personal independence, (*PS.CBI*), a higher index means that the governor has a relative longer tenure, and their appointment and dismissal are not entirely influenced by government. For policy formulation or instrument independence (*Ins.CBI*), a higher index means the central bank significantly participates in economic policy and is free to determine the instruments to use to achieve policy goals. Objectives or goal independence (*Goal.CBI*) captures the extent to which price stability is the sole objective of the central bank. A central bank with other objectives aside price stability such as employment, will have a lower goal independence. Restriction on central bank lending to government or financial independence (*Fin.CBI*) will mean a central bank whose charter places higher limits on its lending to or financing of government expenditure; in the form of advances, securities and their maturities; will be more independent. Overall, a central bank is legally more independent when the governor's term in office is longer; the appointment and dismissal procedures are more insulated from the government; the mandate is more focused on price stability; the formulation of monetary policy lies squarely with the central bank; and the provisions on direct central bank lending are more restrictive.

Following Balls et al. (2018), political independence is defined as the absence of the possibility of political influence over the central bank. Our measure of political independence uses component of the Grilli et al. (1991) index updated by Garriga (2016) and encompasses appointment and dismissal procedures for central bank officials, the presence of government representatives in central bank consultative or decision-making bodies, and the potential for conflicts of interest of central bank officials. We would also place goal independence as a measure of political independence. Operational independence is the ability of the central bank to select and use monetary tools with autonomy. It encompasses the central bank's ability to use the instruments of monetary policy such as the discount rate, and the inability of the central bank to finance government deficits, which is considered to protect the central bank from any influence or obligation to fund the government at the expense of the ability to control inflation. Ball et al. (2018) find only operational independence to have significance for central bank effectiveness. But can the same be said for Africa? We provide, tentative evidence that in Africa, both operational and political CBI are important.

We also measure CBI as the annual central bank governor turnover rate (TOR) which measures the frequency with which governors of central banks leave office within a period. It ranges from 0–1, with 0 signifying lowest turnover rate and therefore higher CBI and 1 signifying highest turnover rate and lower CBI. This is rescaled using the

formular $CBGTO = -1(TOR-1)$ to enable us better to interpret the interactive variables as higher values will now correspond to higher CBI and lower values corresponding to lower CBI. It is also sourced from Garriga (2016). According to the theoretical rationale for CBI, we would expect an increase in CBI to result in a decrease in economic growth.

The variables identified as control variables are motivated by Tayssir and Feryel (2017) and Chinn and Ito (2006). First is *financial development*, sourced from the World Development Indicators database, which we use as the percentage of private credit to GDP. A higher value means a more developed banking sector which promotes effective transmission of monetary policy and therefore a more successful fight against inflation. This promotes economic activities and spurs economic growth. *Political institutions* is measured as the political rights score (PR). The freedom house database is our source of this variable. It is used to measure the degree of free and fair elections, freedom of participation in the political process, and the effectiveness of government. The political rights score ranges between 1 to 7. The lower the score, the lower the level of political rights. However, this study rescales the score to range from 0 to 6; as done by Bodea and Higashijima (2017). The intent is to make lower scores now correspond to lower political rights rating and vice versa. We apply the formula $PR = -1*(PRS-7)$. PRS is the political right score from the freedom house database. Doing so would mean that a country like Ghana with a score 5 provides extensive political rights in the form elections that are free and fair; a system where elected persons are allowed to govern and where competitiveness in the political process is not inhibited with a highly effective opposition and minority groups well represented in politics and governance. Other determinants of economic growth are labour (*Labour*) measured as the total labour force aged 15 years and above; investments (*Investments*) which is measured as gross fixed capital formation (GFCF). GFCF is defined as the “acquisition of produced assets (including purchases of second-hand assets), including the production of such assets by producers for their own use, minus disposals. The relevant assets relate to assets that are intended for use in the production of other goods and services for a period of more than a year.” It is measured as GFCF at constant prices as percentage of GDP.

3.2.3 Estimation technique

This study uses the two-step system generalised method of moments (2SSGMM) estimator with Windmeijer (2005) corrected standard errors which is compared to the one step estimator, has been proven to be asymptotically more efficient. This estimator is considered fitting for this study because the data for some countries in our sample have a relatively small-time duration (Agoba et al., 2019) ranging between 7–17 years. According to Wooldridge (2002), this has the effect of permitting shocks to fixed effect over time which leads to Nickell bias. The use of a lagged dependent variable in the model will require an estimator such as the 2SSGMM. Using a fixed effects OLS regression will lead to bias in our estimates (Plümper and Troeger 2007). We also efficiently mitigate the impact of missing data, heteroscedasticity, fixed country effects and autocorrelation when we use the 2SSGMM (Roodman 2009).

A key issue with the use of 2SGMM is instrument proliferation (Roodman, 2009). Bontempi and Mammi (2015) recommend the use of a collapsed instrument matrix which produces lower instruments and higher point estimates. This also produces a more reliable Hansen Test with lower p-values. We test the validity of our instruments using the Sargan test of over-identifying restrictions. If we fail to reject the null hypothesis,

then we can be confident about our model and the variables we chose as endogenous in the model. To also be confident about how we specified our model, we conduct the Arellano–Bond test for AR(2) in first differences. We do not want the residuals from the regression in differences to be second order serially correlated. If we fail to reject the null hypothesis, then we have support for the model specification.

The study also applies the error correction two-stage least squares (EC2SLS) estimator described in Baltagi and Chang (2000) and implemented by Jacome and Vasquez (2008). We employ the lags of CBI as internal instruments which have a level of correlation with the explanatory variables which we consider sufficient. Since our equations are exactly identified, tests for overidentifying restrictions should not be conducted. An assessment of instrument validity is done using the Woolridge's over-identifying restrictions test; whose null hypothesis is that we have valid instruments. The study also conducts two tests of endogeneity, namely, Woolridge's robust score test and the robust regression exogeneity test. The null hypothesis is that we have exogenous variables in our model. In addition, we employ a five-year moving average two-stage GMM and a fixed effects estimator to check the robustness of our initial estimates. We employ robust standard errors in our estimations to deal with heteroscedasticity.

Our regression takes into consideration country and time-fixed effect. Time-invariant omitted variables (e.g., Institutional variables) could drive correlation in the cross-section analysis, that often are difficult to measure. To control for omitted variables instigated by individual time-invariant effects, the study employs country dummies. This allows for issues of omitted variables bias to be addressed. To control for period individual invariant variables like global shocks that might impact economic growth in any period but are not captured by the explanatory variables; we use period dummies. However, the impact of omitted variables with varying values over time are not accounted for by this technique. However, institutional variables such as CBI that might affect the foreign aid-economic growth relationship, tend to have little time variation.

