TECHNICAL COOPERATION AND SUB-SAHARAN AFRICA'S DEVELOPMENT DILEMMA

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DECLARATION

I, Adedamola Akeem Siyanbola, hereby declare that this dissertation is my work. The dissertation was submitted to meet the requirements for awarding the degree of Doctor of Philosophy (Ph.D.) in the field of Economics at the University of the Witwatersrand, Johannesburg. I declare that the dissertation has not been submitted before for the award of any degree or examination at this or any other University**.**

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Signature  Date ____18st October, 2022_____

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This thesis is dedicated to the Almighty God, the author, and finisher of my faith; to my wife and children; to my parents and siblings, and all my students all over the world, both present, and past.

ABSTRACT

It has been established by Chenery and Strout (1966) that developing countries do not have sufficient capital that can bring about their much-needed growth and development. In addition to foreign investment (in terms of foreign direct investment (FDI) and foreign portfolio investment), foreign aid has in recent times become a much sought after method of augmenting their stock of capital. This thesis examines the impact of technical cooperation (TC), a subset of foreign aid on the development dilemma that plays out in Sub-Saharan Africa. We chose TC because of its direct impact on development, particularly human development.

This thesis employs a three essay method to achieve its objective. Chapter one and chapter five give the introduction and conclusion of the thesis respectively. The middle chapters examine the impact of technical cooperation on development in the region with the assistance of three interlinked essays. The first examines the role of technical cooperation in the development of human capacities in Sub-Saharan Africa while the second essay looks at the impact of technical cooperation on educational development in the region. The third essay focuses on the role of technical cooperation on health outcomes in Sub-Saharan Africa.

The objective of the first essay is to examine the role of TC in the development of human capacities through the use of the Human Development Index (HDI) of the United Nation Development Programme (UNDP). It further examines whether the impact is predicated on good policy and institutional quality and whether productivity is the transmission mechanism for TC to human development in Sub-Saharan Africa.

We use the Kripfganz (2017) variant of the generalized method of moment (GMM), which permits both linear and non-linear moment conditions and the two-stage sequential regression with analytical second-stage standard error correction of Kripfganz and Schwarz (2015) to analyse our data. Our results show that TC significantly influences human development in Sub-Saharan Africa (SSA). It also enhances policy formulation, coordination, evaluation, and

institutional quality which leads to improved human development. The study also indicates that improvement in productivity is a veritable transmission channel through which TC is routed to human development.

The second paper (Chapter three) examines the effectiveness of technical cooperation on educational outcomes in Sub-Saharan Africa. The study analyses panel data of Sub-Saharan African countries for the period 1996 -2018 based on a dynamic autoregressive distributed lag (ARDL) technique. The result suggests that technical cooperation and institutional quality have a significant negative effect on educational attainment while per capital income and gender inequality have a significant positive effect on educational attainment in SSA. In addition, it was found that the lag of educational attainment affects the current, indicating that there is a consistent relationship between the past periods of educational attainment and the present. The study recommends the need to reposition the institutional and policy environment in SSA countries by instituting a more serious and swift legal prosecution of corrupt cases especially those that have to do with foreign aid and grants for education

The third essay (Chapter four) investigates the effect of technical cooperation on health outcomes in Sub-Saharan Africa. Previous literature has either focused on SDG-related or non-SDG-related health targets but not both. This study estimates a pool of data from Sub-Saharan Africa from 1996 to 2018 via the dynamic panel Generalized Method of Moments (GMM) approach. The estimates of the static model suggest that technical cooperation flows to Sub-Saharan Africa translate to an increase in infant mortality rate and immunization. The result of the dynamic panel model finds that immunization is the only component among all the health targets that increase with technical cooperation in Sub-Saharan Africa. However, government health expenditure shows a significant effect on both the SDG and non-SDG-related health targets tested in the study. It was shown to increase with increased life expectancy, health facilities, and infectious diseases and to decrease with infant mortality rate.

The study emphasises the need to reposition technical cooperation to directly stimulate not only immunisation but also other SDG and non-SDG-related health targets. This may be through a prototype model used in the immunisation programme that engages the local government in the provision of house-to-house technical assistance in areas that can improve life expectancy, health facilities and reduce infant mortality rate and infectious diseases in SSA.

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1.1 Introduction

There is a growing interest in understanding the extent to which foreign aid translate into positive development trajectories for developing countries, particularly Sub Sahara Africa (SSA). Foreign aid has been established as a dominating tool for improving economic development and wellbeing in underdeveloped countries (Yiew & Lau, 2018; Asongu & Ezeaku, 2020). Given the perceived uncertainties and a transition in foreign aid from loans to aid grants and technical cooperation grants, determining their impacts on recipient nations becomes imperative. While most growth literature on the region examined foreign aid in aggregate form, literature that specifically seeks to examine the effectiveness of the two main grant typologies of foreign aid (aid grants and technical cooperation grants) on key inclusive growth and development indicators is scarce (Asongu & Ezeaku, 2020). Technical assistance has gained a prominent role among policy-makers, who regard this type of development co-operation as a demand-driven, highly potent and cost-efficient instrument (European Commission, 2021)

Thus, the central focus of this thesis is to examine how technical cooperation (TC) impacts growth and development trajectories in Sub-Saharan Africa (SSA). Technical cooperation is one of the three major classifications of foreign aid. The other two are programme and project aid. Technical cooperation is a general term covering contributions to development essentially through the provision of guidance and or skills in the form of training and scholarship, specialist personnel, grants for research and other associated costs (Ubi and Ebi, 2021). On the other hand, Bartenev and Glazunova (2013) define development (foreign) aid as a voluntary transfer of capital, skills, knowledge, grants, and loans from donors to receivers and can be military, humanitarian, or development aid. In this thesis, we define technical cooperation to include all resources such as training, advisory services, and other forms of assistance for the creation and

use of services, skills, knowledge, and technology, consultancies, study visits, seminars, human capital transformation, and the delivery of services. These resources, according to Baser and Morgan (2001), could also be in the form of long-term or short-term expertise from home or abroad.

