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# Article

# Determinants of economic growth in East African countries: A dynamic panel model approach

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# **DEVELOPMENT ECONOMICS | RESEARCH ARTICLE**

# Determinants of economic growth in East African countries: A dynamic panel model approach

Muuz Hadush<sup>1</sup>\*, Kidanemariam Gebregziabher<sup>1</sup> and Sisay Biruk<sup>1</sup>

Abstract: The purpose of this study is to analyze the determinant of economic growth in the region of East African countries from 2002 to 2018. In order to investigate empirically the key determinants of economic growth in East African countries, this study used a dynamic panel model. To improve efficiency, Generalized Moments Method (GMM) estimators are used. Based on panel data from the East African countries during the 2002-2018 period, this study, therefore, estimated the determinants of economic growth in the region. The result suggests that government expense, government revenue, volume of imports and exports of goods and services significantly contribute to the economic growth of the countries. However, the consumer price index, current account balance, gross government debt, and foreign direct investment lead to negative economic growth. The paper has three policy implications; first, promoting open trade and ensuring peace and stability in the region is a paramount policy to enhance the economic growth of the region. East African Countries should move forward in creating stability regionally and internally within the countries. Second, countries in East Africa are recommended to strengthen and sustain their policies on government expenses, government revenue and revise their policies on government debt, inflation and current account balance. Major reforms are required in foreign direct investment and general government debt within the region. Third, to address obstacles in trade, climate change and the tax collection system, political and economic integration is fundamental to the region and to making the region competitive in the international trade arena.

Subjects: Economics; Finance; Business, Management and Accounting

Keywords: determinants; economic growt; gross domestic product; dynamic mode; East African countries; generalized moments methods

# 1. Introduction

Economic growth can simply be defined as a rise in GDP or GDP per capita. Economic development is a broad concept encompassing economic growth and other developmental dimensions; it can be defined as "a multidimensional process involving major changes in social structure, popular attitudes, and national institutions, as well as the acceleration of economic growth, the reduction of inequality, and the eradication of poverty (Hagerdal, 2013). Economic indicators portray the big picture of a country in regard to the economy. A single indicator or small set of indicators attempts to give you an idea of the overall economic health of a particular geography (The World Bank, 2003).





© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent. Macroeconomic theory has a lot to say about economic growth. The most renowned economic growth model, popularly known as the Solow Model, postulates that economic growth is attributed to advancement in physical capital and not the stock of capital or labor (Rommer, 1990). Other mainstream economic growth theories also conclude that economic growth is enhanced by technological progress. For example, The Ramsey Model argues that capital accumulation embodies technological progress and hence enhances economic growth-a conclusion which contradicts the Solow model (Akanbi & Du Toit, 2011). The so-called Endogenous growth theories, such as Barro's and Lucas' models, conclude that economic growth is generated by human capital accumulation, physical capital accumulation and government action among others.

Economic growth is the most pressing agenda of African countries. Africa is the world's poorest continent (Basu et al., 2005). East African countries have the challenge of raising their economic growth and to cope up with the rapid population growth (Taş et al., 2013). A number of studies have stated that, the economic and social situation in sub-Saharan Africa (SSA) remains fragile and vulnerable to domestic and external shocks. Investment remains passive, limiting efforts to diversify economic structures and boost growth (Nkurunziza & Bates, 2003). Furthermore, a number of countries have only recently emerged from civil wars that have severely set back their development efforts, while in other parts of the continent, new armed conflicts have erupted. These conflicts and other adverse factors, including notably poor weather conditions and deterioration in the terms of trade, have led to a loss of economic momentum in the region over the last three decades (Basu et al., 1999).

SSA countries, therefore, face major challenges in raising economic growth and reducing poverty. Economic growth rates are still not high enough to make a real dent in the pervasive poverty and enable these countries to catch up with other developed nations (Nkurunziza & Bates, 2003). Nkurunziza and Bates (2003) noted that economic growth rates are still not sufficient to make a real dent in pervasive poverty and enable developing countries to catch up with other developed nations. Furthermore, Mallick and Kummar (2002) specifically noted that investment has been one of the slowest growing, a symptom of a pending crisis.

According to the studies conducted in SSA countries by Ndambiri et al. (2012) and Liew et al. (2012), macroeconomic variables like government expenditure, general government debt, and nominal discount rate significantly lead to negative economic growth in the nations. Another empirical study conducted by Lensink and Morrissey (2006), examined the link between foreign direct investment and economic growth and provided consistent findings confirming a significant positive link between the two variables. However, to achieve and maintain such a high growth rate, policy makers need to understand the determinants of economic growth (Mallick, 2008). Therefore, the first fact that motivates this study is to understand the volatile economic growth of East African countries. It is a plausible argument that rigorous studies regarding the determinants of economic growth of the region are scarce and the existing results are inconclusive. Therefore, it is crucial to put an empirical investigation in order to ascertain which factors determine the economic growth of a given region beyond existing theories.

Our analysis is organized around three questions: First, what are the main economic growth determinants in East African countries? Second, which variable, among the given variables, has a positive and significant effect on economic growth? And thirdly, which variable, among the given variables, affects economic growth rate negatively and significantly? This paper aims at investigating the major macroeconomic determinants of economic growth and scrutinizing the relationship between economic growth and other key macroeconomic variables in East African nations. For this, the paper applied static and dynamic panel data models so as to examine the effects of independent macro-economic variables on gross domestic product (GDP) for the period of 2002–2018 over 17 East African countries. Our descriptive and empirical analysis provided possible insights on how each macroeconomic variable ensures sustainable and healthy economic growth in the region.

Our findings revealed that government expenditure, government revenue, volume of imports of goods and services, and volume of exports of goods and services significantly and positively affect the economic growth of East African countries. We also found that current account balance (CAB) and consumer price index (CPI) determinants are driving down economic growth in the region. Another key finding is that foreign direct investment (FDI) and general government debt are empirically deteriorating the economic growth of the countries, which is a reflection of weak policies and institutions. The overall picture is that enhancing involvement in international trade and increasing government spending and revenue should be encouraged.

The paper has three policy implications: first, promoting open trade and ensuring peace and stability in the region is a paramount policy to enhance the economic growth of the region. East African Countries should move forward in creating stability regionally and internally within the countries. Second, countries in East Africa are recommended to strengthen and sustain their policies on government expenses, government revenue, and revise their policies on government debt, inflation and current account balance. Major reforms are required in foreign direct investment and general government debt within the region. Third, to address obstacles in trade, climate change and the tax collection system, political and economic integration is fundamental to the region and to making the region competitive in the international trade arena.