4 Results

In Table 1, we present the descriptive statistics for the dependent and explanatory variables in our model. These are statistics for the raw values of aid, economic growth and CBI variables. The estimations however are done by finding the percentage of aid proxies to the real GDP.

4.1 *Foreign Aid and economic growth*

We present the results of our regressions examining the impact of foreign aid on economic growth in Tables 2–6. The purpose of the regressions is to examine which types of foreign aid, have the most impact on Africa's economic growth, and then based on that, inform policy decisions on which types of aid will accelerate the continent's development. Second is to examine which type of CBI enhances the impact of specific types of aid on economic growth. This would inform the focus of central bank reforms so as to make these reforms as effective as much as possible. Given the cost of policy reforms and their implementations, the findings should make it easier for policymakers to know which types of CBI should be reformed in order to achieve the most from foreign aid.

Table 1 Descriptive statistics

<i>Variable</i>	<i>Definition</i>	<i>Unit of measurement</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min</i>	<i>Max</i>
E.GROWTH	Real GDP growth	Constant US\$	1,036	2,213.432	2,538.273	208.38	12,384.56
INVEST.	Investment	% of GDP	1,036	28.453	11.654	4.279	64.867
LAB.	Labour	Total	1,036	8415432	1.02e+07	356321	6.03e+07
FIN.DEV	Private credit	% of GDP	1,036	25.321	28.457	0.731	173.348
HEALTH.AID	Health aid	Constant US\$	1,036	2.243	2.756	0.000	39.467
EDUC.AID	Education aid	Constant US\$	1,036	4.231	3.835	0.112	24.532
AGRIC.AID	Agriculture aid	Constant US\$	1,036	2.132	2.213	0.000	16.431
HUMAN.AID	Humanitarian aid	Constant US\$	1,036	4.203	9.365	0.000	91.473
EIS.AID	Economic, infrastructure and services aid	Constant US\$	1,036	3.239	5.521	-1.872	59.352
CBI	Central bank independence	CBI Index	1,036	0.5	0.121	0.1	0.8
CBGTO	Central Bank Governor turnover rate	Rescaled annualised five-year average	867	0.82	0.03	0.0	1.2
PS.CBI	Personal CBI	Index	1,036	0.641	0.20	0.08	0.88
GOAL.CBI	Goal CBI	Index	1,036	0.465	0.30	0	1
INS.CBI	Instrument CBI	Index	1,036	0.283	0.28	0	1
FIN.CBI	Financial CBI	Index	1,036	0.48	0.20	0.12	1
FIND.DEV	Private sector credit	% of GDP	1,036	19.892	19.347	19.346	0.491
POL.INST	Political institutions	Scale	1,036	2.178	1.451	0	6

Table 2 Foreign aid and economic growth in Africa: the role of CBI

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	HUM	HUM	HUM	EDU	EDU	EDU	EIS	EIS	EIS	HEALTH	HEALTH	HEALTH	AGRIC	AGRIC	AGRIC
L.GDP	0.887*** (0.011)	0.891*** (0.011)	0.864*** (0.014)	0.875*** (0.013)	0.867*** (0.018)	0.842*** (0.016)	0.854*** (0.015)	0.843*** (0.013)	0.831*** (0.015)	0.866*** (0.018)	0.872*** (0.013)	0.855*** (0.015)	0.859*** (0.018)	0.848*** (0.015)	0.835*** (0.012)
Labour	-0.275 (0.199)	-0.228** (0.062)	-0.233** (0.054)	-0.163* (0.087)	-0.187** (0.054)	-0.156** (0.048)	-0.244** (0.066)	-0.139 (0.177)	-0.231 (0.154)	-0.285** (0.058)	-0.274*** (0.013)	-0.264*** (0.011)	-0.252* (0.089)	-0.244*** (0.016)	-0.233*** (0.012)
Investment	0.544*** (0.008)	0.531*** (0.006)	0.568*** (0.004)	0.558*** (0.005)	0.562*** (0.011)	0.574*** (0.015)	0.677*** (0.013)	0.636*** (0.013)	0.688*** (0.012)	0.668*** (0.014)	0.601** (0.113)	0.613*** (0.115)	0.622*** (0.019)	0.631*** (0.015)	0.614*** (0.013)
CBI	0.211 (0.538)	0.218 (0.522)	0.212 (0.542)	0.162 (0.645)	0.168 (0.698)	0.174 (0.744)	0.178 (0.451)	0.153 (0.664)	0.165 (0.513)	0.138 (0.652)	0.142 (0.655)	0.148 (0.648)	0.148 (0.442)	0.152 (0.437)	0.119 (0.421)
Fin. dev.	0.377*** (0.014)	0.322*** (0.018)	0.304*** (0.016)	0.341*** (0.007)	0.302** (0.072)	0.302** (0.072)	0.435 (0.437)	0.444** (0.082)	0.411** (0.075)	0.456** (0.145)	0.478* (0.178)	0.453* (0.181)	0.473*** (0.017)	0.469*** (0.012)	0.442*** (0.017)
Pol. inst.	0.252*** (0.008)	0.261*** (0.008)	0.244*** (0.012)	0.224** (0.042)	0.238** (0.056)	0.229** (0.051)	0.192*** (0.015)	0.211*** (0.012)	0.226** (0.065)	0.298* (0.097)	0.344*** (0.011)	0.359*** (0.017)	0.336** (0.077)	0.342** (0.069)	0.331*** (0.011)
Aid	-0.331** (0.059)	-0.325*** (0.057)	-0.341** (0.062)	-0.345** (0.092)	-0.322** (0.092)	-0.328** (0.092)	0.446** (0.072)	0.432** (0.072)	0.444** (0.072)	-0.198*** (0.015)	-0.195*** (0.015)	-0.186*** (0.013)	-0.366*** (0.012)	-0.344*** (0.012)	-0.353*** (0.009)
AID*CBI		0.232 (0.312)			0.245 (0.192)			0.077 (0.372)			0.088 (0.115)			0.154 (0.211)	
Aid*CBI*Pol. inst.			0.532*** (0.012)			0.614*** (0.011)			0.092** (0.072)			0.393*** (0.014)			0.698*** (0.013)
Total effect of AID		-0.093 (0.081)	0.191*** (0.011)		-0.077* (0.48)	0.286*** (0.013)		0.509** (0.101)	0.536*** (0.127)		-0.107* (0.062)	0.207*** (0.017)		-0.19 (0.062)	0.345*** (0.015)
Observations	1,236	1,245	1,245	1,253	1,198	1,198	1,257	1,255	1,255	1,256	1,258	1,258	1,261	1,260	1,260
Number of index	48	46	46	48	46	46	48	46	46	48	46	46	48	46	46
AR(1)	0.021	0.022	0.024	0.023	0.021	0.026	0.024	0.033	0.052	0.038	0.031	0.029	0.026	0.021	0.024
AR(2)	0.142	0.144	0.153	0.198	0.192	0.188	0.223	0.304	0.311	0.311	0.278	0.266	0.244	0.249	0.233
Hansen (p>Chi2)	0.331	0.465	0.469	0.442	0.478	0.475	0.445	0.532	0.542	0.442	0.324	0.376	0.356	0.332	0.341