Generally, foreign aid is granted to reduce the savings-investment gap and the import-export gap, that is, deficits in the balance of payment (BOP) and deficits in savings (Anwar & Aman, 2010). However, aid or all forms of developmental assistance are given for many reasons. Aid is sometimes offered for political motives, such as keeping the peace. Others are awarded for particular development goals, such as expanding the capacity of certain businesses, eliminating poverty, or boosting education or health care. Some are also offered for better trade conditions, while others might be donated for humanitarian help in extreme situations like hunger and natural catastrophes (Tamer, 2012). The aggregate measurement of foreign aid is official development assistance (ODA), which consists of many types of aid, comprising, among others, humanitarian or emergency aid and technical cooperation.

The technical cooperation component is a form of aid for the purpose of developmental assistance (Ishnazarov & Cevik, 2017). It is foreign aid or foreign assistance in the form of consultancy services, civilian skill development, or military needs (Tamer, 2012). This means that TC is one part of the complicated, long-term process of human development that is needed to improve broad-based development in Africa and other countries that are not rich.

The 2030 Agenda for Sustainable Development has succeeded in establishing a normative platform that treats development as a universal desire for inclusion and long-term sustainability. (Chaturvedi et al., 2021). Even though there are divergences, most development economists believe that developing countries at the intermediate rung of the development process require huge capital inflows in the form of foreign developmental assistance to drive

sustainable development (Ubi and Ebi, 2021). According to Adamu et al. (2012), foreign aid is capable of accelerating the realisation of a steady-state latent output growth rate by a country with inadequate capital. They also believe that aid is capable of improving the rate of growth in the output of a country because it leads to the transfer of knowledge or know-how and encourages high quality governance and practices. The challenge here is that the extent to which aid flows for about six decades to Africa have achieved the above has not been fully and clearly established in the literature. Easterly (2006) opined that despite spending 2.3 trillion dollars on foreign assistance over the previous five decades, the West has not been able to provide children with twelve-cent medications to prevent 50% of all malaria fatalities, nor have they been able to obtain for impoverished households four-dollar bed nets.

Education is a critical pillar of national prosperity and individual socioeconomic status (El Namrouty et al., 2022). Education is also considered a private good, the consumption of which improves an individual's opportunities and is regarded as a vehicle for differentiation and advancement, (UNESCO, 2021). This implies that those who manage to climb the education ladder are better placed to achieve a higher standard of living and higher returns than others who are not privileged to. However, the endowment and/or availability of these resources is not evenly distributed across countries, geographical groupings, and individuals. According to Sterber and Hultman (2018), people exist and operate in an unequal world. Thus, the share of a person's wealth and possibilities can be fundamentally different from that of others. However, for some countries or regions to come out of the poverty trap, and meet up with the challenges of funding their education they require resources from outside their country or region in form of foreign assistance. Thus, the impact of technical cooperation on educational outcomes is part of the focus of this thesis.

The use of aid became apparent in the aftermath of World War II when the US realised the need to interfere to rebuild Europe in order to make Western Europe stable and formidable

enough to be able to withstand the spread of communist ideology by the Soviet Union. This led to the formulation of the Marshall Plan in 1947, which funneled $12 billion to 16 Western European nations. In later years, foreign assistance became a common weapon for wealthy countries to use in their foreign policy (Tamer, 2012).

Given the growing trend of technical cooperation with a focus on health to countries with insufficient capital for health financing, both the recipient and donor anticipate a significant improvement in SDG-related health outcomes in these countries, including those in Sub-Saharan Africa. It is, however, worrying that the technical assistance has been largely ineffective (Williamson, 2008; Wilson, 2011). Besides, according to the "World Health Organization (WHO)", between 20 percent and 40 percent of global health facilities are squandered (Ssozi & Amlani, 2015). Furthermore, over the last few years, the majority of technical or developmental assistance on health has been focused on SDGs, as aid on SDG-related health components has grown significantly faster than aid in other categories (Dieleman et al., 2016). Liese and Schubert (2009) attributed the rise in developmental assistance to health to SDG-related health components channeled mainly to combating HIV/AIDS, tuberculosis and malaria. In the view of Garret (2007), the majority of the funding goes to stand-alone initiatives including sexually transmitted diseases, malaria, TB, and maternal, infant, and child wellness. Other important elements like nutrition and basic healthcare are overlooked in this stove pipe, reducing total effectiveness.

Meanwhile, both the SDG-related and non-SDG-related health outcomes, comprising of tuberculosis, malaria, HIV/AIDS, child and new-born health, maternal health, infectious illnesses, non-communicable diseases, and sector-wide methods, are all challenges that need to be addressed, and other development assistants are essential to the overall improvement in the aggregate health outcomes. For instance, the growing body of research demonstrating the illness and death caused by inadequate reproductive health access has prompted a push to make

general access to reproductive wellbeing a new Millennium Development Goal (MDG) (Glasier, Gülmezoglu, Schmid, Garcia & Van, 2006).

Also, because conventional vaccinations are inexpensive and have the potential to save lives, vaccination is considered one of the most inexpensive treatments in public health (Ward et al., 2019). Besides, to address the intricacies of health treatments, health care workers (HCWs) are required to have both specific and general technical abilities (Rowe, de Savigny, Lanata & Victora, 2005; Vasan, Mabey, 2016; Chaudhri, Brown, Epstein & Lawn, 2016; Leslie, Gage, Nsona, Hirschhorn & Kruk, 2016). Neglected Tropical Diseases (NTDs), which include sexually transmitted diseases, malaria, diarrhea, and tuberculosis (Moran et al., 2009), are a major public health issue that disproportionately affects people living on less than $2 per day (Hotez, Molyneux, Fenwick, Kumaresan, Sachs, Sachs & Savioli, 2007).As a result, some of the causes ascribed to the neglect of these illnesses include societal shame, great poverty among affected communities, and comparatively reduced mortality (WHO, 2009).

Given the above, the need to examine the extent of the effectiveness of foreign aid, particularly technical assistance on development trajectories in SSA cannot be over-emphasised. The extent to which it has enhanced development in the region needs to be examined, particularly on areas that impact directly on human wellbeing and capacity development. This forms the focus of this thesis.

