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**Determinants of Economic Growth in Sub-Saharan
African Countries: A Panel Data Approach**

par

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Sommaire

Cette étude se penche sur deux questions interconnectées : quels facteurs stimulent la croissance économique dans la région de l’Afrique subsaharienne (excluant L’Afrique du Sud) et parmi ces facteurs, lesquels ont la plus grande influence sur le développement économique de la région? Pour répondre à ces questions, nous avons eu recours aux données de panel issues de 35 pays entre 2000 et 2015. L’hétérogénéité des pays étudiés se manifeste à travers une multitude de variables telles que les conditions initiales, les ressources disponibles, les institutions, l’histoire, etc. Nous avons des raisons de croire que ces variables peuvent avoir une influence sur la croissance du PIB des pays. Par conséquent, l’utilisation d’un modèle à effets aléatoires a permis tenir compte de l’hétérogénéité non observée à travers les régions. Les résultats indiquent que la formation de capital physique, un secteur d’exportation dynamique, l’aide humanitaire et le capital humain sont positivement corrélés à la croissance du PIB dans les pays de l’Afrique subsaharienne. Parmi ces déterminants, le capital physique, les exportations et l’aide humanitaire sont fortement et positivement corrélés avec la croissance du PIB entre 2000 et 2015. Étonnamment, les résultats démontrent que les investissements directs étrangers ont un impact minimal sur la croissance économique des pays de cette région, voire même négligeable, en particulier à court terme.

Determinants of Economic Growth in Sub-Saharan African Countries: A Panel Data Approach*

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Abstract

The paper addresses two broad and interconnected questions: what drives growth in Sub-Saharan African (SSA) region (excluding South Africa) and which factor or determinant among those investigated has the strongest influence on the region's economic growth trajectory? In responding to these questions, we used panel data from 35 countries for the years 2000-2015. The countries studied are heterogeneous with different initial conditions, resources base, history and institutions and many other variables. We have reasons to believe that these variables have some influence on GDP growth. In this regard, the study employed a random effects model to account for unobserved heterogeneity across the region. The empirical results indicate that physical capital formation, a dynamic export sector, foreign aid and human capital are positively correlated with GDP growth in SSA. Of these, the first three (physical capital, dynamic export sector and ODA) are strongly and positively correlated with GDP growth during 2000-2015. Surprisingly, the results show that the role of foreign direct investment in driving economic growth in the region is minimal at best or negligible at worse, especially in the short run.

JEL-Codes: C23, F43.

Keywords: Economic growth, Sub-Saharan Africa, panel data.

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1 Introduction

The paper attempts to address some of the limitations and shortcomings observed in earlier works in explaining the determinants of growth in Sub-Saharan Africa. Its contribution to the existing literature lies in its comprehensiveness - it considers multidimensional variables; its inclusiveness -it covers 35 countries; and dealing with heterogeneity within the region. The paper closely examines the combined role of endogenous and exogenous determinants of growth (such as ODA, FDI). Based on a panel approach, it responds to two interrelated questions: what determines growth in Sub-Saharan African countries and which of the determinants has the greatest influence in growth trajectories of the region?

This paper will focus on the links between empirical evidence and economic policymaking in Sub-Saharan Africa. In this context, the paper is motivated by three key inter-related factors: first, formulating and implementing right policies and strategies in Sub-Saharan African countries requires careful analysis and understanding of key determinants of growth. Second, a clear identification of key determinants and understanding the degree of influence of each factor can assist policy makers and practitioners to develop sector specific policies where each of the countries in the sub-region has comparative advantages. This also helps countries to understand and deal with binding constraints and limiting exploitation of comparative advantages. Finally, understanding key sectors and binding constraints can greatly assist policy makers in the design, rationalization and realignment of appropriate and targeted interventions (incentives) aimed at exploiting existing comparative advantages and addressing binding constraints. This will in turn enable countries in the region to identify latent comparative advantages or to adapt to emerging global opportunities (e.g. as Mauritius has been doing in the financial services and ICT sectors). Therefore, the ultimate objective of the paper is to understand key drivers of economic growth with the view to seek ways and means to make growth

in Sub-Saharan Africa broad-based, inclusive and sustainable with substantial impact on job creation and poverty reduction.