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 3 Foreign aid and economic growth in Africa: the role of personal independence

Variables	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
L.GDP	0.863*** (0.025)	0.855*** (0.041)	0.864*** (0.014)	0.877*** (0.061)	0.884*** (0.067)	0.855*** (0.016)	0.896*** (0.071)	0.866*** (0.065)	0.831*** (0.015)	0.873*** (0.036)	0.802*** (0.054)	0.834*** (0.015)	0.812*** (0.028)	0.888*** (0.022)	0.855*** (0.012)
Labour	-0.223 (0.254)	-0.119** (0.051)	-0.233*** (0.054)	-0.137* (0.098)	-0.178** (0.052)	-0.156** (0.048)	-0.225** (0.074)	-0.194 (0.112)	-0.231 (0.154)	-0.268** (0.064)	-0.264*** (0.027)	-0.264*** (0.011)	-0.247 (0.223)	-0.231*** (0.028)	-0.232*** (0.012)
Investment	0.567*** (0.012)	0.533*** (0.014)	0.568*** (0.004)	0.541*** (0.013)	0.578*** (0.018)	0.574*** (0.015)	0.613*** (0.066)	0.622*** (0.004)	0.688*** (0.012)	0.648*** (0.024)	0.579** (0.193)	0.613** (0.115)	0.588*** (0.012)	0.602*** (0.014)	0.614*** (0.013)
PS.CBI	0.303 (0.363)	0.333 (0.468)	0.512 (0.542)	0.346 (0.453)	0.353 (0.457)	0.474 (0.544)	0.344 (0.363)	0.348 (0.511)	0.465 (0.513)	0.354 (0.465)	0.361 (0.464)	0.448 (0.648)	0.345 (0.461)	0.349 (0.422)	0.419 (0.421)
Fin. dev.	0.498*** (0.011)	0.652*** (0.013)	0.304*** (0.016)	0.433*** (0.008)	0.497** (0.141)	0.302** (0.072)	0.411*** (0.015)	0.413** (0.105)	0.411** (0.075)	0.424** (0.103)	0.428*** (0.008)	0.453* (0.181)	0.465*** (0.004)	0.431*** (0.004)	0.442*** (0.017)
Pol. inst.	0.244*** (0.005)	0.258** (0.061)	0.244*** (0.012)	0.198** (0.048)	0.201** (0.066)	0.229*** (0.051)	0.177*** (0.003)	0.204** (0.052)	0.226** (0.065)	0.287** (0.058)	0.335*** (0.003)	0.359*** (0.017)	0.348*** (0.043)	0.376** (0.056)	0.331*** (0.001)
Aid	-0.288** (0.031)	-0.262** (0.034)	-0.202** (0.034)	-0.377** (0.051)	-0.384** (0.057)	-0.298** (0.062)	0.446** (0.071)	0.452** (0.025)	0.476** (0.027)	-0.273* (0.076)	-0.211** (0.042)	-0.251** (0.048)	-0.312** (0.078)	-0.328** (0.072)	-0.301** (0.075)
AID*PS.CBI		0.232 (0.312)			0.245 (0.192)			0.085 (0.372)			0.093 (0.111)			0.174 (0.211)	
Aid* PS.CBI*Pol. Inst.			0.421*** (0.008)			0.531** (0.115)			0.104** (0.032)			0.335** (0.039)			0.443** (0.016)
Total effect of AID		-0.03** (0.008)	0.219*** (0.003)		-0.139** (0.044)	0.233*** (0.005)		0.537** (0.123)	0.588** (0.106)		-0.118** (0.047)	0.084** (0.021)		-0.154** (0.043)	0.142*** (0.076)
Observations	1,201	1,284	1,203	1,121	1,205	1,289	1,257	1,255	1,255	1,202	1,120	1,258	1,201	1,120	1,260
Number of index	48	46	48	46	48	46	48	46	46	48	46	46	48	46	46
AR(1)	0.021	0.024	0.041	0.035	0.034	0.021	0.024	0.033	0.052	0.066	0.051	0.029	0.059	0.051	0.024
AR(2)	0.103	0.105	0.303	0.304	0.211	0.305	0.223	0.304	0.311	0.204	0.253	0.266	0.205	0.107	0.233
Hansen (p > Chi2)	0.154	0.153	0.174	0.126	0.384	0.378	0.445	0.532	0.542	0.257	0.227	0.376	0.258	0.144	0.341

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 4 Foreign aid and economic growth in Africa: the role of instrument independence