1.2 Motivation

Africa comprises of nations with varying statuses of development and divergent factors of endowment and continues to confront several developmental challenges (Jawoodeen (2010). Similarly, according to Fosu (2015), extreme poverty remains pervasive in the region compared to other regions. Akinkugbe (2009) opines that theories and policy suggestions for these developmental challenges have passed through phases of paradigms. The conventional wisdom of the past was that the core hindrance to development in Sub-Saharan Africa was a lack of

resources. In response to this, the last six to seven decades have witnessed an influx of financial aid of various species into the region. But unfortunately, literature has not sufficiently established the conclusive effect of financial assistance on economic progress.

According to Klees, Samoff, and Stromquist (2012), the practice is riddled with waste, inefficiency, and corruption. Its fungibility exposes it to corrupt practices and inefficiency. Also, it exhibits negative macroeconomic effects such as disincentives to save, Dutch disease, and volatility. This sometimes makes it a bit slower in addressing the major challenge of SSA's development.

Given these shortcomings of financial aid, the last few decades have been devoted to a deeper search for clarity on the major challenges and hindrances to African development and the possible way out. From the foregoing, the motivation for this study is hinged on the fact that the proximate objective of technical cooperation is to raise the productivity of factors of production while the ultimate objective is to increase self-reliance. Second, the possibility of harmful aid dynamics like "poaching" noted in Akinkugbe (2009) is associated with the negative impact of financial aid in SSA that arises because of low absorptive capacity that needs to be enhanced through TC; otherwise, it is like a case of putting the cart before the horse. It will drive in the wrong direction (see also Berg 1993; Brütigam & Knack 2004).

Third, the paradigm shifts at the "4th High Level Forum on Aid" from aid effectiveness to development, which implies exploring other means of achieving development in addition to aid. Lastly, employing aggregate aid data excludes one from ascertaining the specific type of aid that enhances economic progress and, by implication, prevents donors from knowing the sector to target for aid. These justify our choice of TC as a subset of general aid such that we could critically examine its capacity to influence human development compared to other aid modalities.

It is worth noting also that human capital development has long been emphasized as the most reliable source of economic growth in developing nations' developmental processes (Teixeira & Queiros, 2016). However, many poor nations spend significantly less on human capital development owing to their savings deficit. As a result, foreign assistance is often seen as a complementary tool for achieving economic development (Fashina, Asaleye, Ogunjobi & Lawal, 2018). Aid, despite being a key international tool for poverty reduction, is underutilized and poorly targeted. This is due to the fact that there is much too little help and far too much of it is unrelated to human growth (UNDP, 2005).

Furthermore, donor practices such as requiring the use of specific procurement sources in order to channel funds and work to the donor's preferred contractors, suppliers, consultants, and technical assistance teams have caused the developing world to view project or development financing as benefiting the donor country rather than utilizing local human resources for the program (Cabraal, 2010). This observed decline in living standards in Africa in spite of aid flow has cast doubt on the effectiveness of foreign assistance and its ability to promote the wellbeing of the receiving nations.

Developing nations have been receiving increasing amounts of technical or development aid (ODA) for health objectives since the late 1990s (OECD, 2009). Consequently, health-care spending across countries in the region has been on the increase (Sweeney, Zielinska & La Ragione, 2015; Liu, Guo, Qian, Tang, Li & Chen, 2014). In Sub-Saharan Africa (SSA), all the key categories of health expenditure have experienced an increment since 2000. Health aid accounts for a significant magnitude of the rise in health spending (Ssozi & Amlani, 2015). However, not all infection and health components benefited equally from increased development assistance for health in developing countries (Liese & Schubert, 2009). SSA countries continued to face some of the world's most serious health issues (Akinlo & Sulola, 2018). Most of the cash from the hike in health expenditure to fight the HIV/AIDS pandemic

is leaking away without result (Garret, 2007). This is because, due to layers of financial administration bottlenecks and inefficient medical institutions, not all of the cash authorized is used properly. Furthermore, corruption has allowed a lot of funds to seep out in the form of remunerations to ghost workers, inflated transportation and storage fees, drug misappropriation to the black market, and the selling of fake prescriptions (Ssozi & Amlani, 2015). Thus, the effectiveness of donor support in the form of technical cooperation for health in the receiving nations is now an empirical question (Dieleman et al., 2016)

1.3 Gap in the literature

The notable theory that started the debate on aid analysis was the Chenery and Strout (1966) dual-gap hypothesis. Since then, the debate on the effectiveness of international assistance for economic progress has been heat-generating, with the literature coming to sharply opposing conclusions (Dreher et al., 2008). One major limitation of aid effectiveness analysis that makes it difficult to reach a conclusion is its focus on the aid-growth/development nexus (Dreher et al., 2008). In the same way, donors have said many times that they want to help many people at the same time (Isenman and Ephrenpreis, 2003).

The short-impact aid analysis of Clemens et al. (2004) pioneered the shift towards using disaggregated aid data. However, most studies were devoted to horizontal disaggregation of aid (aid to different sectors like education, health, water, etc.), with few studies on vertical disaggregation (typology of aid). Given the new trend in aid studies (disaggregation), we chose to revisit the imports of the early dual-gap theory. One major area which has not enjoyed as much attention in the literature among the three major prerequisites for development in the theory is ‘skill’. The uniqueness of skill is that it has the potential to unlock other hidden resources that can accelerate economic progress. Hence, the bane of this study is human capital development and not principally economic development. The type of aid that focuses on skill

enhancement and human development is called technical cooperation. Hence, this study focuses on the role of technical cooperation in developing human capabilities.

For paper one, three gaps are clearly identified in the literature on aid architecture and effectiveness. First, aid heterogeneity studies has not sufficiently explored the peculiar role of technical cooperation in human development. Most literature concentrate on aggregate aid. According to Asongu & Ezeaku (2020), most studies and other existing literature merge the two types of aid, which may diminish the advantage of disaggregated aid effects. Second, Burnside and Dollar (1997) opened a new debate on aid effectiveness by suggesting that effectiveness depends on good policy in the host country. However, such a debate has yet to be fully extended to the TC-human development nexus. An early attempt was by Akinkugbe (2009) and a thorough search of relevant peer-reviewed databases did not provide much study in that direction again. In addition, literature remains rather thin on the effectiveness of technical cooperation in enhancing policy and institutional quality in the recipient's country, particularly in line with the SGD 2030 agenda. Finally, literature has yet to sufficiently establish the most effective channel for transmitting technical cooperation to human development, which is necessary for the achievement of the SDGs 2030 agenda.