2 Economic growth in Sub-Saharan Africa

Economic growth, its sources and key determinants has been subject to empirical investigation in developing countries as a whole. More specifically, these studies have focused on causes and consequences of economic convergence (or divergence) between developed and developing countries using the two main growth theories - neoclassical and endogenous growth theories as their main frame of reference (Arvanitis and Loukis (2009)). This in turn has been motivated by two broad trends: first, convergence in income of some developing economies such as those in East Asian (emerging) economies with developed economies; and second, the persistent lag of the African region in the catch-up process. The convergence and divergence trends are also behind the reasons for an increasing interest to understand the sources, form and quality of economic growth. The focus of these and other earlier similar works has primarily been on investigating the role of human and physical capital formation, political stability and market distortions in economic (and income) convergence or divergence. For instance, using school enrolment as proxy for human capital, Barro (1991) argued that for a given starting value of per capita GDP, a country's subsequent growth is positively related to initial human capital. On the other hand, factors of accumulation could explain the differences in income per capita according to the neoclassical school of thought (Solow (1956)). Others such as Romer (1986) and Romer (1990) underscored the importance of externalities associated with physical and human capital formation as well as innovation in driving sustained and steady growth. Further research on sources of economic convergence or divergence placed emphasis on the role of institutions as fundamental causes of differences in economic development between and across countries (Acemoglu et al. (2005)).

As with many developing economies, there was a need to understand growth dynamics and related challenges in the African region in general and Sub-Saharan Africa in particular. The fact that African countries, especially those in the Sub-Saharan region (excluding South Africa) have been lagging behind the rest of the developing world in economic growth and income convergence, continues to attract the attention of researchers, policy makers and practitioners alike. Aghion et al. (1998) refers to the club convergence phenomenon, where some countries manage to converge to growth rates of the most advanced countries and others (for example, African countries) diverge from them. Consequently, robust empirical and historical work has been undertaken on the sub region as a whole- at a country level or on a group of countries. These include, but not limited to, tracking Africa's economic growth performance and understanding key determinants of growth. Such an important work is expected to continue in the future as well, so long as there is no conclusive evidence as yet as to what determines the growth performance of the African continent as a whole and the Sub-Saharan region in particular.

With respect to the Sub-Saharan region, the most notable and comprehensive work undertaken on the subject to date is a two-volume assessment of the political economy of growth in the region carried out by the African Economic Research Consortium (AERC). Drawing from rigorous country specific studies, this work analysed Africa's growth experience. It did so through two broad analytical frameworks: (a) an analysis of "anti-growth syndrome" and explanation of observed policy patterns in terms of political economy and geography; and (b) an application of the "syndrome taxonomy" to issues of contemporary growth strategies. These analytical frameworks or approaches encompass five key features: divergence of income between Africa and the rest of the developing regions, diversity of countries covered by the study, slow capital accumulation, demographic shift and limited structural transformation and inter-temporal variation of growth rates within countries (growth volatility). The broader policy conclusions of the work were on improving economic,

environmental and political governance. These include the need for putting in place appropriate investments and policy choices, overcoming locational disadvantages and building human capital. The study focussed in the analysis of "anti-growth syndrome" and an application the "syndrome taxonomy" to address binding constraints (Ndulu (2008)).

Subsequently, Collier et al. (1998) investigated the relative importance of technology and endowments of human and physical capital in determining differences in earnings and productivity of the manufacturing sector in the selected Sub-Saharan African Countries (Cameroun, Ghana, Kenya, Zambia and Zimbabwe). Accordingly, "evidence from the earnings functions shows that private returns to both experience and education rise with level of education, whereas evidence from the production function gives lower returns on education than the earnings function". While the analysis and the findings provides valuable input for policy making, the study is confined to a specific sectors (manufacturing) and only five countries from SSA. It also covers a limited number of variables (technology, human and physical capital). Such a narrow approach limits a wider applicability of the underlying policy recommendations to a broader context.

Further efforts to clearly define or understand key determinants of economic growth in SSA have been undermined by the policies and strategies pursued in the sub region. This was partly due to the fact that development policies and strategies pursued and implemented in Sub-Saharan Africa during the last several decades has been exclusively focused on generating high economic growth. Notable examples of these strategies were the Structural Adjustment Programmes (SAPs) of the 1980s, Poverty Reduction Strategy Papers (PRSPs) of the 1990s, which guided, directed and influenced formulation and implementation of domestic policies and strategies in SSA. The prescribed policies have not been fully internalized by African institutions and human resources. Nor have they been fully integrated with domestic sectoral policies wherever such policies existed. In fact, they have created parallel coordina-

tion mechanisms and, at times, they diverted or competed for scarce investible resources. Moreover, the underlying assumption of these policies was that a sustained high economic growth would lead to robust employment opportunities and substantial reduction in the number of people living in extreme poverty rapidly. This broad assumption deflected the attention of African policy makers and practitioners away from factors determining or generating a sustainable economic growth. Such a misplaced or mistaken focus on the quantity of economic growth has masked the key determinants of economic growth and their behaviours. This greatly weakened the institutional capacities and domestic ownership of policies and strategies. The later was caused by weak integration of externally imposed or prescribed policy into sectoral regulations (UNCTAD (2008)).