The paper also makes significant contributions to the existing literature by showing how the major economic determinants can be used to forecast and achieve long-term sustainable real per capita GDP growth rates, which will help curb the problems of unemployment, poverty and uncertainty for investors. Unlike previous studies, we collected information on the heterogeneous countries and a period of nearly two decades, from 2002 until 2018, in order to capture a major economic downturn and the latest development of African economic growth. Furthermore, unlike the previous studies, we use both the Arellano and Bond (1991) difference GMM estimator and Blundell and Bond (1998) System GMM estimation Approach so as to have a robust inference. Likewise, the study is expected to add to the body of existing knowledge from related and similar studies in the African Context. This paper joins the relatively scarce, empirical literature on this topic in East Africa, one that is dominated by European Asian cases.

# 2. Literature review

# 2.1. Theoretical review

Economic growth has always received overwhelming interest. Many scholars and researchers have investigated the determinants of economic growth in many countries and various theories of economic growth have been developed (Djordjevic, 2019). Arthur Lewis laid down the basics in "The Theory of Economic Growth", which remains as rich and relevant now as at its publication in 1955. In the 1960s, two notable scholars focused on related aspects of the age-old questions: Myrdal (1968) offered a rather glooming on poverty in his book entitled "An Inquiry into the Poverty of Nations."

In the modern era, the earliest answer to the question of what determines growth was pioneered by Smith (1776). Solow (1970) and Swan (1956) provided a mathematical understanding of growth with a theoretical framework that still serves as the foundation for discussions of growth. The field has become crowded and the approaches are more creative. Scholars asked, "If You Are So Smart, Why Aren't You Rich?" and wondered, "Why Isn't the Whole World Developed?" Easterly (2001) characterized the "quest for growth" as "elusive." Elhanan Helpman (2006) described it as a "mystery," and Friedmin (2006) considered it a moral question.

Growth models began with classical economists; Adam Smith, Thomas Malthus, and David Ricardo. The classical economists' school of thought was pegged on the concrete conditions of their time as well as historical economic and social events. During the industrial revolution, they recognized that accumulation and productive investment of a part of the social product are the main driving forces behind economic growth and that under capitalism, they mainly take the form of profit reinvestment (McIver, 2001). They focused on the relationship between the law of diminishing returns and population growth.

The classical models predicted that output is a function of capital, labor and land. Thus, they postulated that output growth is determined by population growth, increases in investment, land and the total labor productivity growth. Therefore, the main problem of economic growth, according to them, is the explanation of the forces underlying the accumulation process. Afterwards, there came the Keynesian growth models, which were based on the transition of savings to investment and its multiplication effect. Domar started the multiplication effect, but he eventually came to the same conclusion that the rate of output growth is determined by the national savings ratio (Dhingra, 2006).

The aggregate growth models were extended in the neoclassical models, with Solow's classic articles playing a leading role. Solow (1956) showed that the rates of saving and population growth, taken exogenously by assuming a standard neoclassical production function with decreasing returns to capital, determine the steady-state level of income per capita, which is exogenous. Solow is therefore considered the founder of traditional neoclassical theory, which assumes that the growth rate is determined by the rate of population growth and technical progress and savings. Both are external factors for growth, which is determined by the equation of production of the first degree.

Most of the growth models considered land, labor, capital and technological progress as the most important factors of production (Keita, 2018). In the Solow-Swan model, growth depends on an efficient relationship between labor and capital where technology plays a fundamental role in achieving this efficiency. Population growth rate and the labor force, unlike saving, influence short-term economic growth, while long-term economic growth is substantially shaped by technology. These exogenous neoclassical growth models were extended in the late 1980s and early 1990s to endogenous growth models (Romer, 1990).

In the endogenous growth theory, economic growth is driven mostly by internal factors rather than external ones. In this regard, while private sector investment is needed to boost technological progress, government policies are required for market competition. The Harrod-Domar model, from the Keynesian economic growth theory, stipulates that economic growth depends on savings and capital. In this theory, an increment in economic growth is entitled to an increase in the quantity and quality of production factors, political stability and rule of law, social cohesion, entrepreneurial spirit, substantial investment, governmental support granted to business endeavors (Batrancea et al.., 2019).

The endogenous growth models developed by Lucas-Romer challenged the old neoclassical model by emphasizing the role of endogenous factors (i.e., human capital stock and R&D activities) as the main engines of economic growth. While early neoclassical models assumed total factor productivity growth (or technical progress) as exogenously given, the newer endogenous growth models attributed this component of growth to the "learning by doing" effect occurring between physical and human capital, which results in increasing returns to scale in production technology (Lucas, 1988).

Romer (1990) established the endogenous growth model in which the Cobb-Douglas production function depends on firm-specific inputs (AKL), where A is a scale parameter, K refers to capital stock and L represents work effort. This is an important component of the theory of development in developing countries. This theory assumes that continued growth is determined by the production process, not by outside factors (Grandy, 1999). Modern theory also assumes increasing marginal returns on the size of production factors through the role of external effects of returns on human capital investment, which will generate improvements in productivity.

Growth therefore depends on savings and investment in human capital on the one hand (Lucas, 1988) and investment in research and development on the other (Romer, 1990). The implication of endogenous growth theory is that policies which embrace capital formation, openness, competition, change and innovation will promote growth. The most distinctive difference between neoclassical exogenous and endogenous growth theories is that the former assumes constant returns to scale whereas the latter generally assumes increasing returns to scale. The assumption of increasing returns to scale provides a possible way to long-run sustained growth in endogenous growth theories. These theories of endogenous economic growth stress the point that the opening up of investment opportunities under a liberalized market-friendly economy brings about high economic growth.

Therefore, this study is based on endogenous growth theory. Studying growth issues is a concern for all nations and all people. To achieve and maintain such a high growth rate, policy makers need to understand the determinants of economic growth (Mallick, 2008). The level of income in an economy at any point in time represents the accumulated growth in incomes over time. Hence, investigating what produces higher incomes and determines economic growth is really an important research question to be explored (Romer, 2019).

# 2.2. Empirical review

A vast body of empirical literature has looked at the relationship between economic growth and its determinants in developing countries. Among numerous studies, Onafowora and Owoye (1998), Foster (2008), and Yavari and Mohseni (2012) reported a positive long-run correlation between trade openness and economic growth. In the study of Taş et al. (2013) in a panel data framework, the gross domestic product in European countries is explained by variables such as total investment, general government total expenditure, inflation (average consumer prices), unemployment rate, general government gross debt, current account balance, gross national saving, general government revenue, population, volume of imports of goods and services, and volume of exports of goods and services. Their findings revealed that population number was positively related to economic growth, while unemployment rate and total expenditure had a negative impact on economic growth.

Loizides and Vamvoukas (2005) found a positive relationship between government spending and economic growth. Likewise, Hsieh and Lai (1994) reported a lack of evidence of any definite relationship between the two. During the period of 1995–2003, a study by Ciftcioglu and Begovic (2008) found that the volume of exports of goods and services and volume of imports of goods and services harnessed the economic growth of East and Central European countries. In this study, inflation has a negative impact on GDP growth of the countries. On the other hand, a panel data analysis by Trpkova and Tashevska (2011) shows that inflation, current account balance, population growth, and general government expenditure affect the economic growth of South East European countries.