This thesis also identified three gaps in paper two (chapter three). In most empirical studies on the effects of development assistance, researchers continued to use aggregated data without distinguishing between aid components, commodities, and technical assistance (Axel, Peter, & Rainer, 2006). These studies produce results that are not robust in terms of aid-impact on development (Harms & Lutz, 2005). The few studies that consider different components of aid, distinguishing between project and programme aid or between grants and loans, do not give due consideration to the sectoral dimension of aid (Axel, Peter & Rainer, 2006). According to Asongu and Ezeaku (2020), the literature on the effect of aid grants on growth has been modest to date; however, empirical literature on technical cooperation grants is scarce, and the neglect

persists, despite the fact that both types of foreign aid account for significant portions of aid to the SSA region. We attempt to fill the gap here by examining the effect of a subset of aid (technical cooperation) on educational attainment.

Second, most studies on the determinants of educational outcomes only tried to demonstrate the comparative importance of market factors like per capita income, adult education, school size, and urban development with regard to educational outcomes, while neglecting the implication of production forces such as student-teacher ratio, unit education costs, and public spending on education. To address these issues, this study incorporates public expenditure and institutional quality as determinants of educational outcomes in the analysis. Thus, the inclusion of institutional quality is believed to capture the interaction between institutions and aid.

Third, the study also introduces gender inequality into the model. This is not unconnected to the fact that, in recent times, donors have continued to increase the proportion of assistance resources allocated to the education sector in recipient countries in order to eradicate educational disparities between men and women and help achieve universal primary education (Thiele, Nunnenkamp & Dreher 2006).

We also identified two gaps in paper three (chapter four). Empirical literature on the effectiveness of technical cooperation or health aid as a category or form of technical cooperation has used diverse components of health outcomes covering SDG-related (Liese & Schubert, 2009; Garret, 2007; Wilson, 2011) and non-SDG-related health outcomes (Hsu, Berman & Mills, 2013; Tirivayi & Groot, 2011; Tranchant, Gelli, Bliznashka, Diallo, Sacko, Assima, Siegel, Aurino & Masset, 2018). Despite the diverse health outcomes used in the existing studies, these studies have shown varied outcomes: some research uncovers favorable impacts, while others uncover negative or statistically negligible effects (Ssozi & Amlani,

2015). To the best of the authors' awareness, existing studies on the effectiveness of aid for health have not examined both SDG-related and non-SDG-related health targets combined in one study, with the exception of the study conducted by Ssozi and Amlani (2015), but their focus was on the effectiveness of health expenditure rather than technical cooperation. This study is inspired to address this gap by analyzing the effects of technical cooperation on both the SDG-related and non-SDG-related health targets as well as health facilities in Sub-Saharan Africa.

Because of the gaps in previous research, the goal of this thesis is to answer the following research questions:

i. Does technical cooperation impact positively on human development in SSA?
ii. What is the dynamic relationship between technical cooperation and educational attainment as part of the 2030 SDGs agenda in Sub-Saharan Africa?
iii. What is the impact of technical cooperation on SDG-related health targets and non-SDG-related health targets in Sub-Saharan Africa?

1.4 Objectives

The aim of this research is to examine the impacts of technical cooperation on the growth and development trajectories in the Sub Sahara Africa Countries. Thus, based on SDGs 2030 agenda, the specific goals are to:

(i) Examine the effectiveness of technical cooperation on human development in Sub-Saharan Africa.

(ii) Estimate the dynamic effect of technical cooperation on educational attainment as one of the SDGs in Sub-Saharan Africa

(iii) Investigate the effect of technical cooperation on SDG-related health targets and non-SDG-related health targets in Sub-Saharan Africa.

1.5 Significance/Contribution

This thesis contributes to the empirical and theoretical literature on development assistance. In terms of methodological literature and policy-wise, the outcome of the study is invaluable. Empirical-wise, the study adds to the ongoing debate on aid effectiveness by disaggregating aid into components while exploring the implications of the technical cooperation components on development, particularly human development. This no doubt hopefully helps to reveal the impact of technical cooperation on human capacity development with emphasis on education and health. On the theoretical ground, the existing theories like educational outcomes of foreign aid are explored with the hope of articulating the channels and the environment in which the provision and receipt of foreign aid can be translated to improve human welfare and overall development of recipient countries and the world at large.

The research would aid in a better understanding of the need to prioritize technical cooperation flow as a special case of development aid in Sub-Saharan Africa, as well as its potential in the region's human capability development. The output of this research also seeks to draw government and policymakers' attention to the important role a nation's productivity level and institutional quality play as channels for transmitting TC and enhancing its effectiveness.

This research adds to the general debate on the effectiveness of aid in five dimensions. Even though the general aid effectiveness literature has been over-flogged, the specific effect of different aid types in terms of aid effectiveness when aid heterogeneity is considered is under-studied. More importantly, there is sparse evidence in the area of technical cooperation effectiveness and its implications for human development. We contribute to the literature in this regard. We address this gap by investigating technical cooperation effectiveness and its implications on human development using a more efficient method of data analysis; system GMM and sequential regression. The study's use of the dynamic panel estimation technique would be a significant innovation to the methodologies used in existing aid studies, as it would

help to address the dynamic issues surrounding the provision and utilization of aid, potentially yielding more informed results. In addition, the thesis employed the use of multiple techniques to enhance robustness. Recent literature supports the benefit of various estimation methods for robustness objectives (Asongu et al., 2018; Boateng et al., 2018)

The study highlights the performance of technical cooperation and the challenges limiting its efficiency for policy purposes, allowing the government to put policies in place to address the challenges and improve performance will also be richly blessed by working with donor countries who will be able, through the outcome of the study, to enhance their activities. Finally, the study will provide a reliable source of reference materials for future studies on development assistance and human development.