The broad consequence of these phenomenon was that it undermined efforts to identify sectors of comparative advantages in the countries and misguided the incentive structure by directing them towards inefficient and economically less viable sectors. The confluences of these phenomenon greatly diminished the capacities of African countries to deal with growth-disrupting impacts of endogenous or exogenous shocks that most countries in Sub-Saharan Africa have often been subjected to. These poverty reduction-centred and growth-driven policy frameworks also reoriented public expenditure and budgets towards social sectors where poverty outcomes were thought to be significant and quicker. OECD/DAC data on Official Development Assistance in the 1990s and 2000s shows that ODA commitment to social sector, on average, constituted more than 40 per cent of net ODA disbursements to SSA, while the share of productive sectors (agriculture and industry) continues to decline or receive less priority (UNCTAD (2008)). The focus of national budgetary process and donor funding on social sectors is not bad in itself, but this should not have been done at the expense of production and productive sectors or productive capacity development, which is key in determining economic growth, its inclusiveness and sustainability.

As much as earlier policies masked determinants of growth, they have also weakened endogenous policy formulation and implementation capacities in Sub-Saharan Africa. Above all, the policies with weak ownership and implementation capacities misplaced excessive emphasis on the quantity of economic growth at the expense of quality, form and sustainability. The focus on growth (quantity) without understanding its sources, form and quality undermined efforts to clearly explain and understand drivers or determinants of economic growth. This phenomenon led to rethinking development policies in Sub-Saharan African countries. Sub-Saharan African countries themselves realized the need for reorienting their macroeconomic, industrial, agricultural (rural) and infrastructure policies towards generating inclusive and sustained economic growth capable of creating decent jobs and accelerating transformative development. The New Partnership for Africa's Development (NEPAD) - a regionally owned framework, adopted in 2001, was a response to the need for home-grown solutions to specific development problems and challenges facing the African continent. However, the noble objectives of NEPAD to lead African countries' transformative development has been extremely slow due mainly to weak institution and human resources capacities, lack of adequate finance, poor prioritization strategy and other persistent problems facing Africa.

In the recent discourse on the so-called paradigm shift in development policies in Africa, key issues such as policy space, country ownership of development policies, governance, partnership and the concept of productive capacities - all have become at the center of global trade and development discourse in recent years. There is emerging consensus now that, for African countries to achieve broad-based, sustained and inclusive economic growth, it is critical to go through fostering productive capacities. This path involves an increase in the share of high productivity manufacturing and modern services in output, accompanied by an increase in agricultural productivity (UNCTAD (2012)). In terms of identification and analysis of determinants of growth, this means that drivers of economic growth are multi-dimensional and understanding or

explaining them requires a comprehensive approach.

3 Theoretical background

As discussed earlier in the paper, neoclassical theory identifies ingredients necessary for sustained economic growth. It focuses on three components that influence the total output of an economy, which include the quality and quantity of physical capital, availability of labor and technology. Solow (1956) and Swan (1956) made major contributions to the neoclassical theory and the determinants of the growth path of an economy. The Solow-Swan growth model attributes the steady-state equilibrium of an economy with 3 main factors: capital formation, gains in productivity and labor growth. The model predicts that in the short run, the growth of an economy is determined by the attainment of a new steady state which can be achieved through increase capital investment, high saving rate, labor force growth and the depreciation rate. In the long run, the authors concluded that growth is achievable only through exogenous technological progress. Since then, Mankiw et al. (1992) made important additions to the work of Solow and Swan by introducing human capital components to the model. These authors, alongside later research, dismiss the Solow-Swan model in favor of endogenous-growth models that assume constant and increasing returns on capital. One of the main idea that was put forward is the concept of conditional convergence, also known as the catch-up effect. This hypothesis refers to the tendency of a developing economy to grow at a higher rate per capita than a more developed economy and therefore reducing the difference between the two economies.

In more recent years, renewed emphasis was placed on explaining the differences in per-capita growth rate across countries with a set of quantifiable explanatory variables (Barro (2003)). Our work is motivated by some of the most influential findings brought to light by these literatures which identify the key determinants of economic growth. These include: initial capital, for-

eign direct investment, physical capital formation, government expenditure, economic freedom, openness to trade and human capital.