Hussin and Saidin (2012) ran a panel data analysis and put the impact of openness, foreign direct investment, gross-fixed capital formation on GDP for Asian countries and all the variables were positively correlated with GDP except in four countries (Thailand, Malaysia, Indonesia, and the Philippines); in these countries, FDI was not correlated with GDP. From the empirical studies, Ndambiri et al. (2012) confirmed that government expenditure and foreign aid and nominal exchange rate significantly lead to negative economic growth. This study also added that the lagged GDP-dependent variable was empirically positively correlated with the growth of the preceding years. Similarly, the finding found that government expenditure has an inverse effect on the GDP growth of sub-Saharan countries.

The impact of foreign direct investment (FDI) on economic growth was studied in Middle East and Northern Africa countries and the result shows that economic growth is not significantly influenced by FDI but rather depends on macroeconomic stability (Rapport, 2000). On the other hand, as stated by Campos and Kinoshita (2000), foreign direct investment enhances economic growth. Another finding of Munemo (2018) revealed that FDI had a positive impact on entrepreneurship and the development of national markets in 28 African countries. A study by Awolusi et al. (2017) using data from five African countries during the period 1980–2014 reported a limited or negligible impact of FDI. The earliest empirical studies conducted by Levin et al. (2002) using the GMM panel estimator of Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) suggested no robust link between economic growth and foreign direct investment.

A significant positive long-term relationship between savings and economic growth was observed by Oladipo (2010) using panel data from 1970 to 2006 in Nigeria. Likewise, Ribaj and Mexhuani (2021) reported that savings had a positive impact on economic growth in Kosovo during the period 2010–2017. The empirical results of Calderón et al. (2020) based on 174 countries, including sub-Saharan countries, for the period 1970–2014 showed a positive effect of trade on economic growth.

A time series of data for Nigeria over a period from 1962 to 2006 scrutinized by Adepoju et al. (2007) showed that debt negatively affected economic growth in Africa. This is not consistent with a study conducted by Ayadi and Ayadi (2008), whose result revealed that government general debt positively affected the economic growth of South Africa. In addition, inflation is an indicator of the strength of both monetary and fiscal policy in a nation and Abou-Ali and Kheir-El-Din (2009) found that inflation significantly hampers economic growth in African countries.

Based on panel data from 34 countries across Africa running from 2001 to 2019, Batrancea et al. (2021) showed that economic growth, proxied by the GDP growth rate, was substantially affected by the level of imports, exports, gross capital formation and gross domestic savings. Chirwa and Odhiambo (2019) in their study in Zambia concluded that economic growth was influenced by investment, population growth, foreign aid, the real exchange rate, trade openness, government consumption, and inflation.

Summing up the literature review, various econometric estimation results produce inconsistent results in explaining the determinants of economic growth. In this review, the results of key macroeconomic variables are mixed. This, therefore, opens further investigations. Thus, the motive of this study is to investigate the relationship of macroeconomic variables with economic growth and thereby, make a significant contribution to the studies of the economic growth determinants of the region.

# 3. Methodology of the study

# 3.1. Data set

To find out the fundamental determinants of economic growth for countries, annual data running between 2002 and 2018 is taken from the world economic outlook (WEO). The data set includes gross domestic product (GDP) growth rate as an outcome variable, independent variables are current account balance, general government gross debt, general government revenue, general government total expenditure, gross national savings, inflation (average consumer prices), population, total investment, foreign direct investment, volume of exports of goods and services, volume of imports of goods and services obtained from the World Economic Outlook (WEO) October 2018. Therefore, the panel data approach completely depends on the secondary data from the World Economic Outlook Database. The data covers the period of 2002–2018 for the set of 17 East African countries, and the type of data is quantitative data.

Therefore, this study used a database consisting of a panel data set of 17 East African countries (N) for 17 years, 2002–2018 term (T). The dataset is a balanced panel data and has  $N^*T = 17 \times 17 =$ **289** total observations. An econometric model and descriptive methods were then used in order to analyze the data.

#### 3.2. Estimation methods

The econometric method this study used to assess the determinants of economic growth in East African countries is presented in this sub-section. In panel data model, we have variation over time and over cross-sectional units. The Panel data is a set of data obtained by observation of the characteristics of a variety of units (cross-sectional variables) over time (Ahn & Moon, 2014). The Panel data set has both cross-sectional and time-series dimensions. The size of the time series is formed by monitoring the same cross-section units during a given period (Wooldridge, 2009). Panel data provide more informative data, more variability, more degrees of freedom, less collinearity among the variables and more efficiency (Baltagi & Pirotte, 2010). Panel data analysis can be considered as a combination of regression and time-series analysis (Frees, 2004). Studying the repeated cross section of observation panel data can better detect and measure effects that cannot be observed in pure cross section or pure time-series data (Gujarati, 2009).

In panel data analysis, the cross-sectional units are considered to be heterogeneous and controlled for variation (heterogeneity). Pure time series or cross-sectional studies that do not control this heterogeneity may run the risk of obtaining biased results. Panel data are able to control variables that are subject or time invariant (Baltagi & Pirotte, 2010). Because panel data has time-based dynamics with the observations of cross-sectional data repeated through time, the effect of unmeasured variables can be controlled (Hsiao, 2003). Hsiao further stated that, with the use of cross-sectional observations over time, panel data analysis provides more clarification character, less collinearity and more degrees of freedom and efficiency than only cross-sectional analysis or time-series analysis. As it is depicted in its title, the paper uses a dynamic panel model approach but starts with the following static panel form;

$$Y_{it} = X_{it}\beta + \mu_i + \varepsilon_{it} \tag{1}$$

where  $Y_{it}$  = gross domestic product varies among cross units (*i*) and over years (t),  $X_{it}$  represent exogenous variables. Likewise,  $\mu_i$  and  $\varepsilon_{it}$  indicate time-invariant country effects and error terms, respectively. This model takes the unobserved heterogeneity between observations into account and will control it formally. Estimation of cross-sectional regression Eq (1) through ordinary least squares (OLS) leads to biased coefficient estimates (Caselli et al., 1996). Second, it does not exploit the time dimension of the data-set. Panel estimation, which relaxes the restrictive assumption of an identical production function can take care of both limitations. However, many econometric relationships are dynamic in nature and enables to manage the individual heterogeneity or country-specific effects. Unlike static panel data, dynamic panel data contain lags of the dependent variable as regressors. The lagged dependent variable( $Y_{it-1}$ ) is also considered as part of the regressor variables. Thus, the dynamic model is characterized by the presence of a lagged dependent variable among the regressor. i.e

$$Y_{it} = \delta Y_{it-1} + X_{it}\beta + \mu_i + \varepsilon_{it} = 1, \dots, N; t=1, \dots, T$$
(2)

Where  $\mu_i \sim \text{IID}(0, \sigma_{\mu}^2)$  and  $\varepsilon_{it} \sim \text{IID}(0, \sigma_{\varepsilon}^2)$  independent of each other and among themselves. Even if  $\mu_i$  is uncorrelated with the  $X_{it}$  regressors,  $\mu_i$  is inherently correlated with the lagged dependent variable  $Y_{it-1}$ . Therefore, the OLS estimator of  $\delta$  will no longer be unbiased and consistent, even if all covariates are exogenous. Moreover, the fixed effects (within) estimator is no longer consistent, in which the panel involves a large number of individuals and short-time dimension. However, an instrumental variable (IV) and GMM estimator will be consistent (Hsiao, 2003). Part of this issue can be resolved by differencing the data, which eliminates fixed effects.