The study builds on previous and recent studies on developmental assistance, which encompassed millennium development goal (MDG) and sustainable development goal related health targets, but covers a more inclusive set, including the non-sustainable development goal related health targets. The goal is to encourage donors to realise the need to balance the flow of their developmental assistance across both the SDG-related and non-SDG-related health targets since both are important in realising their objective of improving the overall health outcomes in developing countries and to guide policy with the purpose of increasing the efficiency and effectiveness of such developmental assistance.

1.6 Structure of the research

The remainder of the study focuses on three empirical chapters on technical cooperation and how it impacts on development in SSA. Each chapter presents its own conceptual and theoretical framework, empirical literature, method of analysis, findings, conclusion and recommendations. The last chapter presents the summary, conclusion and recommendation of the whole thesis.

Chapter Two

The Role of Technical Cooperation in Developing Human Capabilities in Sub-Saharan Africa

2.1. Introduction

2.1.1 Background

This chapter examines how technical cooperation (TC) impacts economic progress trajectories in Sub-Saharan Africa (SSA). Technical assistance has gained a prominent role among policy-makers, who regard this type of development co-operation as a demand-driven, highly potent and cost-efficient instrument (European Commission, 2021). Technical cooperation is designed to be needs-oriented and to build on partner countries' development priorities rather than on externally defined objectives (DG DEVCO, 2020). According to Mohamed and Mzeea (2017) aid (technical cooperation) can be linked to human development due to its role in filling the domestic resource gap and thus financing public investment in social services directly related to people's lives, thereby improving their living standards. This is significant because it facilitates the accumulation of human capital and, in the long run, leads to inclusive growth and development growth.

Bartenev and Glazunova (2013) define development (foreign) aid as a charitable transfer of resources from donors to beneficiaries, such as products, talents, know-how, grants, and loans, and can be military, humanitarian, or development aid. TC falls within the purview of development aid. For the purpose of this study, technical cooperation includes Training, advisory services, consultancies, study trips, seminars, development of human capabilities, and service delivery are all examples of resources that assist economic progress and the usage of services, skills, knowledge, and technology. Baser and Morgan (2001) suggest that such resources might come in the form of long-term and short-term knowledge from domestic and

international sources. This suggests that TC, as a source of knowledge, is a component of the complicated, long-term process of human growth required to enhance broad-based development in Africa and other developing countries.

TC, as highlighted above, encourages self-sufficiency in underdeveloped nations by increasing their production capacity and local resources, among other things. This is done through enhanced "managerial, technical, administrative, and research capabilities required in the development process". International development partners (IDP) and developed countries through DAC and non-DAC ODA (bilateral and multilateral-undertake capacity and other human development programmes). Bilateral and multilateral institutions in "Africa" (African Development Bank, African Capacity Building Foundation, etc.) are also involved on a large scale in human development efforts in Sub-Saharan Africa (Akinkugbe and Yinusa, 2009a)

Foreign aid has established as a dominating tool for improving economic development and wellbeing in underdeveloped countries (Yiew & Lau, 2018; Asongu & Nwachukwu, 2017; Alimi, 2018; Ugwuanyi, Ezeaku & Ibe, 2017, Asongu & Ezeaku, 2020). Between 1984 and 2018, total net official development assistance and official aid to Sub-Saharan Africa (SSA) was US$ 952.85 billion (World Development Indicators, 2019). The debate about ODA's potential role has dominated recent African development literature. (Mahembe & Odhiambo, 2019; Asongu & Nnanna, 2018; Quibria, 2014; Asongu & Nwachukwu, 2018; Bwire, Lloyd & Morrissey, 2017; Crivelli & Gupta, 2017; Asongu & Nnanna, 2019; Ezeaku, Egbo, Nwokoby & Onwumere, 2019; Asongu & Leke, 2019; Moyo & Mafuso, 2017; Asongu, 2016; Mascagni & Timmis, 2017; Asongu & Ezeaku, 2020). Given the perceived uncertainties and a transition in foreign aid from loans to aid grants and technical cooperation grants, determining their impacts on recipient nations becomes critical. While most growth literature on the region examined foreign aid (or official development assistance) in aggregate form, literature that specifically seeks to examine the effectiveness of the two main grant typologies of foreign aid

(aid grants and technical cooperation grants) on key inclusive growth and development indicators is scarce (Asongu & Ezeaku, 2020).

In terms of natural resource endowment, the African region is among the richest regions in the world in both proven and expanding reserves of oil, gas, and solid minerals (Brosio and Singh 2014). It is also highly endowed with a rich agricultural and arable land mass suitable, to a very large extent, for the production of diversified rain-fed agricultural commodities. Regardless, despite a decade of growth resurgence (early 2000 to late 2013), extreme poverty remains widespread in Africa in comparison to other regions of the world (Caulderwood, 2015; Fosu, 2015). That is, the nearly 2-decade high rate of growth in Africa was largely insufficient and inadequate to guarantee appreciable productive employment and economic diversification across the different countries. Significant proportions of Africa's population, and specifically the youth, are left behind, remain unemployed, and are becoming exasperated by the day.

Given the growth trend of Africa's young population, Roxburgh et al. (2010) conclude that by 2040, the region's labour pool will have grown to almost a billion people, displacing China and India as the world's biggest. Yet, Yogo and Mallaye (2015) find that Africa trails the rest of the world in terms of the Human Development Index (HDI) and other welfare indicators. As a result, Africa's continued placement on the lower rung of the HDI scale implies a poor performance in terms of productive capacity, health, and other social indicators, as well as a rather limited capacity to unlock the potentialities of its active population. The relationship between technical cooperation and HDI has become one of the most hotly debated issues in the last couple of decades, with a wide divergence of opinions.

2.1.2 Motivation

Africa is made up of countries with varying levels of development and disparities in factor endowment, and it continues to face a number of developmental challenges (Jawoodeen, 2010).

Similarly, according to Fosu (2015), extreme poverty remains pervasive in the region compared to other regions. Akinkugbe (2009) opines that principles and policy remedies for these developmental challenges have passed through phases of paradigms. The conventional wisdom of the past was that the core hindrance to development in Sub-Saharan Africa was a lack of resources. In response to this, the last six to seven decades have witnessed an influx of foreign assistance of various species into the region. But unfortunately, literature has not sufficiently established the conclusive impact of financial aid on economic transformation.