3.1 Initial capital

The initial capital hypothesis as a source of economic growth, is directly linked to the conditional convergence hypothesis mentioned earlier. Accordingly, Barro (2003) reported an inverse relationship between initial level of GDP and GDP per capita growth of the following period. His models predicted a higher growth rate of GDP per capita in response to lower starting point of GDP, when other variables are held constant. However, the pace of convergence is expected to be dependent on context-specific structural factors, including level of human capital (i.e. life expectancy and educational attainment) and the policy environment in place in each country.

3.2 Foreign Direct Investment

In recent years, the stock and flow of foreign direct investments (FDI) grew at an exponential rate due to the internationalization of economic activities. It has therefore attracted much attention as a determinant of economic growth both in empirical and policy areas. However, the empirical literature studying the impact of FDI on economic growth has been divided. On one hand, multiple studies have linked FDI to economic growth in the host country mainly due to the gain in productivity caused by the transfer of new technologies, more effective management and positive influence on local markets (see Xu (2000), and Alfaro et al. (2004)). On the other hand, Wang and Wang (2015) found no evidence of additional productivity gains from foreign investment, since both domestic and foreign acquisitions brings productivity improvements. These authors compared the post-acquisition performance changes of foreign and domestic acquired firms in China. After controlling for the acquisition effect in domestic acquisitions, they found no evidence that foreign ownership can bring

additional productivity gains to the acquired firms. Likewise, by studying the spillovers effects from joint ventures in Venezuelan plants with and without foreign equity participation, Aitken and Harrison (1999) concluded that FDI may not bring any beneficial spillover effects in the host country and possibly creating a destructive competition between foreign affiliates and domestic firms.

3.3 Physical Capital formation

The World Bank defines physical capital formation as the amount by which total physical capital stock increased during an accounting period plus net changes in the amount of inventory outlays on additions to the fixed asset of a given economy. This generally refers to additional or incremental investment in machineries, tools, new technologies and other productive assets used in the production processes. Usually, it does not include consumption (capital depreciation). UNCTAD uses the notion of Gross Fixed Capital Formation (GFCF), which it defines as "an increase in physical assets (investment minus disposals) within the measurement period, which is being disaggregated into gross public capital formation, gross fixed domestic private capital formation and foreign direct investment" (UNCTAD (2006)).

As demonstrated by Solow (1962), physical capital formation is a necessary, but not sufficient, condition for growth. One of the key findings of Ndambiri et al. (2012) and Artelaris et al. (2007) is that even though physical capital formation is generally less efficient for the case of African countries, it is still a fundamental determinant of economic growth. Another interesting study by Collier et al. (1998) found that private returns on physical capital in Sub-Saharan Africa are higher than those available on human capital investments in production function, implying also a high cost of physical capital in the region. This partly explains the reasons for failure in Africa to foster structural economic transformation and vibrant manufacturing sector.

3.4 Government expenditures

The role of government (alternatively, State) in economic development has been a center of debate for several decades. The intensity and degree of controversies vary between and across schools of economic thoughts. Earlier contributions to and debates on the role of governments (states) centered on the preservation of national economic interest and the promotion of socio-economic wellbeing of individuals and communities. Adolph Wagner ¹ was the first to provide comprehensive empirical evidence or explanations on the nexus between economic development and a relative growth in the public sector (Dutta and Magableh (2006)). He postulated that government expenditure grows faster than the economy during the early processes of industrialization and urbanization (Biehl et al. (1998)). According to the author, the growth in the size of the economy is accompanied by a concomitant relative growth in government (public) expenditure on providing goods and services (Egbetunde and O Fasanya (2013)). For Yavas (1998), the size and type of expansion of government activity in an economy differs according to the stages of development. On the other hand, Rathenau (1921), viewed the State as "the guardian and administrator of enormous means of investment where it places such means at the disposal of all productive occupation and will eventually determine the level and rates of wage to be paid".

Recent literature has also continued to provide substantial analysis on the respective role of the government and market with a focus on efficient allocation of resources. As with earlier work, contemporary literature stresses that government policies play a major role in the growth path of an economy. Others view government intervention in resources allocation as a source of market distortions and argue that market does the best job in allocative efficiency.