Therefore, Anderson and Hsiao (1981) suggest using IV 2SLS estimator that stems from within the model. The Anderson and Hsiao (1981) estimator is consistent but not necessarily efficient;

because, all moment conditions are included and not differenced structure on the residual disturbances. According to Anderson and Hsiao (1981), the estimator is defined as under:

$$Y_{it} - Y_{i,t-1} = \delta(Y_{i,t-1} - Y_{i,t-2}) + \beta'(X_{it} - X_{it-1}) + \mu_i + (\varepsilon_{it} - \varepsilon_{it-1})$$
(3)

In equivalent term, the estimator is mostly specified as

$$\Delta Y_{it} = \delta \Delta Y_{i,t-1} + \beta' \Delta X_{it} + \Delta \varepsilon_{it} \tag{4}$$

Estimation of Eq (4) through OLS still leads to biased estimates due to correlation between  $(Y_{i,t-1} - Y_{i,t-2})$  and  $(\varepsilon_{it} - \varepsilon_{it-1})$ . In order to consistently estimate  $\delta$  and  $\beta$  presented in equation (4), the endogeneity issue is resolved by using  $\Delta Y_{i,t-2}$  or the level  $Y_{i,t-2}$  and  $\Delta X_{it-1}$  as valid instruments for  $\Delta Y_{i,t-1}$  or  $(Y_{i,t-1} - Y_{i,t-2})$  which is correlated with  $(Y_{i,t-1} - Y_{i,t-2})$  by construction but is uncorrelated with  $(\varepsilon_{it} - \varepsilon_{it-1})$  provided that new error  $(\varepsilon_{it} - \varepsilon_{it-1})$  term is serially uncorrelated (Arellano & Bond, 1991),

However, Arellano and Bond (1991) estimator is consistent and asymptotically efficient in the presence of heteroscedasticity. AB argues that the Anderson-Hsiao estimator, while consistent, fails to take all of the potential orthogonality conditions into account. The AB estimator allows the inclusion of external instruments as well. Adding additional instruments increases the efficiency of the IV estimator. In the time period, the number of moments increases and efficiency sample size tradeoff will be avoided. Arellano and Bond's estimator uses a time-specific instrument and addresses this tradeoff; and assumed that error terms have no serial correlation, and regressors are weakly exogenous, that is, they are not correlated with future error terms, uses the Generalized Method of Moments (GMM) and controls the endogeneity of regressors.

The AB estimator has limitations in bias and imprecision; therefore, to reduce these problems, Blundell and Bond (1998) is preferred when regressors' time is short period. The system GMM which combines system in the difference estimator with the estimator in levels is best estimator. As stated above, difference in regressors and country-specific effects are uncorrelated. System GMM is a consistent and efficient estimator; hence, it employs the moment condition.

#### 3.3. Definition of variables<sup>1</sup>

The dependent variable, Gross Domestic Product (GDP), represents the economic health of a country and it is a sum of a country's production which consists of all purchases of goods and services produced by a country and services used by individuals, firms, foreigners and the governing bodies. GDP is not only used as an indicator for most governments and economic decision-makers for planning and policy formulation; but also helps the investors to manage their portfolios by providing them with guidance about the state of the economy. The right-hand side variables include **Balance of payments** which systematically records all the economic transactions between residents of a country (Central Government, monetary authority, banks, and other sector) and nonresidents for a specific time period.

The **current account** is one of the two components of a country's balance of payments, the other being the capital account. It consists of the trade balance (the difference between the total value of exports of goods and services and the total value of imports of goods and services), the net factor income (difference between the return on investments generated by citizens abroad and payments made to foreign investors domestically) and net cash transfers, where all these elements are measured in the domestic currency. The other two parts are the capital accounts and the financial accounts. The ratio of the current account balance to the Gross Domestic Product (or % of GDP) provides an indication of the country's level of international competitiveness. In economics, **inflation** is a sustained increase in the general price level of goods and services in an economy over a period of time. The measure of inflation is the inflation rate, the annualized percentage change in a general price index, usually the consumer price index, over time.

**Population** growth is the increase in the number of individuals in a population. The unemployment rate is the share of the labor force that is jobless, expressed as a percentage. **Foreign direct investment (FDI)** is an investment in the form of a controlling ownership in a business in one country by an entity based in another country. The origin of the investment does not impact the definition, as an FDI: the investment may be made either "inorganically" by buying a company in the target country or "organically" by expanding the operations of an existing business in that country. The variable of **export and import** volume is the total amount of goods and services exported and imported. Likewise, government expenditure refers to the purchase of goods and services, which include public consumption and public investment, and transfer payments consisting of income transfers (pensions, social benefits) and capital transfer.

**Government revenue** is an important tool of the fiscal policy of the government. Revenues earned by the government are received from sources such as taxes levied on the incomes and wealth accumulation of individuals and corporations and on the goods and services produced, exports and imports, non-taxable sources such as government-owned corporations' incomes, central bank revenue and capital receipts in the form of external loans and debts from international financial institutions.

**Government debt** also known as public interest, public debt, national debt and sovereign debt contrast to the annual government budget deficit, which is a flow variable that equals the difference between government receipts and spending in a single year. The debt is a stock variable, measured at a specific point in time, and it is the accumulation of all prior deficits. Public debt usually only refers to national debt. While **Gross national saving** is calculated by deducting final consumption expenditure from gross national disposable income and consists of personal saving, plus business saving, plus government saving, but excludes foreign saving, **Total investment** is defined as the total amount of financial resources that a nation puts into a project (Spilioti, 2015).

# 4. Results and discussions

# 4.1. Descriptive results

As the summary descriptive analysis depicted in Table 1 shows, the data has 289 observations in which 17 countries were followed throughout 17 years. "Overall" statistics are ordinary statistics that are the 289 observations; "Between" statistics are calculated on the basic summary statistics of the 17 countries regardless of time period, while "Within" is to statistics of 17 time periods regardless of the countries.

For the dependent variable, real GDP growth rate, the within variation (3.711) is greater than the between variation (2.344); meaning that the variation of countries over time is greater than the variation from one country to another. It is also true in the independent variables of consumer price index, volume of import of goods and services, volume of export of goods and services, FDI, and current account balance. In the case of saving, population, government revenue, government expense, and government debt, the between variation outweighs the within variation, implying that the variation from one country to another is greater than the variation of a country over time.