Financial aid, which has been the central focus of development assistance in the last five decades is fraught with wastages, inefficiency and corruption (Klees, Samoff, & Stromquist, 2012). It is argued that financial aid limits private sector investment and encourages public sector growth which hinders broad-based growth and development (Bauer, 1972; Friedman, 1958). Ahmed (2012) also finds that it influences the clinching to power of autocratic rulers by increasing the resources available to them for political patronage. Collier (2007) identifies a case where one percent of a particular assistance to a country's ministry of health actually got to the health clinics. Furthermore, a consistent finding from previous studies is that the aid and development nexus follows a diminishing return (Feeny & McGillivray, 2010). Another issue that makes financial aid less efficient compared to technical cooperation is its fungibility, which exposes it to corrupt practices and inefficiency. According to Oya and Pons-Vignon (2010), it exhibits negative macroeconomic effects such as disincentives to save, Dutch disease, and volatility. Finally, it is also highly supply-driven compared to technical cooperation. This sometimes makes it a bit slower in addressing the major challenge of SSA's development.

Given these shortcomings of financial aid, the last few decades have been devoted to a deeper search for clarity on the major challenges and hindrances to African development and the possible way out. A number of forces have been acknowledged, over and above the lack of financial resources. They include institutional weaknesses, skill deficiency, low capacity

development, and poor leadership (Browne 2003; Fields 2015). That is, SSA continues to face critical challenges in terms of developing the skills to harness its resources and bring about structural transformation and economic diversification; having strong and efficient institutions to enhance skill and capacity development through good policies and the rule of law; and having the capacity to manage its resources and good leadership to build strong and efficient institutions.

From the foregoing, the motivation for this study is hinged on the following: First, according to Berg (1993), the proximate objective of technical cooperation (TC) is to raise the productivity of existing stocks of factors of production, while the ultimate objective is to increase self-reliance. TC raises productivity temporarily through skill gap filling and permanently through skill and technical know-how transfer to the local people. The skill enhancement component of TC includes education for all, training on the job, and the development of expertise deepening in crosscutting skills (Berg, 1993). These are the core areas where SSA's development needs attention. Second, the possibility of harmful aid dynamics like "poaching" noted in Akinkugbe (2009) is associated with the negative impact of financial aid in SSA that arises because of low absorptive capacity (see also Berg 1993; Bräutigam & Knack 2004). The absorptive capacity needs to first be enhanced through TC; otherwise, it is like a case of putting the cart before the horse. It will drive in the wrong direction.

Further reinforcement of our motivation is the paradigm shift at the "4th High Level Forum on Aid" from aid effectiveness to development effectiveness. This implies exploring other means of achieving development in addition to aid. TC comes in handy in this regard. Also, according to Asiedu (2014), employing aggregate data for aid analysis presupposes that all categories of aid affect growth in the same way and can lead to spurious regression results. Hence, employing aggregate aid data excludes one from ascertaining the specific type of developmental assistance that enhances economic progress and, by implication, prevents donors from knowing the sector

to target aid. These justify our choice of TC as a subset of general aid such that we could critically examine its capacity to influence human development compared to other aid modalities.

2.1.3 Technical Cooperation and ODA flows: A brief overview of Recent Statistics

A further motivation for this study is the recent data on Technical Cooperation and ODA to SSA that highlights the growing importance of TC and hence the need for a more critical assessment of intensity, direction, use and effectiveness.

OECD (2020) reveals that net official development assistance (ODA) to SSA in 2018 was $52.66 Billion while net technical cooperation (TC) to Africa as a whole was $4.29 Billion. The ratio of technical cooperation to ODA in 1996 was 17.6% but fell to 6% in 2017 (OECD, 2020). This is a source of concern for policy makers and academicians to unravel the implication of the declining trend of technical cooperation as a component of development assistance to SSA as compared to ODA on development trajectories of SSA countries. Figure 1 shows the wide margin between ODA and technical cooperation in SSA. Without any doubt, ODA has been the largest chunk of development assistance to SSA particularly as from the turn of the century. Even when ODA peaked at almost $28, 767m in 2006, TC was still about $6,558m.

A closer look at ODA per capita and TC per capita in Figure 2 shows a fluctuating trend. However, TC per capita does not follow the trend of ODA growth. While ODA per capita hover in upward direction, TC per capita hover downward but was less volatile. Conversely, TC as ratio of gross national income in Figure 4 was constant and hover near zero through-out the period. In Figure 3 ODA as ratio of life expectancy also shows a fluctuating trend hovering upward while TC as ratio of life expectancy and primary completion rate was constant hovering

near zero through-out the period. These are subtle indications of better correlation between technical cooperation and the selected human development indicators

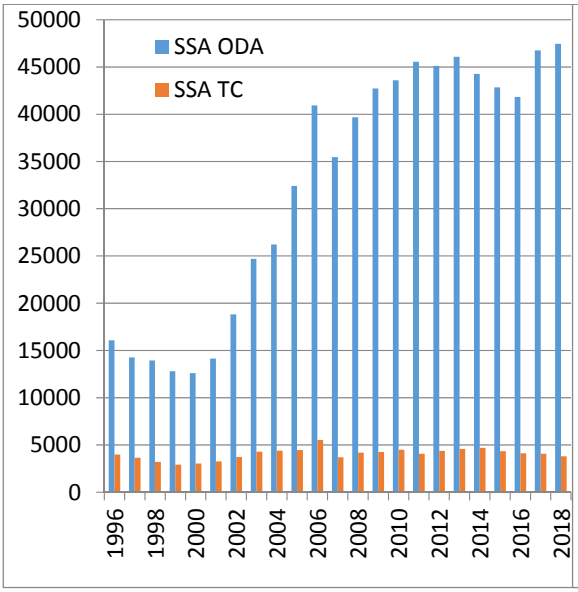

Fig.1: TC and ODA in SSA (1996-2018)