¹German economist who advanced the "Law of Fiscal Institutions and the Growth of Government" referred to as Wagner's Law (Hutter (1982)). He also laid the foundation for labour laws, social security contracts, competition law, systems of credit and various laws on extension of public property in the provision of public goods and services. He provided, perhaps, the first empirical estimation and economic interpretation of the nexus between the size of the economy and the size of government (1870- 1890)

As defined by Barro (2003), government consumption measures expenditures that do not directly affect productivity but can lead to distortions in the economy. These distortions can be caused by inefficient government activities with adverse effects on the private sector associated with public taxes. In a similar study, Barro (1995) concluded that when non-productive government consumption is low and distortions in the private markets are limited, it induces higher levels of real per capita GDP. Generally, for the neoliberal school of thoughts, it is the market that fixes economic problems by allocating scarce resources effectively and efficiently. While there is no conclusive evidence on the roles of state and markets, nevertheless, there is emerging consensus that both markets and states (governments) are needed for the proper (efficient) functioning of the economy.

3.5 Economic freedom

Other factors related to government and institutional policies may also influence the economic growth of a country. The assumption is that improvements in institutional framework imply enhanced property rights and, consequently, serves as an incentive for higher investment and growth (see Barro (2003)). The analysis includes a subjective indicator (from the Heritage Foundation) as a proxy for economic freedom which includes rule of law, government size, regulatory efficiency and market openness. Rodrik (2000) concluded that healthy institutions not only directly affects economics growth, but also influence other major determinants of growth such as human and physical capital, investments and technological progress.

3.6 Openness to trade

Another crucial source of growth highlighted in the literature is openness to trade. Numerous empirical studies (Barro (2003), Gallup et al. (1998), Ndambiri et al. (2012) have demonstrated that countries that have been con-

sistently open to global markets would show a faster growth than closed economies. Openness to the global trade is likely to induce faster growth rate because open economies are inclined to have a greater division of labor and production processes that are more in line with their comparative advantages (Gallup et al. (1998)). In accordance to our remarks on foreign direct investment, open economies are more likely to import new technologies and skills from the rest of the world, consequently causing advances in productivity. Since many developing countries largely depend on their exports sector, openness can be measured by the annual growth rate of exports to GDP (Dollar and Kraay (2000)).

3.7 Human capital

Human capital involves the propensity of the labor force to acquire knowledge, skills and experience through education and training. Since the addition of human capital to the neoclassical theory by Mankiw et al. (1992), numerous studies have empirically proven the positive relationship between human capital and economic growth. The current growth literature not only focuses on the quantity of the labor force, but also the quality. Human capital involves the propensity of the labor force to acquire knowledge, skills and experience through education and training. With the use of education level, fertility rate and life expectancy as proxies for human capital (Barro (2003)) concluded that, for a given per capita GDP, high initial human capital will lead to a higher economic growth. Another comparative analysis of economic performances across countries (Barro (1991)) found that the divergence in economic growth and across countries can be attributed to the variation in human capital formation. Countries with higher human capital formation also have lower fertility rates and higher ratios of physical investment to GDP. Such a gap explains variations not only in economic growth, income and development but also in productive capacities, structural economic transformation, technological leapfrogging and advances in innovation.

The body of knowledge reviewed in this section provided substantial basis to the current paper which also takes into account a set of additional control variables as important determinants of economic growth in Sub-Saharan countries. These variables include the official development aid received by each country and an index reflecting the growth rates of a basket of commodity prices developed by UNCTAD.

4 Determinants of Economic Growth: Model Specification

The central hypothesis that we are trying to verify is the following: **Which of the potential determinants of economic growth have a significant impact on growth trajectories in Sub-Saharan countries?** We will consider an augmented growth model by Solow (1956) as adopted by Barro (2003) to better understand the growth process in the region.

More specifically, we apply the conventional economic growth model and use other determinants that applies to Sub-Saharan African economies. Our model takes the following reduced form:

$$GDPG = f(GDP_{t-1}, CF, GE, EXPG, ODA, FDI, FRDM, EDUC, COMM)$$

where $GDPG$ is the annual growth rate of GDP per capita, CF is the ratio of gross physical capital formation to GDP, GE is the ratio of final consumption expenditure of general government to GDP, $EXPG$ is the annual growth rate of exports of goods and services to GDP, ODA is the net official development assistance received as a ratio to GNI, FDI is the ratio of foreign direct investment inflow to GDP, $FRDM$ is the Economic Freedom index of the country, $EDUC$ is the mean years of schooling of the population and $COMM$ is an index representing the relative prices of a basket of commodities

The relationship between the dependent variable and the explanatory variables can be rewritten using the following econometric model specification:

$$GDPG_{it} = \phi_1 GDP_{it-1} + \phi_2 lCF_{it} + \phi_3 lGE_{it} + \phi_4 lEXPG_{it} + \phi_5 lODA_{it} \\ + \phi_6 lFDI_{it} + \phi_7 lFDI_{it}^2 + \phi_8 FRDM_{it} + \phi_9 EDUC_{it} + \phi_{10} COMM_{it} + \epsilon_{it}$$

where $i = 1, 2, \dots, N$ and $t = 1, 2, \dots, T$ (from 2000 to 2015)

The subscripts i and t refer to the country and time respectively. The variables in logarithm form are denoted with the letter l . The error term ϵ_{it} is equal to $\alpha_i + u_{it}$ where α_i is a scalar representing unobserved characteristics of each individuals i that doesn't change with t . This scalar is country-specific accounting for unobserved heterogeneity among countries and u_{it} is a white noise.