As per the result depicted in Table 1, the average real GDP growth rate of the East African countries incorporated in this study is 4.56% and varied from -17.9% in Sudan to 16.3% in Zimbabwe between 2002 and 2018, with a growth variation of 4.35%. When compared with previous works on the study of economic growth, the descriptive analysis of this paper confirmed that the economic growth of African countries is, as stated by Nkurunziza and Bates (2003), still not high enough to make a real dent in poverty and assist developing countries to catch up with other developed nations.

The average consumer price index, volume of imports of goods and services, volume of exports of goods and services, government revenue, and expenses, and foreign direct investment are

Table 1. Descriptive s	tatistics					
Variable		Mean	Std. Dev.	Min	Max	Observations
GDP (GDP growth rate)						
GDP(%)	overall	4.559862	4.353756	-17.9	16.3	N = 289
	between		2.343526	.5470588	9.176471	n = 17
	within		3.710551	-15.16367	20.3128	T = 17
I (Investment, % of GDP)						
Ι	overall	23.55346	10.51947	6.673	96.254	N = 289
	between		10.4622	6.673	96.254	n = 17
	within		0	23.55346	23.55346	T = 17
S (Saving, % of GDP)						
S	overall	13.69648	11.59703	-34.579	41.344	N = 289
	between		11.54998	-34.579	41.344	n = 17
	within		.9838643	6.985906	20.40706	T = 17
CPI (consumer price Index	(, %∆)					
CPI	overall	8.969197	14.26484	-72.729	156.964	N = 289
	between		9.731709	-34.67	80.725	n = 17
	within		8.686811	-67.2698	85.2082	T = 17
IM (Import volume,%∆)						
IM	overall	8.030463	17.94964	-61.645	161.427	N = 289
	between		18.0016	-61.645	161.427	n = 17
	within		1.900481	-6.625919	22.68685	T = 17
EX(Export Volume,%Δ)						
IM	overall	8.030463	17.94964	-61.645	161.427	N = 289
	between		18.0016	-61.645	161.427	n = 17
	within		1.900481	-6.625919	22.68685	T = 17
						(Continued

Table 1. (Continued)						
Variable		Mean	Std. Dev.	Min	ΜαΧ	Observations
POP(Population in Billion)						
POP	overall	20.64172	21.01506	.082	94.138	N = 289
	between		21.11562	.082	94.138	n = 17
	within		1.169366	14.89722	26.38622	T= 17
GR (Government revenue,	% of GDP)			-		
GR	overall	22.25786	8.178329	2.236	49.823	N = 289
	between		8.081485	9.947	49.823	n = 17
	within		1.183799	13.22036	31.29536	T = 17
GE(Government expense, '	% of GDP)			-		
GE	overall	25.55447	9.187237	4.27	67.009	N = 289
	between		9.05077	4.53278	67.009	n = 17
	within		1.405944	15.89604	35.21291	T = 17
GD(Government debt, % o	f GDP)			-		
GD	overall	62.02052	36.92703	16.718	202.052	N = 289
	between		37.11001	16.718	202.052	n = 17
	within		3.810362	31.20752	92.83352	T = 17
CAB(Current account Balar	ice,% of GDP)					
CAB	overall	-9.38309	10.16783	-91.502	9.674	N = 289
	between		10.2684	-91.502	9.674	n = 17
	within		.4565832	-12.62559	-6.14059	T = 17
FDI(foreign direct investm	ent, % of GDP)					
FDI	overall	4.767658	6.584388	6100591	57.87725	N = 289
	between		6.635114	6100591	57.87725	n = 17
	within		.0930231	3.965737	5.56958	T = 17
NB: Own compilation, 2020.						

8.96%, 8%, 7.11%, 22.26%, 25.55%, and 4.77% of the real GDP of the countries, respectively. The average population of the region is 20.642 million; in East African countries, the minimum population number is 82,000 and the maximum population is 94.138 million.

### 4.2. Empirical results

This section presents the **static and dynamic linear** estimation results which fully presents the determinants of economic growth of the East African countries.

### 4.2.1. Static linear panel estimates

Table 2 presents the results of the POLS, FE, and RE estimators of the GDP. The second column displays POLS estimator results, while the third and fourth columns present results from FE and RE estimators. Having the assumptions of the  $E(\alpha_i/x_{it}) = 0$ , random effects assumption, "no country-specific time constant unobserved heterogeneity", and  $E(\epsilon_i/x_{it}) = 0$ , contemporaneous endogeneity assumption, "no time varying unobserved heterogeneity" in mind, 289 observations are pooled and estimated in the model neglecting the nature of cross section and time series of the data. In order to check for stationarity, the researcher decided to conduct a unit root test using a proper Levin—Lin-Chu test approach (Levin et al., 2002) under the null hypothesis stating that the series contains a unit root versus the alternative hypothesis of a stationary series. Based on the test result, the Levin—Lin-Chu bias-adjusted t statistic is -10.8260, which is significant at all the usual testing levels. Therefore, we reject the null hypothesis and conclude that the series is stationary. We also checked the cross-sectional dependence following the approach developed by Pesaran (2021). Our test result of Pr = 0.6713 strongly supported the null hypothesis of no cross-sectional dependence, at least at the 5% level of significance.

4.2.1.1. POLS estimation. The Pooled OLS results (Col 2, Table 2) demonstrate that saving (0.128) positively affects GDP growth and is significant (p < 0.01). The volume of imports of goods and services is positively related to real GDP growth at a significance level of 1%. Export volume of goods and services simply linked with the region's economic growth at a 1% significance level. The population number is significant (P < 0.01) and increased the GDP growth of the region during the 2002 to 2018 period which is consistent with the findings of Taş et al. (2013). Similarly, a - one percent increase in general government expenditure significantly increased the real GDP growth of East African countries by 0.177%.

However, the consumer price index has an adverse effect on economic growth. General government debt has also a significant (P < 0.01) but negative impact on the economic growth of the East African countries. In this finding, the current account balance was found significant (P < 0.1) and negatively affected the real GDP growth of the region. In the POLS estimation, government expense has the highest coefficient value (0.177) then followed by population number (0.0699) and volume of imports of goods and services (0.0501) compared to the other variables with significant and positive coefficients.