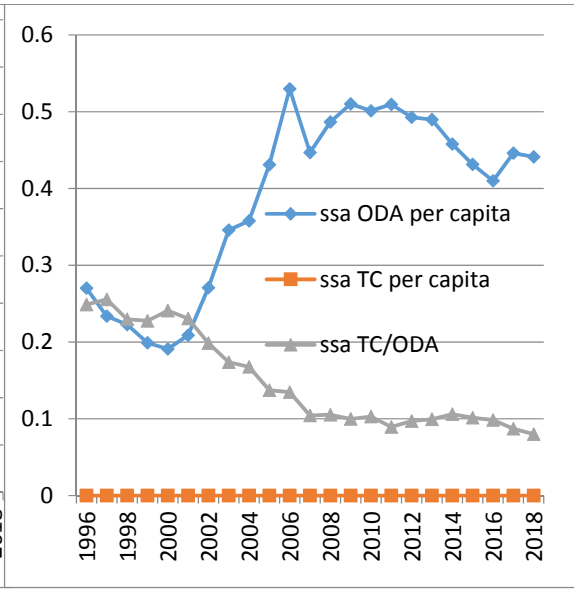

Fig.2: TC Per Capita, ODA Per Capita and TC as ratio of ODA in SSA (1996-2018)

Source: OECD Stat., 2020

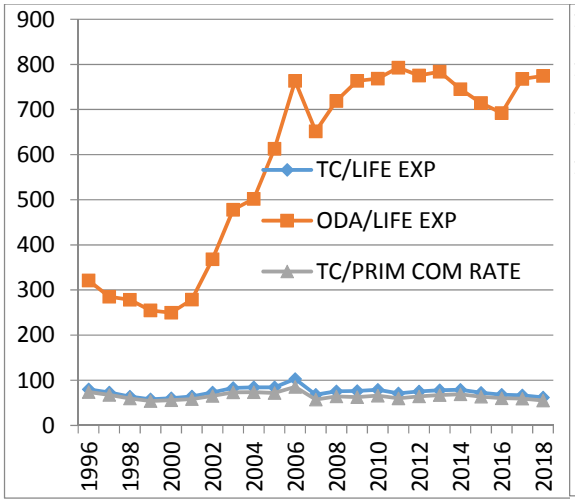

Figure 3: TC as ratio of life expectancy and primary completion rate, ODA as ratio of life

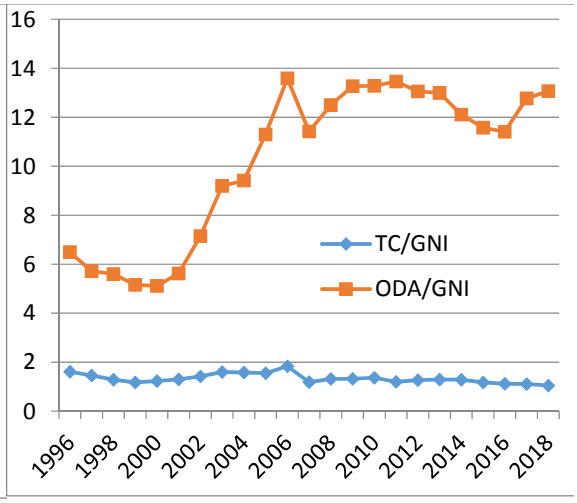

Figure 4: TC as ratio of GNI and expectancy and primary completion rate ODA as ratio of GNI

Source: OECD Stat., 2020

Figures 5 and 6 shows the flow of TC and ODA to SSA compared to other regions and developing countries as a whole. Statistics from the two diagrams and related evidence indicated that Sub-Saharan Africa received more TC than other regions. The question is why does SSA continue to perform poorly on several indicators of development relative to the other continents. This may be connected to the weak institutional framework, low human capital development and poor leadership in SSA. As noted by Aryeetey et al (1998), the reason for SSA's dismal performance may lie in a low skill-to-land ratio. Akinkugbe (2009) opined that human capacity is one of the earliest multiplying factors in the process of growth and, as such its upliftment remains a necessary condition, a *sine qua non* for more efficient use of resources.

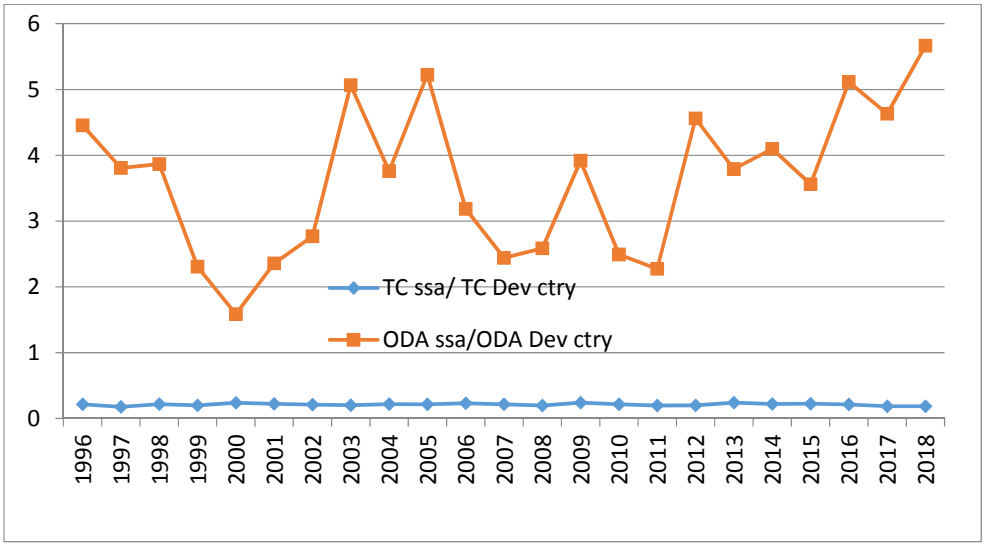

Figure 5: SSA Technical Cooperation as ratio of developing countries Technical Cooperation, SSA ODA as ratio of SSA developing countries ODA