Variables	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)
	HUM	HUM	HUM	EDU	EDU	EDU	EIS	EIS	EIS	HEALTH	HEALTH	HEALTH	AGRIC	AGRIC	AGRIC
L.GDP	0.858*** (0.025)	0.842*** (0.021)	0.861*** (0.021)	0.877*** (0.027)	0.882*** (0.021)	0.857*** (0.025)	0.866*** (0.026)	0.795*** (0.024)	0.803*** (0.028)	0.874*** (0.022)	0.821*** (0.013)	0.805*** (0.011)	0.852*** (0.014)	0.843*** (0.018)	0.872*** (0.018)
Labour	-0.211** (0.058)	-0.108** (0.049)	-0.124** (0.046)	-0.147** (0.038)	-0.206** (0.061)	-0.178 (0.149)	-0.242** (0.058)	-0.233*** (0.017)	-0.221 (0.245)	-0.215*** (0.021)	-0.262*** (0.013)	-0.261*** (0.011)	-0.244* (0.089)	-0.247*** (0.016)	-0.241*** (0.012)
Investment	0.543*** (0.012)	0.528*** (0.014)	0.529*** (0.013)	0.574*** (0.018)	0.609*** (0.016)	0.605*** (0.004)	0.648*** (0.024)	0.579** (0.193)	0.588*** (0.012)	0.602*** (0.014)	0.605** (0.113)	0.611** (0.115)	0.621*** (0.019)	0.624*** (0.015)	0.628*** (0.013)
INS.CBI	0.308 (0.373)	0.336 (0.378)	0.347 (0.461)	0.356 (0.465)	0.349 (0.566)	0.362 (0.508)	0.358 (0.579)	0.369 (0.573)	0.348 (0.579)	0.351 (0.478)	0.341 (0.655)	0.335 (0.648)	0.367 (0.442)	0.362 (0.437)	0.387 (0.421)
Fin. dev.	0.493*** (0.001)	0.404** (0.077)	0.438*** (0.007)	0.405** (0.071)	0.432** (0.085)	0.458** (0.095)	0.433 (0.503)	0.446*** (0.008)	0.471* (0.111)	0.422* (0.122)	0.417* (0.178)	0.379* (0.181)	0.385*** (0.017)	0.326*** (0.012)	0.344*** (0.017)
Pol. inst.	0.255** (0.067)	0.279** (0.065)	0.205** (0.051)	0.198*** (0.013)	0.186** (0.048)	0.211* (0.091)	0.276** (0.042)	0.276*** (0.008)	0.164*** (0.005)	0.285*** (0.003)	0.294*** (0.011)	0.286*** (0.017)	0.301** (0.077)	0.305** (0.069)	0.311** (0.091)
Aid	-0.283*** (0.035)	-0.291** (0.038)	-0.279*** (0.059)	-0.264** (0.064)	-0.428*** (0.051)	-0.411** (0.061)	0.158*** (0.005)	0.144*** (0.005)	0.142*** (0.023)	-0.315*** (0.088)	-0.318** (0.085)	-0.324*** (0.093)	-0.328*** (0.012)	-0.335*** (0.012)	-0.329*** (0.009)
AID*INS.CBI	0.245 (0.205)	0.245 (0.205)	0.245 (0.205)	0.245 (0.205)	0.268 (0.213)	0.268 (0.213)	0.159 (0.116)	0.159 (0.116)	0.159 (0.116)	0.159 (0.116)	0.178 (0.115)	0.178 (0.115)	0.163 (0.211)	0.163 (0.211)	0.163 (0.211)
Aid*INS.CBI*Pol. Inst.															
Total effect of AID		-0.046** (0.018)	0.129** (0.039)		-0.16* (0.06)	-0.19* (0.06)	0.303** (0.076)	0.303** (0.076)	0.319*** (0.016)	0.319*** (0.016)	-0.14** (0.058)	0.042** (0.016)	-0.172*** (0.051)	-0.172*** (0.051)	0.157** (0.043)
Observations	1,201	1,284	1,203	1,121	1,205	1,289	1,202	1,120	1,201	1,120	1,204	1,211	1,211	1,213	1,215
Number of index	48	46	48	46	48	46	48	46	48	46	46	46	48	46	46
AR(1)	0.029	0.027	0.043	0.038	0.039	0.019	0.069	0.058	0.055	0.056	0.029	0.022	0.015	0.023	0.021
AR(2)	0.123	0.111	0.218	0.277	0.247	0.178	0.231	0.185	0.218	0.198	0.222	0.243	0.211	0.224	0.211
Hansen (p > Chi2)	0.154	0.158	0.166	0.129	0.364	0.381	0.272	0.136	0.262	0.151	0.278	0.301	0.314	0.231	0.308

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 5 Foreign aid and economic growth in Africa: the role of financial independence

Variables	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)
L.GDP	0.854*** (0.026)	0.863*** (0.015)	0.868*** (0.024)	0.872*** (0.028)	0.893*** (0.031)	0.868*** (0.011)	0.859*** (0.013)	0.842*** (0.016)	0.808*** (0.014)	0.804*** (0.019)	0.789*** (0.013)	0.781*** (0.015)	0.831*** (0.018)	0.842*** (0.015)	0.838*** (0.012)
Labour	-0.204 (0.222)	-0.176** (0.049)	-0.143* (0.099)	-0.148** (0.042)	-0.226** (0.061)	-0.218* (0.087)	-0.219** (0.045)	-0.255*** (0.011)	-0.248 (0.442)	-0.241*** (0.017)	-0.213*** (0.013)	-0.218*** (0.011)	-0.223* (0.089)	-0.237*** (0.016)	-0.235*** (0.012)
Investment	0.566*** (0.016)	0.539*** (0.017)	0.542*** (0.016)	0.554*** (0.015)	0.578*** (0.012)	0.608*** (0.005)	0.619*** (0.015)	0.617** (0.098)	0.613*** (0.015)	0.624*** (0.011)	0.611** (0.113)	0.615*** (0.115)	0.605*** (0.019)	0.608*** (0.015)	0.612*** (0.013)
FN.CBI	0.327 (0.365)	0.356 (0.361)	0.362 (0.372)	0.368 (0.477)	0.371 (0.468)	0.379 (0.411)	0.382 (0.474)	0.386 (0.577)	0.367 (0.561)	0.372 (0.575)	0.388 (0.655)	0.374 (0.648)	0.412 (0.442)	0.416 (0.437)	0.425 (0.421)
Fin. Dev.	0.499*** (0.017)	0.512** (0.106)	0.418*** (0.011)	0.433** (0.065)	0.424** (0.088)	0.429*** (0.085)	0.431 (0.555)	0.447*** (0.014)	0.466* (0.122)	0.473* (0.119)	0.465* (0.178)	0.458* (0.181)	0.453*** (0.017)	0.475*** (0.012)	0.472*** (0.017)
Pol. Inst.	0.252** (0.057)	0.301*** (0.008)	0.234*** (0.001)	0.222** (0.064)	0.217** (0.041)	0.246*** (0.075)	0.251** (0.064)	0.277*** (0.011)	0.289*** (0.008)	0.303** (0.076)	0.312*** (0.011)	0.318*** (0.017)	0.327** (0.087)	0.323* (0.099)	0.332*** (0.101)
Aid	-0.283** (0.035)	-0.191** (0.038)	-0.279** (0.059)	-0.394** (0.064)	-0.428** (0.051)	-0.411** (0.061)	0.158** (0.055)	0.144** (0.058)	0.168** (0.063)	-0.315*** (0.028)	-0.298*** (0.015)	-0.231*** (0.013)	-0.315*** (0.012)	-0.327*** (0.012)	-0.331*** (0.009)
AID*FN.CBI															
Aid* FN.CBI*Pol. Inst.			0.424** (0.081)			0.617** (0.098)			0.196** (0.065)			0.278** (0.064)			0.494** (0.098)
Total effect of AID		0.061 (0.179)	0.145** (0.035)		-0.163* (0.073)	0.206** (0.039)		0.306** (0.045)	0.364** (0.067)		-0.114** (0.052)	0.047*** (0.003)		-0.15* (0.065)	0.163** (0.045)
Observations	1,201	1,284	1,203	1,121	1,205	1,289	1,202	1,120	1,201	1,120	1,124	1,205	1,262	1,245	1,216
Number of Index	48	46	48	46	48	46	48	46	48	46	46	46	48	46	46
AR(1)	0.028	0.026	0.045	0.037	0.034	0.022	0.032	0.038	0.039	0.032	0.034	0.024	0.021	0.019	0.024
AR(2)	0.118	0.122	0.312	0.309	0.222	0.313	0.214	0.298	0.221	0.125	0.217	0.242	0.208	0.223	0.275
Hansen (p>Chi2)	0.174	0.168	0.179	0.128	0.345	0.366	0.262	0.366	0.346	0.146	0.305	0.321	0.342	0.309	0.349