5 Data and variables

The paper uses GDP per capita growth from 2000 to 2015 as a proxy for economic growth and as the main dependent variable in the analysis. Annual data for GDP per capita growth was obtained from the World Bank's Development Indicators database (2017). Table 1 shows the definition and data sources of the dependent and independent variables used in our model. Since data was in some cases sporadic, the panel was compiled on 35 Sub-Saharan countries (the list of countries included in the sample is included in appendix). On the first round of selection, 9 Sub-Saharan countries were excluded from the model due to lack of data availability. Then, on the second round of selection of countries, Equatorial Guinea, Central Africa and Zimbabwe were identified as outliers and therefore removed from the model due to extreme values (see Appendix A).

6 Estimation Methodology

To estimate the coefficients of the regression, we will use balanced panel data from 2000 to 2015. Studying a relatively short time period, using time series estimators would not be appropriate. The use of panel data gives us several advantages, including the use of three estimation methods: OLS, fixed effects and random effects. Each country studied has specific unobserved characteristics that contributed to their economic growth. If these characteristics are correlated to one of the explanatory variables of the model, then the estimates with the OLS method will likely be biased (Wooldridge (2002)). This unobserved heterogeneity can bias the results if it is linked to the explanatory variables of the model and not taken into account. Hence, these fixed effects are systematically found in the error term so that the hypothesis of orthogonality of the explanatory variables is violated. This problem can be addressed by introducing the fixed and random effects estimators that allow

Table 1: Definitions and data sources of variables.

| Variable name | Definitions and data source |
|---------------|---|
| GDPG | Dependant Variable. Annual growth rate of GDP per capita. <i>Source:</i> WDI, World Bank |
| CF | Ratio of gross physical capital formation to GDP. <i>Source:</i> WDI, World Bank |
| GE | Ratio of final consumption expenditure of general government to GDP. <i>Source:</i> WDI, World Bank |
| EXPG | Annual growth rate of exports of goods and services to GDP. <i>Source:</i> WDI, World Bank |
| ODA | Net official development assistance (ODA as a ratio to GNI). <i>Source:</i> WDI, World Bank |
| FDI | Ratio of foreign direct investment inflow to GDP. <i>Source:</i> UNCTAD, Internal Database |
| FRDM | Index of Economic Freedom. <i>Source:</i> The Heritage Foundation |
| EDUC | Average years of schooling (age 22+). <i>Source:</i> Institute of Health Metrics and Evaluation, University of Washington. |
| COMM | Annual growth rate of the Free market commodity price indices. <i>Source:</i> UNCTAD, Internal Database |

the presence of unobserved heterogeneity. More precisely, the random effects estimators allows us to take into account the unobserved heterogeneity by assuming that the fixed effects are not correlated with the explanatory variables. Thus, unobserved effects are included in the error term which we assume to be uncorrelated with the explanatory variables. This study uses a Multi-level mixed-effects (ME) linear regression that includes both fixed and random effects with the Maximum Likelihood procedure.

To avoid erroneous results, it is also necessary to verify the stationarity of the variables used. Therefore, unit root tests have been conducted on each variable. The way in which N and T converge to infinity is critical to distinguish the asymptotic tendencies of the estimators and testing for the non-stationarity of the panel data. The Maddala (1999) test, which is a non-parametric Fisher

test, is less restrictive than the Levin-Lin-Chu (LLC) test and has been used in the analysis. The later retains the restrictive alternative hypothesis stipulating that the autoregressive coefficient p_i is the same for all individuals.

The null hypothesis indicates that all variables follow a stationary process and the alternative hypothesis indicates that at least one variable has a unit root. In addition, we have also performed the Wald test to verify the presence of heteroscedasticity and the variance inflation factor (VIF) test to test multicollinearity (see Wooldridge (2002)).