4.2.1.2. FE and RE estimator of the results. From Table 2, column three portrays the result of the FE estimator on the economic growth of the countries in the subject. Estimated results from the FE estimator indicated that 27% of the GDP is explained by the model. The FE estimator results on saving are consistent with Pooled OLS estimator and in this static model, the finding shows that saving had a significant positive effect on growth rates. The increase of 1% in saving increases economic growth by 0.145%. This is in line with the findings of Peter (2011), whose study indicates that an increase in savings accumulation leads to an increase in GDP growth. It also coincides with the finding of Oladipo (2010) in which a significant positive long-term relationship between savings and economics was observed using panel data from 1970 to 2006 in Nigeria. Ribaj and Mexhuani (2021) reported that savings has a positive impact on economic growth in Kosovo during the period 2010–2017. The volume of import and export of goods and services has a strong positive correlation with economic growth. This concurs with numerous studies conducted by Foster (2008)

Table 2. Pool, FE and RE	estimation of GDP		
	(Pool)	(FE)	(RE)
VARIABLES	GDP	GDP	GDP
I (Investment, % of GDP)	-0.0250	-0.0996**	-0.0559
	(0.0425)	(0.0503)	(0.0453)
S(Saving, % of GDP)	0.128***	0.145***	0.136***
	(0.0342)	(0.0444)	(0.0376)
CPI (consumer price Index, %Δ)	-0.0425***	-0.0457***	-0.0440***
	(0.0148)	(0.0144)	(0.0143)
IM (Import volume,%∆)	0.0501***	0.0489***	0.0504***
	(0.0124)	(0.0121)	(0.0120)
EX(Export Volume,%∆)	0.0435***	0.0369***	0.0393***
	(0.0105)	(0.0103)	(0.0102)
POP(Population in Billion)	0.0600***	-0.0256	0.0625***
	(0.0119)	(0.0658)	(0.0176)
GR Government revenue, % of GDP)	-0.0416	0.0376	-0.00415
	(0.0561)	(0.0719)	(0.0619)
GE(Government expense, % of GDP	0.177***	0.155**	0.161***
	(0.0564)	(0.0682)	(0.0609)
GD(Government debt, % of GDP)	-0.0178***	-0.0141*	-0.0148**
	(0.00665)	(0.00812)	(0.00715)
CAB(Current account Balance,% of GDP)	-0.0639*	-0.123***	-0.0816**
	(0.0363)	(0.0460)	(0.0396)
FDI(foreign direct investment, % of GDP)	-0.0364	-0.0612	-0.0487
	(0.0412)	(0.0435)	(0.0418)
Constant	-1.087	0.407	-1.211
	(0.992)	(1.955)	(1.253)
Observations	289	289	289
R-squared	0.386	0.276	
Number of id	17	17	17

Notes: NB: Standard errors in parentheses \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

and Yavari and Mohseni (2012), in which whose results revealed a positive long-run correlation between trade openness and economic growth.

Government expenditure positively affected economic growth at a 5% significance level and a one percent increase in GE increases the GDP by 0.155%. The study of Ndambiri et al. (2012) has a contrary result which they found that government expenditure has an inverse effect on the GDP growth of sub-Saharan countries. Contrary to the expectations, investment negatively affects the economic growth of the countries and a one percent increase in investment leads to.0996 percent (P < 0.05) decrement in GDP growth. We also observed that inflation exerts a significant and negative influence on GDP growth. The increase of 1% in CPI causes economic growth to decrease by 0.0457% (p < 0.01). This finding is supported by Das (2016). Likewise, a one percent increase in general government debt significantly decreases economic growth by 0.014% (P < 0.1).

In the RE estimation, eight of eleven explanatory variables are statistically significant at 1% and 5% significance levels and this estimator is almost consistent with the POLS so RE is the preferred estimator. Savings exerted a positive and significant impact on real GDP growth. The population number is also among the positive determinants of the economic growth of the countries which shows that a one million increase in population supported the economy to grow by 0.0625% at a 1% significance level. The variables of the volume of imports of goods and services (0.0504) and volume of exports of goods and services (0.0393) affected GDP to grow at a 1% significance level. Similarly, government expense is positively related to the real GDP growth of East African countries during the 2002–2018 period. In the RE estimator, the coefficient of the consumer price index is negative and significantly reduces GDP growth. This result is the same as the FE estimator. One percent growth in government debt shows a similar negative impact at a 5% significance level. The current account balance (-0.0816, P < 0.05) adversely affects the economic growth of the region.

However, the static panel data approach using POLS, FE, and RE estimators has the limitation of incorporating lag variables. In economic growth regression, income in the previous period is also a significant determinant of income in the following period (Caselli et al.., 1996); therefore, it is more appropriate to specify growth regression in a dynamic panel framework as below. Therefore, as it clearly pointed out in the model specification part, this study used dynamic panel data. The GMM estimators are an asymptotically normal, consistent, and efficient class of estimators. Efficiency in this term entails estimators having the smallest possible variance.

4.2.2. Dynamic panel GMM estimation results

4.2.2.1. The Arellano and bond estimator. Based on the assumptions, it is known that pooled OLS estimation is upward biased and fixed effect is also downward biased (Baltagi, 2008). The coefficient of the first lag of GDP in Table 3 (Col. 2) is about 0.3% while the value of this variable in Table 3 (Col. 3) is 0.17%. The reasonable value, however, should be between the value 0.17% and 0.3%. Likewise, a stable estimation lies below one (Baltagi, 2008).

Blundell and Bond (1998) stated that different GMM estimators of the lagged dependent variable are strongly downward biased. They suggested the system GMM estimation is between the upper bound of POLS and the lower bound of fixed and different GMM estimations. In Table 4, the second column shows the different results of the estimation of determinants of economic growth of East African countries. The Arellano and Bond (1991) difference GMM estimator results put a percentage of GDP as a dependent variable with its lagged variables on top of other explanatory variables.

Regarding the first lag of real GDP, the analysis found that it has a significant positive impact on the economic growth of the region. As it was expected, an increase in the level of GDP likely increases the GDP growth by 0.171% (P < 0.01) and this is in line with Ndambiri et al. (2012), whose findings show that lagged GDP dependent variable empirically positively correlated on the growth of the preceding years. Another variable like general government expenditure (0.135) likely increases the GDP growth rate which may imply that governments are spending on productive economic sectors. General government revenue (0.135) similarly positively affects the economic growth of the region at a significance level of 1%. The economic growth of South Africa was generated by trade and fixed investment. Empirical results of Calderón et al. (2020) based on 174 countries including sub-Saharan countries for the period 1970-2014 showed a positive effect of trade on economic growth. The findings of Malefane and Camarero (2020) using time-series data from Botswana further revealed that trade openness fostered economic growth in the short and long run. In Table 4 column 2, the AB estimator confirms that the volume of imports of goods and services enhances significantly the GDP of the region. A one percent increase in the volume of imports more likely produces a 0.0375% (P<0.01) increase in GDP rate. Moreover, a one percent increase in the volume of exports of goods and services offers 0.0406% (P < 0.01) a positive effect on economic growth. Both findings are in line with the findings of Dollar and Kraay (2000) and Calderón et al. (2020) in sub-Saharan Africa.