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 6 Foreign aid and economic

Variables	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)
	HUM	HUM	HUM	EDU	EDU	EDU	EIS	EIS	EIS	HEALTH	HEALTH	HEALTH	AGRIC	AGRIC	AGRIC
L.GDP	0.872*** (0.028)	0.865*** (0.011)	0.869*** (0.028)	0.874*** (0.023)	0.890*** (0.028)	0.861*** (0.015)	0.854*** (0.017)	0.801*** (0.013)	0.778*** (0.016)	0.794*** (0.014)	0.843*** (0.011)	0.841*** (0.016)	0.835*** (0.014)	0.839*** (0.011)	0.842*** (0.009)
Labour	-0.198 (0.115)	-0.102** (0.053)	-0.131* (0.072)	-0.153** (0.038)	-0.215** (0.074)	-0.204* (0.098)	-0.211** (0.044)	-0.242*** (0.005)	-0.244 (0.308)	-0.238*** (0.016)	-0.226*** (0.019)	-0.233*** (0.015)	-0.236* (0.088)	-0.242* (0.095)	-0.253 (0.776)
Investment	0.574*** (0.015)	0.528*** (0.014)	0.534*** (0.011)	0.542*** (0.012)	0.577*** (0.008)	0.611*** (0.004)	0.622*** (0.024)	0.603** (0.193)	0.610*** (0.012)	0.615*** (0.014)	0.617*** (0.009)	0.614*** (0.006)	0.618*** (0.013)	0.623*** (0.013)	0.636*** (0.013)
GOAL.CBI	0.235 (0.262)	0.241 (0.267)	0.252 (0.361)	0.264 (0.353)	0.258 (0.253)	0.271 (0.309)	0.277 (0.358)	0.284 (0.342)	0.263 (0.279)	0.272 (0.305)	0.289 (0.443)	0.321 (1.434)	0.401 (0.743)	0.407 (0.431)	0.411 (0.489)
Fin. dev.	0.402*** (0.005)	0.406*** (0.098)	0.412*** (0.014)	0.427** (0.078)	0.418** (0.079)	0.422** (0.087)	0.428 (0.576)	0.436*** (0.012)	0.450* (0.109)	0.444* (0.116)	0.435** (0.096)	0.432* (0.102)	0.447* (0.106)	0.461** (0.102)	0.468** (0.078)
Pol. Inst.	0.248*** (0.001)	0.255*** (0.007)	0.211*** (0.009)	0.208*** (0.012)	0.192** (0.008)	0.198*** (0.009)	0.262** (0.004)	0.269* (0.005)	0.195*** (0.008)	0.204*** (0.002)	0.353*** (0.011)	0.356*** (0.017)	0.359** (0.087)	0.363** (0.099)	0.358*** (0.101)
Aid	-0.283** (0.052)	-0.291** (0.057)	-0.288** (0.059)	-0.264** (0.064)	-0.228*** (0.051)	-0.215** (0.061)	0.143** (0.063)	0.142** (0.067)	0.167** (0.063)	-0.315*** (0.028)	-0.246* (0.096)	-0.232* (0.087)	-0.302** (0.071)	-0.306 (0.443)	-0.275** (0.068)
AID*GOAL.CBI		0.185 (0.211)			0.209 (0.323)			0.165 (1.013)			0.188 (0.115)			0.243 (0.211)	
Aid*			0.305** (0.042)			0.286** (0.055)			0.172** (0.062)			0.255** (0.073)			0.324*** (0.013)
GOAL.CBI*Pol. Inst.															
Total effect of AID		-0.106** (0.042)	0.017** (0.006)		-0.019** (0.008)	0.071** (0.044)		0.307** (0.074)	0.339** (0.044)		-0.058* (0.521)	0.023* (0.012)		-0.063 (0.211)	0.049** (0.016)
Observations	1,201	1,284	1,203	1,121	1,205	1,289	1,202	1,120	1,201	1,120	1,124	1,205	1,262	1,245	1,216
Number of index	48	46	48	46	48	46	48	46	48	46	46	46	48	46	46
AR(1)	0.022	0.024	0.043	0.045	0.035	0.021	0.067	0.058	0.072	0.044	0.022	0.024	0.022	0.022	0.026
AR(2)	0.103	0.107	0.308	0.301	0.212	0.306	0.214	0.157	0.211	0.118	0.121	0.204	0.206	0.233	0.241
Hansen (p>Chi2)	0.159	0.156	0.178	0.126	0.383	0.344	0.257	0.343	0.248	0.149	0.146	0.229	0.287	0.298	0.276

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 7 Foreign aid and economic growth in Africa: the role of CBI

Variables	2SLS (5 Year Averages)		Fixed effects		2SLS (5 Year averages)		CBI turnover rate		Fixed effects	
	INS, CBI									
	(51)	(52)	(53)	(54)	(55)	(56)	(57)	(58)	(59)	(60)
L.GDP	0.877*** (0.028)	0.865*** (0.025)			0.895*** (0.029)	0.888*** (0.008)				
Labour	-0.258 (0.315)	-0.244*** (0.054)	-0.348* (0.101)	-0.353** (0.076)	-0.261*** (0.065)	-0.224* (0.092)	-0.304** (0.053)	-0.312*** (0.005)		
Investment	0.533*** (0.008)	0.521*** (0.009)	0.538*** (0.011)	0.542*** (0.011)	0.537 (1.342)	0.544** (0.084)	0.529 (1.231)	0.537** (0.086)		
INS.CBI	0.353 (0.451)	0.368 (0.458)	0.389 (0.361)	0.411 (0.397)						
CBGTO					0.388** (0.072)	0.424*** (0.013)	0.392** (0.081)	0.413** (0.092)		
Fin. dev.	0.455*** (0.013)	0.442** (0.094)	0.418*** (0.016)	0.375** (0.074)	0.441** (0.096)	0.437** (0.088)	0.438 (0.978)	0.449*** (0.015)		
Pol. Inst.	0.254** (0.058)	0.307** (0.048)	0.237** (0.053)	0.228** (0.044)	0.222** (0.056)	0.249* (0.097)	0.234** (0.062)	0.244** (0.015)		
EIS.Aid	0.265*** (0.055)	0.201** (0.057)								
EIS* INS.CBI*Pol.Inst.		0.318*** (0.008)								
EIS.Aid			0.265** (0.061)	0.253** (0.065)						
EIS. Aid* INS.CBI*Pol.Inst.				0.332*** (0.016)						
EIS. aid					0.387*** (0.013)	0.376** (0.069)				