7 Estimation results

Table 3 shows basic descriptive statistics for each variable. On average, the GDP in Sub-Saharan countries grew at a rate of 2.22% cent from 2000 to 2015. Similar interpretation can be given for capital formation, exports of goods and services and other explanatory variables. The last column of Table 2 shows the unit root test results (ADF Z statistic) and it can be seen that the inverse normal Z statistics of all coefficients are highly statistically significant at 1% or 5%. These results show that both dependent and explanatory variables are stationary. On the basis of multicollinearity, we used the variance inflation factor. To take into account the presence of heteroskedasticity, we used the observed information matrix (OIM) to estimate the variance-covariance matrix. Overall, the empirical results indicate that physical capital formation, a dynamic export sector, foreign aid, government expenditure and human capital (education) -are all positively correlated with GDP growth with different degrees of influence on the economy. Our results also confirms the conditional convergence hypothesis with a statistically significant inverse relationship between initial level of GDP and GDP per capita growth of the following period. However, the strongest variables that determine economic growth in the region are found to be physical capital formation, dynamic export sector and ODA, which are strongly and positively correlated with GDP growth. The results show that the role of foreign direct investment (FDI) in driving economic growth in the region may be limited, questioning the policies in place and suggesting a reorientation of FDI flows (see details on this in the following section).

Table 2: Regression table

| Variables | (1) | (Unit root test) |
|---------------------|------------------|------------------|
| | (ML) | (Z statistic) |
| GDPG | - | -10.98*** |
| LGDP1 | -0.638* (0.3010) | -8.75*** |
| LFDI | -0.675 (0.3709) | -7.59*** |
| LFDISQ | 0.143* (0.0709) | -6.95*** |
| LCF | 1.161** (0.4473) | -8.70*** |
| LGE | 0.476 (0.4934) | -8.01*** |
| LEXP | 2.345** (0.7523) | -10.16*** |
| ODA | 0.040* (0.0190) | -8.87*** |
| EDUC | 0.447** (0.1559) | -2.27** |
| COMM | 1.083 (0.6882) | - |
| FRDM | 0.031 (0.0283) | -8.62*** |
| Constant | -1.690 (2.3022) | |
| Observations | 441 | |
| VIF | 2.49 | |
| Wald test statistic | 52.66*** | |

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Descriptive statistics

| Variable | | Mean | Std. Dev. | Min | Max | Observations |
|----------|---------|-----------|-----------|-----------|----------|-----------------|
| GDPG | overall | 2.216325 | 4.656968 | -33.98337 | 28.80417 | N = 560 |
| | between | | 1.668106 | -.2093124 | 5.588437 | n = 35 |
| | within | | 4.356554 | -37.36831 | 25.71459 | T = 16 |
| CF | overall | 20.66627 | 8.4773 | 1.09681 | 59.72307 | N = 555 |
| | between | | 6.211276 | 6.308436 | 34.65688 | n = 35 |
| | within | | 5.903351 | .426654 | 50.01387 | T = 15.8571 |
| EXPG | overall | -.1111318 | 5.599305 | -32.31456 | 31.56396 | N = 521 |
| | between | | 1.010124 | -3.713389 | 1.256617 | n = 35 |
| | within | | 5.50973 | -31.89914 | 31.97939 | T = 14.8857 |
| ODA | overall | 10.67326 | 13.95619 | -.2532269 | 181.1872 | N = 525 |
| | between | | 10.83159 | .5379178 | 60.81595 | n = 35 |
| | within | | 8.976998 | -39.58577 | 131.0445 | T = 15 |
| FDI | overall | 42.89382 | 89.19675 | .056325 | 838.3095 | N = 555 |
| | between | | 84.51725 | 2.946048 | 507.5802 | n = 35 |
| | within | | 30.75144 | -156.2888 | 373.6231 | T-bar = 15.8571 |
| FRDM | overall | 55.05673 | 6.964393 | 24.3 | 77 | N = 513 |
| | between | | 6.635728 | 40.75 | 71.2625 | n = 35 |
| | within | | 2.841416 | 34.75673 | 64.65673 | T-bar = 14.6571 |
| EDUC | overall | 4.18827 | 1.976033 | .8940874 | 9.950614 | N = 560 |
| | between | | 1.946407 | 1.156197 | 8.898328 | n = 35 |
| | within | | .4667639 | 3.101297 | 5.280445 | T = 16 |
| COMM | overall | .0557785 | .1421828 | -.1690861 | .3022497 | N = 560 |
| | between | | 0 | .0557785 | .0557785 | n = 35 |
| | within | | .1421828 | -.1690861 | .3022497 | T = 16 |