Table 3. Dynamic OLS and FE e	stimation of GDP	
	(OLS)	(FE)
VARIABLES	GDP	GDP
L.GDP (lag 1)	0.297***	0.170***
	(0.0579)	(0.0581)
L2.GDP (Lag 2)	0.0414	-0.000840
	(0.0486)	(0.0474)
L.I(Lag 1)	0.0149	-0.0328
	(0.0520)	(0.0543)
L2.I(lag 2)	0.0732*	0.0545
	(0.0419)	(0.0418)
S(current)	0.0252	-0.0418
	(0.0396)	(0.0456)
L.S(lag 1)	-0.0176	0.0494
	(0.0425)	(0.0455)
CPI (current)	-0.0273**	-0.0312**
	(0.0133)	(0.0136)
L.CPI(lag 1)	0.0397***	0.0259*
	(0.0139)	(0.0148)
IM(current)	0.0341***	0.0385***
	(0.0111)	(0.0108)
L.IM(lag1)	0.0209**	0.0258**
	(0.0105)	(0.0101)
EX(current)	0.0385***	0.0349***
	(0.00868)	(0.00824)
L.EX(lag 1)	0.0142	0.0178**
	(0.00861)	(0.00830)
POP(current)	0.131	-0.122
	(0.303)	(0.298)
L.POP(lag 1)	-0.0996	0.0194
	(0.308)	(0.299)
GR(current)	0.138**	0.145**
	(0.0648)	(0.0666)
L.GR(lag1)	-0.116*	-0.114*
	(0.0619)	(0.0654)
GE(current)	0.120*	0.144*
	(0.0721)	(0.0742)
L.GE(Lag 1)	-0.0705	-0.0408
	(0.0677)	(0.0693)
GD (current)	-0.0546***	-0.0503***
	(0.0158)	(0.0155)
L.GD(Lag 1)	0.0461***	0.0469***
	(0.0140)	(0.0135)
CAB(current)	0.0217	0.0752*
	(0.0418)	(0.0428)

(Continued)

Table 3. (Continued)		
	(OLS)	(FE)
VARIABLES	GDP	GDP
L.CAB(lag 1)	-0.0179	-0.124**
	(0.0490)	(0.0546)
FDI(current)	-0.0346	-0.0608
	(0.0372)	(0.0370)
L.FDI(lag 1)	-0.0302	-0.0449
	(0.0390)	(0.0384)
Constant	-1.573*	1.623
	(0.948)	(1.939)
Observations	255	255
R-squared	0.608	0.527
Number of id		17

Notes: NB: Standard errors in parentheses \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

In the Arellano and Bond (1991) model estimation, this study found government expenditure is an important positive determinant of economic growth in East African countries. It shows a 1% growth in government expenditure likely increases growth in the gross domestic product by 0.135% (P < 0.05). In the same fashion, a one percent increase in government revenue generates a GDP growth rate of 0.135%. The estimated coefficient of the consumer price index, -0.0284, decreases the GDP growth rate at 1% significance and this is supported by Abou-Ali and Kheir-El-Din (2009) in which they presented that as inflation significantly hampers economic growth in African countries. Developing economies, particularly, East African Countries do not manage to attract foreign capital that generates job opportunities, infrastructure development, and technological advancement (Batrancea et al., 2021). FDI as the most important determinant of economic growth in Africa is regarded as a fundamental strategy by governing authorities. However, there is a dilemma regarding the type of effect of FDI inflows on economic growth (i.e., positive vs. negative). In this paper, foreign direct investment (0.0378) has a significant negative correlation with GDP at 5% of significance in contrast with the empirical literature studied by Lensink and Morrissey (2006) who found a positive impact of foreign direct investment on economic growth provided a significant positive link between the two.

Another significant variable analyzed here is government gross debt (0.061, P < 0.01) which has a significant negative effect on GDP and this result is consistent with the study of a time-series data for Nigeria over a period from 1962 to 2006 scrutinized by Adepoju et al. (2007) and confirmed as debt negatively affected economic growth. The result of government debt is also in line with the paper studied in Sub Sahara Countries by Ndambiri et al. (2012) and Liew et al. (2012), macroeconomic variable general government debt significantly leads to the negative economic growth of the nations.

4.2.2.2. Blundell and Bond (1998) system GMM approach estimation of results. The Blundell and Bond (1998) estimator is better suited for estimating autoregressive models with persistent panel data. The system GMM estimator is discussed in detail in Blundell and Bond (1998) and this report improved and made precise results for a model with a lagged dependent variable, which is more typical of the equations estimated in the empirical growth literature. In this study portrayed in Table 4, the result placed in column three is system GMM estimation. This system GMM increases

Table 4. Dynamic AB and BB e	stimation of GDP	
	(AB)	(BB)
VARIABLES	GDP	GDP
Lag1.GDP(%)	0.171***	0.190***
	(0.0495)	(0.0437)
Lag2. GDP(%)	-0.0243	-0.00927
	(0.0359)	(0.0346)
Lag1.I	-0.0130	0.0117
	(0.0387)	(0.0431)
Lag2. I	0.0739**	0.0716**
	(0.0306)	(0.0292)
S	0.00788	-0.0311
	(0.0293)	(0.0345)
Lag1.S	0.0362	0.0294
	(0.0331)	(0.0387)
СРІ	-0.0284***	-0.0298***
	(0.00964)	(0.00931)
Lag1.CPI	0.0292***	0.0253**
	(0.0105)	(0.0102)
IM	0.0375***	0.0415***
	(0.00790)	(0.00774)
Lag1.IM	0.0274***	0.0256***
	(0.00756)	(0.00711)
EX	0.0406***	0.0367***
	(0.00608)	(0.00584)
Lag1. EX	0.0178***	0.0183***
	(0.00605)	(0.00581)
POP	-0.0585	0.114
	(0.224)	(0.200)
Lag1. POP	0.105	-0.0704
	(0.228)	(0.203)
GR	0.135***	0.155***
	(0.0480)	(0.0462)
Lag1. GR	-0.116**	-0.114***
	(0.0456)	(0.0427)
GE	0.135**	0.119**
	(0.0537)	(0.0503)
Lag1. GE	-0.0594	-0.0668
	(0.0496)	(0.0485)
GD	-0.0610***	-0.0592***
	(0.0119)	(0.0114)
Lag1.GD	0.0524***	0.0496***
	(0.0104)	(0.0100)
CAB	0.0415	0.0697**
	(0.0308)	(0.0346)
Lag1.CAB	-0.0641*	-0.0896**

(Continued)

Table 4. (Continued)		
	(AB)	(BB)
VARIABLES	GDP	GDP
	(0.0378)	(0.0441)
FDI	-0.0522**	-0.0480*
	(0.0263)	(0.0252)
Lag1.FDI	-0.0227	-0.0443*
	(0.0276)	(0.0266)
Constant	-1.549**	-1.288*
	(0.781)	(0.779)
Observations	255	255
Number of id	17	17

Notes: NB: Standard errors in parentheses \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

the precision and reduces biasedness associated with the difference GMM estimator. In the findings of this study, the coefficients of Arellano and Bond (1991) and the system GMM are very close and consistent except in the coefficient of the current account balance. Coefficients of first lag GDP, consumer price index, the volume of imports of goods and services, government revenue, government expenditure, and government debt have almost the same value including its sign.