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 7 Foreign aid and economic growth in Africa: the role of CBI (continued)

Variables	2SLS (5 Year Averages)		INS CBI		Fixed effects		2SLS (5 Year averages)		CBI turnover rate		Fixed effects	
	(51)	(52)	(53)	(54)	GDP	GDP	(55)	(56)	GDP	GDP	(57)	(58)
	GDP	GDP	GDP	GDP			GDP					GDP
EIS.Aid* CBGTO								0.308*** (0.016)				
EIS.Aid										0.241*** (0.011)		0.233*** (0.007)
EIS.Aid* CBGTO												0.303*** (0.006)
Total effect of AID		0.519*** (0.008)							0.684*** (0.004)			0.536*** (0.005)
Observations	208	208		1,088			208	208		1,088		1,088
Number of index	48	46		46			48	46		48		46
R2				0.478						0.462		0.485
Wald Chi2	46.31***	46.58***					45.42***	45.42***				
Woolridge's OIR	0.525	0.525					0.538	0.538				
p-value	(0.486)	(0.492)					(0.444)	(0.444)				
Woolridge Rob.	8.543**	8.578**					8.765**	8.356**				
Robust regression	5.667**	5.685**					5.489**	5.476**				

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 8 foreign aid, CBI and economic growth in Africa: role of political institutions

Variables	<i>Weak institutions</i>	<i>Strong institutions</i>
	<i>(Pol. inst. < 0.465)</i>	<i>(Pol. inst. > 0.465)</i>
	<i>(59)</i>	<i>(60)</i>
	<i>GDP</i>	<i>GDP</i>
L.GDP	0.862*** (0.026)	0.874*** (0.018)
Labour	0.076* (0.041)	0.098** (0.023)
Investment	0.548** (0.142)	0.673*** (0.164)
CBI	0.344 (0.244)	0.445** (0.187)
Fin. dev.	0.248* (0.098)	0.424*** (0.015)
Health. aid	-0.173* (0.076)	-0.065** (0.042)
Health aid * CBI	0.093 (0.111)	0.214** (0.052)
Total effect of AID	-0.08 (0.088)	0.149** (0.035)
Observations	512	689
Number of index	20	28
AR(1)	0.021	0.022
AR(2)	0.227	0.213
Hansen ($p > \chi^2$)	0.193	0.177

It is evident from the results in Table 2–6 that, aside economic, infrastructure and services aid, other forms of foreign aid, do not directly promote economic growth in Africa. As can be seen from models (1)–(49), all other types of foreign aid have significant and negative impact on economic growth. For example, a 1% increase in humanitarian aid led to a 33.1% decrease in economic growth (model 1) while, a 1% increase in educational aid led to a 34.5% decrease in economic growth (model 4). A 1% increase in health aid led to a 19.8% decrease in economic growth (model 10) but a 1% increase in economic, infrastructure and services aid led to a 44.6% increase in economic growth (model 7). Finally, a 1% increase in Agric aid led to a 36.6% decrease in economic growth (model 13). These agree with the findings of Gong and Zou (2001), Mallik (2008), Hossain and Mitra (2013) and Mitra et al. (2015). The explanation offered in literature for this negative impact is that foreign aid reduces the accumulation of capital and labour supply. This is because, it increases leisure time for citizens and minimises productivity which has a negative impact on economic output and growth (Liew et al., 2012). Another reason for this negative impact is the appreciation in exchange rate, which has a negative impact on balance of payments. This results in

higher risk with more expensive exports, leading to deficits in these economies. The other argument could be that because countries in our sample have shorter time periods for the data, the regression only captures the impact of aid on economic growth in the short run. And this is attested to by Mitra et al. (2015) who concluded that foreign aid had a negative impact on economic growth in the short run.

The main argument that we seek to make here however, is the impact of foreign aid on inflation and its subsequent negative impact on economic growth. It is observed that though other foreign aid has no direct positive impact on economic growth, economic, infrastructure and service aid (*EIS.Aid*) has a positive impact (Table 1–6). The increase in the net foreign assets of central banks because of the receipt of foreign aid, could lead to higher money supply and government spending attributable to higher aggregate demand. This increase in aggregate demand gives rise to an increase in prices. This is however dependent on whether the aid received is spent on tradable or non-tradable goods and services. Tradable goods and services include imports and domestically produced import substitutes, and their prices are determined in world markets. On the other hand, non-tradable consist of domestically produced and consumed goods and services, and their price is determined by the changes in domestic supply and demand. If the foreign aid is spent only on imports, it will have no direct impact on the money supply or aggregate demand in the economy because the balance of payment will show both a capital account and an offsetting current account deficit. It is from this that we can explain the negative impact of health, educational, humanitarian and agric. aid on economic growth as these usually result in increase in incomes of medical personnel, teachers, trained students, farmers and labour in general as the aid is spent on domestically produced goods and services; thereby increasing money supply and aggregate demand. With limited production capacity, prices of domestic goods and services go up. The increase in cost of goods and services would always outweigh increase in wages, which eventually leads to a recession due to high cost of living.

However, for economic infrastructure and service aid, we argue that aside monies paid to labour who would work on these projects, many of the equipment and building materials for the projects are imported and their prices determined on the global market; making this aid mostly spent on tradable goods, which have no significant impact on money supply, and thus little source of worry for inflation. Moreover, the increased demand for tradable goods can be satisfied directly by imports, without changing the structure of domestic production.

4.2 *CBI and economic growth*

When we focus on the impact of CBI on economic growth, it is evident that our CBI index and the component indices namely personal independence, instrument independence, goal independence and financial independence, have no direct significant impact on economic growth. This is not new as past findings have confirmed that the CBI index does not reflect actual independence of central banks in Africa and other developing countries. This is mainly due to the fact that most CBI laws are not necessarily implemented except in countries with elevated levels of political institutional quality.