8 Conclusion and Policy Recommendations

For several years, the lack of persistent of economic growth in Sub-Saharan Africa even during commodities boom has remained a primary preoccupation for development experts and policy makers. High economic growth, although a necessary condition, is not a sufficient condition in itself to ensure income convergence between Sub-Saharan African countries and the rest of the developing economies. Consequently, socio-economic vulnerabilities in SSA continued unabated and long term sustainability of economic growth remains a daunting challenge. Generally, economic growth of the region remains fragile, not inclusive and sporadic or enclave- based with little or no impact on jobs creation or reducing the number of people in extreme poverty. Such a bleak economic performance of SSA overshadowed the recently emerging "Rising Africa" stories. If left to continue, it may bring back the long-standing view of "Africa Lagging" or "Africa Diverging" stories to the fore of public and policy discourse on the continent.

Generally speaking, formulating and implementing the right policies and strategies that address the root-causes of underdevelopment in Sub-Saharan African countries and divergence from other developing regions requires careful analysis and understanding of key determinants of growth and their degree of influence. This will in turn help identifying sectors with comparative advantages with an understanding of binding constraints. Understanding key sectors of growth potential and binding constraints can greatly assist policy makers in the design, rationalization and realignment of appropriate and targeted incentives aimed at exploiting existing comparative advantages. Interestingly, understanding the nature and behaviour of determinants of economic growth in SSA can provide empirical evidence on the sources or consequences of fragility and vulnerability of economic growth. It can also assist countries in their efforts to squarely deal with those variables that made growth vulnerable to exogenous shocks. For instance, the strong influence of Official

Development Assistance (ODA) and the export sector may be responsible for the inherent vulnerabilities of growth performance to external shocks of countries in SSA. This is because ODA is strongly dependent on the political will and strategic interest of donor countries than economic viability or necessity of such resources to recipient countries. Using panel data covering twenty-three years (1987-2009) and 154 recipient countries, Kim and Oh (2012) examined whether South Korea's ODA reflects recipient nation's needs more than the donor's interest. They found that South Korea provides more aid to higher income developing countries with higher growth rates, which shows the tendency to serve the donor's economic interests. This shows the volatility and vulnerability as well as effectiveness of development aid in supporting poorer nations such as those in Sub-Saharan Africa.

Any interruption in the flow of ODA may cause havoc on economic performances of recipient countries. Moreover, dependence on ODA for development financing can reduce policy space in recipient countries as donors tend to influence or dictate domestic development policies and strategies. In this regard, the primary focus of trade and development policies of African countries should be to reduce their dependence on external sources of public finance. They should put more emphasis on generating domestic resources for financing their development. From the empirical results, dynamic and vibrant export sector (not trade as a whole) is also one of the strongest determinants of economic growth in countries of SSA. However, these countries are known for their heavy dependence on exports of a limited set of primary commodities, with little or no value addition (diversification or transformation). The trend in international primary commodity prices determines or dictates export earnings of the countries concerned. Export instabilities and volatilities in international commodity prices greatly affect the resilience of the economies of SSA to external shocks. Building economic resilience to shocks including through exports diversification- principally via manufacturing (value addition) should be the avenue for inclusive and sustainable economic growth in the countries.

Further interesting finding of the paper is that the role of foreign direct investment in driving economic growth in the SSA was found to be minimal, especially in the short run. There are several underlying reasons or factors that made FDI statistically the least desirable for job creation and poverty reduction in SSA: quality and quantity of FDI flows to the region; FDI governance (perceived risk, balance between outflows and inflows); concentration of FDI in extractive sectors and weakness in sectoral distribution; and high capital intensity or low labour- intensity of such flows to Sub-Saharan African region. This suggests modifications in policies and strategies towards foreign direct investment including better investment targeting and carefully balancing of its distribution across economic sectors outside of the extractive industry; maximizing the employment intensity of FDI and realigning the flows with the overall development objectives of the countries as well as redefining the incentives provided to foreign investors.

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B Countries included in the research

Table 4: List of countries included in the sample

| | | |
|------------------------|---------------|-----------------------------|
| Angola | Gambia | Namibia |
| Benin | Ghana | Niger |
| Botswana | Guinea | Nigeria |
| Burkina Faso | Guinea-Bissau | Rwanda |
| Burundi | Kenya | Senegal |
| Cameroon | Liberia | Seychelles |
| Chad | Madagascar | Sierra Leone |
| Comoros | Malawi | Swaziland |
| Congo | Mali | Togo |
| Côte d'Ivoire | Mauritania | Uganda |
| Dem. Rep. of the Congo | Mauritius | United Republic of Tanzania |
| Gabon | Mozambique | |