Overall, the analysis of this study finds expected results according to the economic theories which capture determinants of economic growth of the countries of the region. As different theoretical and empirical literature indicated, from the independent variables of this study, the first real GDP lag variable has a positive impact (0.19) on the economic growth at a 1% significance level and this result is in line with Ndambiri et al. (2012) and Simionescu et al. (2016) studies. The first lag of GDP could be interpreted as previous growth enhancing subsequent years' GDP growth. Current account balance is not a significant determinant of economic growth in the AB estimator; however, it becomes significant at a 5% significance level in the system GMM estimator. From all independent variables, FDI was statistically insignificant in POLS, FE, and RE estimators but become significant in the GMM estimators. As it is depicted in Table 4, the lagged dependent variable real GDP has a significant dynamic effect in the economic growth of East African countries.

The results revealed that the volume of imports of goods and services is an important determinant variable (P < 0.01) of economic growth in East African countries. A one percent increase in the volume of import contributes 0.0415% to the GDP growth rate. The same is true for the volume of exports of goods and services which increases GDP by 0.0367% (P < 0.01). The result of the volume of exports and imports matches with the previous works of Ciftcioglu and Begovic (2008) who found that volume of exports of goods and services and the volume of imports of goods and services increase the economic growth of East and Central Europe countries during the period of 1995–2003 but contradicts with the findings of Anyanwu (2014), who explored imports and exports are negatively affecting economic growth of Africa. The first lag of both the volume of imports and exports of goods and services significantly and positively affects the economic growth too

General government revenue (0.155, P < 0.01) significantly influences economic generation. Likewise, general government expenditure (0.119, P < 0.05) also positively affect the economic growth during the study period. The finding on both general government revenue and government expense is reinforced by previous works of Loizides and Vamvoukas (2005) who found a positive relationship with economic growth. On the other hand, a one percent change in inflation significantly reduces the economic growth of East African countries by 0.0298% (P < 0.01) and the current account balance decreases GDP by 0.069% (P < 0.05). Government debt (-0.592) percent

(P < 0.01) negatively impacts the growth of GDP. This result matches with the finding scrutinized by Adepoju et al. (2007) but is in contrast with a study conducted by Ayadi and Ayadi (2008) who stated government general debt positively affected the economic growth of South Africa. However, the second lag of the general government debt (0.0496, P < 0.01) has a significant positive effect on economic growth.

The analysis of the system GMM shows as FDI has no significant effect on economic growth at 5%; but FDI (-0.048) is significant with an inverse relation at a 10% of significance level and which may imply that it is not serving as a source of technologies and skill in the region. This finding is contrary to the finding of Onyango and Were (2015) who studied East African Communities (EAC) as FDI has a positive impact on economic growth but matches with the earliest empirical studies conducted by Carkovic and Levine (2005) which used GMM panel estimator of Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) in the Middle East and Northern Africa countries. This paper did not support the theoretical literature focused on the relationship between the law of diminishing returns and population growth (McIver, 2001). The classical/pre-Keynesians postulated that output growth is determined by population growth, investment, saving, land and total labor productivity growth. In this estimator, both population and savings are not statistically significant and there is no reason to reject the null hypothesis.

Regarding investment, there is no reason to reject the null hypothesis since its coefficient is insignificant. However, the second lag of investment has significantly increased the GDP rate of the countries. One percent increase in investment likely nurtures economic growth by 0.0716% (P < 0.05). This implies that the return on investment positively affects the GDP growth in the case of the second lag and in subsequent years. Investment promotes the growth of GDP by allowing firms to increase the production of goods and services in future time periods because the second lag of investment positively and significantly increases the GDP of East African countries.

Since the model is stable, first lag 0.17 in Table 4 is less than 1 and the value of the first lag of GDP is between the value of OLS and FE in Table 3. The Arellano and Bond estimator has a limitation in downward biasedness; hence, Blundell and Bond (1998) estimator is the most preferred system in this study, which is a more precise, unbiased, and consistent estimator. From the best model which is system GMM, eight of the twelve independent variables including the lagged variable of GDP are statistically significant. Moreover, the lagged independent variables of investment, export, import, consumer price index, government expense and revenue, current account balance and foreign direct investment are significant and dynamically affect economic growth.

# 5. Conclusion and policy recommendations

His paper studied determinants of economic growth through a dynamic panel data model in 17 East African countries in the period of 2002–2018. It aims to identify key macroeconomic determinants of the economic growth of the region and produce useful insights that can promote sustainable economic growth in the region. Its static effect is estimated using FE and RE estimators and its dynamic effect is also estimated using the precise, consistent, and unbiased Generalized Moments Methods (GMM) estimators. Most of the results of the variables from the different estimators are consistent. The Arellano and Bond estimator has a limitation in downward biasedness; hence, Blundell and Bond (1998) estimator is the most preferred system in this study, which is a more precise, unbiased, and consistent estimator.

From the best model which is system GMM, eight of the twelve independent variables including the lagged variable of GDP are statistically significant. In the system, the GMM estimator, government expenditure, government revenue, volume of imports of goods and services, and volume of exports of goods and services were revealed as significant and positive determinants of the economic growth of East African countries. The important estimated results of this study enable us to conclude that East African countries should promote their export and import sectors and hence expressively contribute to increasing the growth of the economy. Government expense and revenue have also increased return in the economic growth during the 2002–2028 period. As a result, enhancing involvement in international trade and increasing government spending and revenue are more likely should be encouraged. The findings of the present study on those variables are also consistent with the existing literature.

Whereas, current account balance (CAB) and consumer price index (CPI) determinants are driving down the economic growth of the region. Another key finding is that foreign direct investment (FDI) and general government debt are empirically deteriorating the economic growth of the countries which is a reflection of weak policies and institutions. The finding of foreign direct investment in this paper is contrary result to the previous findings of this region. In the GMM estimation, basic variables like saving and investment are found insignificant. Conversely, the lagged effect of investment is positive and has a dynamic and positive role in improving the economic growth of the region in the long run.

The paper has three policy implications; first, promoting open trade and ensuring peace and stability in the region is a paramount policy to enhance the economic growth of the region. East African Countries should move forward in creating stability regionally and internally within the countries. Second, countries in East Africa are recommended to strengthen and sustain their policies on government expenses and government revenue and revise their policies on government debt, inflation and current account balance. Major reforms are required in foreign direct investment and general government debt within the region. Third, to address obstacles in trade, climate change and the tax collection system, political and economic integration is fundamental to the region and to making the region competitive in the international trade arena.

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#### Note

1. https://databank.worldbank.org/

#### **Disclosure statement**

No potential conflict of interest was reported by the author(s).

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