Table 9 Foreign aid, CBI, monetary integration and economic growth in Africa

Variables	CFA ZONE						NON-CFA ZONE (2SGMM)					
	All CFA Countries (2SGMM)			W.AEMU (fixed effects)			CAEMC (2SLS)					
	(61)	GDP	(62)	(63)	GDP	(64)	(65)	GDP	(66)	(67)	GDP	(68)
L.GDP	0.862*** (0.028)		0.859*** (0.025)				0.871*** (0.029)		0.864*** (0.008)	0.832*** (0.028)		0.848*** (0.025)
Labour	-0.165* (0.087)		-0.172 (0.113)	-0.157 (0.238)		-0.162 (0.335)	-0.165 (0.443)		-0.178 (0.398)	-0.184 (0.176)		-0.182* (0.092)
Investment	0.443*** (0.011)		0.413*** (0.012)	0.428*** (0.014)	0.432*** (0.013)		0.427** (0.097)		0.421** (0.094)	0.442*** (0.086)		0.429*** (0.086)
FIN.CBI	0.208 (0.452)		0.214 (0.452)	0.194 (0.456)	0.197 (0.458)		0.225 (0.462)		0.231 (0.462)	0.472 (0.407)		0.458 (0.407)
Fin.Dev.	0.312*** (0.008)		0.318*** (0.009)	0.254*** (0.011)	0.289*** (0.059)		0.219** (0.062)		0.221** (0.078)	0.285 (1.342)		0.291* (0.086)
Pol.Inst.	0.195* (0.091)		0.199 (2.112)	0.192* (0.088)	0.201 (0.325)		0.182* (0.096)		0.225 (0.443)	0.205** (0.062)		0.238*** (0.015)
Health.Aid	-0.306* (0.043)		-0.311* (0.042)	-0.298** (0.054)	-0.313** (0.057)		-0.295* (0.091)		-0.304** (0.046)	-0.178** (0.042)		-0.192** (0.053)
Health.Aid* FIN.CBI*Pol.Inst.			0.421** (0.053)		0.432** (0.052)				0.442** (0.061)			0.453*** (0.008)
Total effect of AID			0.11*** (0.008)		0.119** (0.046)				0.138** (0.054)			0.261*** (0.005)

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 9 Foreign aid, CBI, monetary integration and economic growth in Africa (continued)

Variables	CFA Zone						Non-CFA Zone (2SGMM)	
	All CFA countries (2SGMM)		W.AEMU (fixed effects)		CAEMC (2SLS)			
	(61)	(62)	(63)	(64)	(65)	(66)	(67)	(68)
Observations	408	408	238	238	1,205	1,289	1,202	1,120
Number of index	14	14	7	7	48	46	48	46
R2			0.512	0.536				
AR(1)	0.021	0.022					0.025	0.027
AR(2)	0.227	0.213					0.201	0.216
Hansen (p > Chi2)	0.193	0.177					0.331	0.342
Wald Chi2					48.43**	47.35***		
Woolridge's OIR					0.563	0.548		
p-value					(0.352)	(0.386)		
Woolridge Rob.					8.243**	8.443**		
Robust regression					5.562**	5.481**		

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

4.3 *Impact of CBI on aid-economic growth nexus: the political economy factor*

We further examine the impact CBI, and its component indices have on the effect of different forms of aid on economic growth in Africa. We have argued that the impact of CBI on aid effectiveness may vary depending on the on the type of aid. From Table 2–6, where we use the composite CBI index as a proxy for CBI as well as its sub-components, the interactive term between aid and CBI are positive but not significant. This would mean that CBI has the potential to mitigate the negative impact of all forms of aid on economic growth in Africa, if effective. The effectiveness of CBI is measured in the respect for the CBI provisions. This is present in an environment where political institutions are strong. We proceed to interact the three terms, CBI, Aid and Political institutions to examine the effect of political institutional quality on the effectiveness of CBI on foreign aid's impact on economic growth. Doing these results now in a significant and positive impact of aid on economic growth from Table 2–6. This means that when CBI provisions are respected, then we have a more effective central bank committed to ensuring price stability and therefore a more stable economic environment is provided to ensure the effective use of foreign aid.

First, since inflation reduces the value of money balances, resulting in lower real balances being held in the economy, an independent central bank that ensures price stability should lead to the preservation of the real value of foreign aid received. This would translate into more productive use of aid in terms of paying for more labour, capital and technology, leading to higher economic growth. In addition, having an independent central bank would mean the threat of foreign aid to inflation is curtailed to a significant extent, thereby mitigating the negative impact of aid on economic growth through inflation.

Secondly, with regards to the argument that inflows of aid allow governments and politicians to spend aid on popular, as opposed to productive purposes, having an independent central bank acts as check on governments' fiscal behaviour with central banks being able to use monetary policy to counter government's fiscal misdemeanours through interest rate hikes and restrictions on government funding should money be needed by governments to spend on critical aspects of the economy after they have misused donor funds. When governments know, they cannot run to the central bank for financing beyond the legal required limits, aid would be used judiciously for productive purposes to spur economic growth.

Thirdly, CBI has been known to improve financial development through effective supervision and regulation of financial institutions, preservation of bank balances and reduction in cost of loans through stability in interest rates. By being able to transfer funds from the surplus units to deficit units (Appiah-Otoo and Song, 2020), financial development facilitates savings and investment, thereby advancing economic growth (Appiah-Otoo and Song, 2020). Financial intermediaries also bring borrowers and lenders together and reduce the problem of risks associated with the transfer of funds (Ang, 2008). Thus, the financial system reduces transactions cost and information asymmetry problems (Ang, 2008). Financial intermediaries also provide monitoring and corporate governance leading to economic growth (Botev et al., 2019). This implies that countries with a developed financial system which is as a result of having an independent central bank, will successfully allocate aid inflows to firms and households. With an improved financial sector, aid should be translated into more productive sectors of the economy.

Finally, independent central banks signal the broad quality of institutions in an economy. Strong institutions have been established to have impact on economic growth through political stability which ensures a productive environment for economic activities to take place. So, with an independent central bank, aside macroeconomic stability, political stability is ensured to enhance the effective and corrupt-free usage of aid to be channelled into productive sectors of the economy to spur economic growth.

The CBI aspect with the most effective impact on aid effectiveness is financial independence as seen in Table 5. This is because on average, it gives us the highest total effect of aid on economic growth compared to other forms of CBI. For example, it is in Table 6 that the total effect if aid on economic growth is the highest at 16.3% when Agric. aid increases by 1%. (Model 45). Same can be said for Economic, infrastructure and services aid, whose total effect is highest when interacted with financial independence and political institutions in Table 6. This means that ensuring financial independence of central banks would be most potent in enhancing the impact of any form of aid on economic growth in Africa. The rampant financing of government expenditure does significantly fuel inflation and erodes the real value of any form of foreign aid. However, given financial independence, governments would put aid to the most productive use, knowing they cannot rely on the central bank when they waste these resources.

We split our sample into two in Table 8 and run separate regressions for weak institutions versus strong institutions and the results are confirmed; that strong political institutions are necessary to have aid effective.

Overall, we can conclude that operational independence of African central banks expressed in financial independence, is particularly important to enhancing the effectiveness of aid in Africa countries.

4.4 Robustness checks

In Table 7, we test the results from our 2SGMM with two variables representing political independence and operational independence. We proxy political independence with the rescaled Central Bank Governor Turnover Rate (GBGTO) and operational independence with instrument CBI (INS.CBI). We also used Two stage least square instrumental variable approach and fixed effects to estimate the model to examine the impact of aid and CBI on economic growth and the impact of CBI of aid effectiveness. The results basically confirm the findings from the GMM estimation as both operational and political independence have a significant positive impact on economic growth. Using EIS. Aid as proxy for foreign aid, we also observe that it has a positive impact on economic growth and in the presence of higher levels of CBI and political institutions, its impact is enhanced on economic growth (model 51–54). In model 55–58, when we proxy aid with economic, infrastructure and services aid (*EIS.AID*), it has a positive impact on economic growth, and this is enhanced when interacted with political CBI (CBGTO). The net effect is an overall positive impact of aid on economic growth. The political independence has been known to reflect or measure the real level of CBI in Africa.

4.5 Aid, CBI, and economic growth: exchange rate regime differences

According to an IMF report on Monetary policy in Africa, Central banks (CBs) in sub-Saharan Africa (SSA) have made great progress over the past two decades in

stabilising inflation, to single digits on average, in the context of greater CBI, support from fiscal-based stabilisation efforts, and more sustained and stable growth. They have done so by relying on monetary policy arrangements centred, at least de jure, on money targets, often with some form of a de facto exchange rate peg.

In about half of SSA countries, a hard peg provides a nominal anchor. In those countries that are the main focus of this study however, the exchange rate is now at least partly flexible. Especially in these countries, policymakers are beginning to ask more of monetary policy than the achievement of some basic degree of stabilisation, and existing regimes have lacked clear and effective policy frameworks. This has affected central banks' ability to steer financial conditions, respond appropriately to shocks, and avoid policy misalignments. Fully aware of these limitations, many central banks are therefore in the process of modernising their monetary policy frameworks.

We contend that given that monetary policy effectiveness is lower in fixed exchange rate regimes than in floating exchange rate regimes, the impact of CBI on aid effectiveness will be higher in floating exchange rate regimes than fixed exchange rate regimes.

Several types of exchange rate regimes have been applied across countries and have different effects on the CBI–economic growth issue. For example, based on the theory of opportunistic political business cycles, governments employ expansionary economic policies before elections. This occurs in several ways based on the type of exchange rate regime and level of CBI. Under a fixed exchange rate regime, before the election, an expansionary policy is undertaken through tax reductions and/or public expenditure increases. However, under a flexible exchange rate regime, the expansionary policy is applied through interest rate reductions and/or money supply increases. Therefore, our objective is to empirically distinguish among the effects of different exchange rate regimes in explaining the Aid CBI–Economic growth relationship.

To this end, we estimate the model for CFA (Communauté Financière Africaine) franc zone, which comprises a group of countries in Central and West Africa whose currencies have been linked to the French franc, and non-CFA zone countries. Indeed, as pointed out by Bleaney and Fielding (2002), the CFA Franc Zone has a special exchange rate regime as it combines two hard peg regimes (monetary union and the pegging of its common currency to the French Franc). These regimes are generally expected to affect economic performance in the same way, the only difference being that monetary union implies greater political commitment and credibility than a peg. The estimation is further done for the West African Economic and Monetary Union (WAEMU) – Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, and Togo, and the Central African Economic and Monetary Community (CAEMC), established in March 1994, whose members are Cameroon, the Central African Republic, Chad, the Republic of Congo, Equatorial Guinea and Gabon, all groupings are under the CFA Zone.

It is evident from the results in the Table 9 models 61–66, that though CBI has no significant direct positive impact on economic growth in the CFA Zone, the magnitude of this impact is on average lower than the impact it has in the non-CFA Zones as shown in models 67–68. However, foreign aid (i.e., *Health.Aid*) has a stronger impact in the CFA Zones, than in non-CFA Zones. This should be due to the relatively lower inflation and stronger exchange rate stability in CFA Zones, which preserves the value of the aid received and therefore results in higher productivity; thereby leading to higher impact on economic growth. Thirdly, the impact of CBI on aid effectiveness is higher in non-CFA zones (0.453 in model 68) than in CFA zones. This is due to the enhanced monetary

policy transmission mechanism in non-CFA zones, which results in more effective impact of independent central bank monetary policy decisions and therefore a higher effect on the impact of aid on economic growth.

5 Conclusions

The study set out to explore the impact of various dimensions of foreign aid and CBI on economic growth in Africa, using the most widespread and current data on CBI and foreign aid. We also intended to explore the impact of various forms of CBI, broadly categorised as political and operational independence on the aid-economic growth nexus. This was to enable us better to understand which types of aid and central bank reforms will be most beneficial for Africa in terms of economic growth enhancement. The study's findings, highlight the importance of respect for CBI provisions in enhancing the impact of aid on economic growth in Africa with financial independence being the most effective form of CBI that enhances impact of aid on economic growth. Aside economic, infrastructure and services aid, which had a direct positive impact on economic growth, other forms of aid had a direct negative impact on economic growth and needed a stable macroeconomic environment propelled by an independent central bank, to have a positive impact on economic growth. Furthermore, both political and operational independence are important for economic growth; however, central banks solely focused on price stability, may not be able to achieve that as their policies can impede productivity. Finally, foreign aid has a stronger impact in fixed exchange regimes due to their relatively lower levels of inflation and stronger exchange rate stability. However, we find that CBI impacts economic growth more in the non-CFA Zone, thus reflecting the role of flexible exchange regimes in improving CBI effectiveness.

Data availability statement

The data that support the findings of this study are openly available in:

- 1 World Bank (2017). The World Development Indicators, at <https://datacatalog.worldbank.org/dataset/world-development-indicators>
- 2 Freedom House (2017). Freedom in the World, at <https://freedomhouse.org/report-types/freedom-world>
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