Source: OECD.Stat, 2020

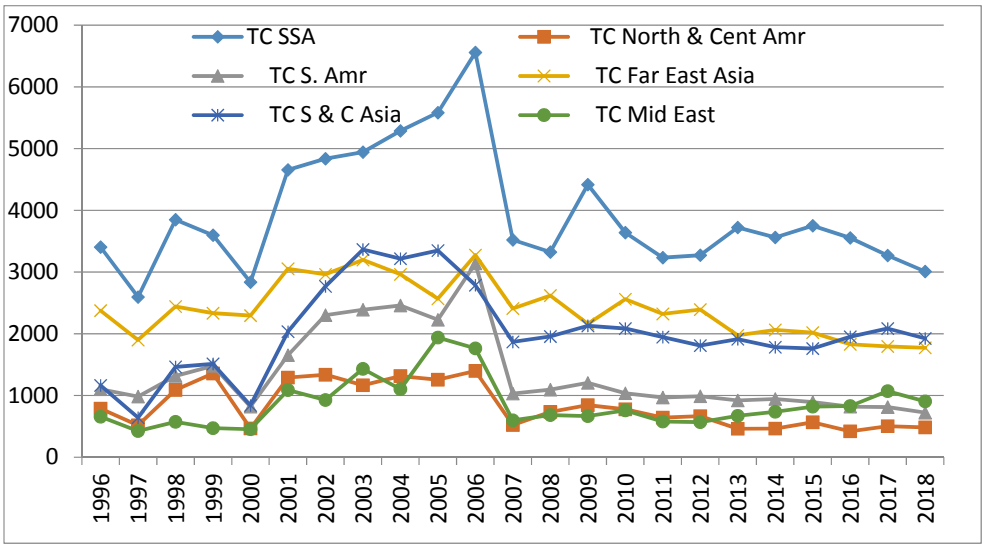

Figure 6: TC across regions

Source: OECD. Stat, 2020

This study focuses on Sub-Saharan Africa because the region, in recent times, is experiencing a declining trend in TC compared to ODA as components of development assistance. Also, despite receiving more TC than other regions, even with the declining trend of TC in the region, SSA continues to perform poorly on several indicators of development compared to the other regions, as evident above. Meanwhile, the region's poor performance may not be unconnected with the weak institutional framework, low human capital development, and poor leadership in SSA. Consequently, this study explores the impact of TC on human capabilities since skill enhancement and human capacity development have been regarded as a precondition for better economic performance and a sine qua non for more efficient use of resources (Aryeetey et al., 1998; Akinkugbe, 2009). Although the earliest strategy of economic progress was predicated on capital accumulation, and later attention was on economic development with advocacy on the quality of the growth process, in recent times, the attention of policymakers has shifted towards the need to develop human capabilities (UNDP, 2013). In addition, we focus on SSA because education attainment is lower in SSA compared to other regions. The region is home to more than 40% of working out-of-school children with lower literacy rates (Asiedu,

2014).The flow of aid into the region is also a reflection of the international community's interest in SSA. In addition, the workability of policies and strategies differs from region to region. According to Dawson et al. (2016), "green revolutions" were successful in Asian and Latin American countries during the 1960–90 period but not so in SSA. Hence the need to evaluate the effectiveness of technical cooperation aid in the region. Finally, as opined by Asiedu (2014), policymakers in Africa believe that results and policy prescriptions based on findings from other regions are not applicable to SSA and, as such, have no credibility for their policy making. Therefore, to birth an appropriate policy prescription for the region, the need for sufficient findings based on studies conducted in the region cannot be over-emphasised.

2.1.4 Gap in the literature

Post-World War II programmes of foreign assistance have replaced colonial relations, with economic and social development as the focus. This trend was birthed with the launching of the "Marshall Plan" by President Truman of the US in 1948. Also referred to as the European Recovery Programme, the plan aimed to provide aid to fund the rebuilding of Western Europe to the tune of $15 billion. Theories and analytical evaluations of the effects of this aid, particularly on the developing economies, began to spring up around the 1960s.

The notable theory that started the debate on aid analysis was the Chenery and Strout (1966) dual-gap hypothesis. They believe that to transform a poor, stagnant economy into a viable one, there must be an increase in savings and investment, the introduction of more efficient machinery, a significant shift in the mix of production and employment, and the creation of new institutions, etc. In essence, the major pre-requisites to development in developing economies are skill, savings, and foreign exchange. Unfortunately, these also double as the resources lacking in such economies. According to the theory, the introduction of foreign aid will increase developing countries' stock of resources. This was soon subjected to empirical analysis.

The debate on the effectiveness of developmental assistance in promoting economic progress has been heat-generating, with the literature coming to sharply opposing conclusions (Dreher et al., 2008). However, they believe that the earlier literature tends to neglect the fact that different components of aid may not produce the same kind of economic effects on recipient countries. One major limitation of aid effectiveness analysis that makes it difficult to reach a conclusion is its focus on the aid-growth/development nexus (Dreher et al., 2008).In the same way, donors have said many times that they want to help people grow and improve (Isenman and Ephrenpreis, 2003).

The short-impact aid analysis of Clemens et al. (2004) pioneered the shift towards using disaggregated aid data. And soon, others followed. However, most studies were devoted to the horizontal disaggregation of aid (aid to different sectors like education, health, water, etc.). Few studies have been done on vertical disaggregation (the typology of aid). Given the new trend in aid studies (disaggregation), we chose to revisit the imports of the early dual-gap theory. One major area which has not enjoyed as much attention in the literature among the three major prerequisites for development in the theory is skill. The uniqueness of skill is that it has the potential to unlock other hidden resources that can accelerate growth and development. In addition, investment in skill or capacity building brings about almost a lifetime stream of benefits. Except in the case of license revocation or death, a trained doctor is a doctor for file.He only needs to upgrade himself if he wishes to specialize further. Skill enhancement improves human development. Hence, the focus of the study is on human development as opposed to economic development.

The type of aid that focuses on skill enhancement and human development is called technical cooperation. Hence, this study focuses on the role of technical cooperation in developing human capabilities.

Three gaps are clearly identifiable in the literature on aid architecture and effectiveness. First, aid heterogeneity studies do neither effectively capture nor reveal the special role of technical cooperation in human development. Most studies focused on financial aid, even when the impact on human development indicators such as educational outcomes, health outcomes, and so on was assessed. Also, past studies have produced mixed results on how aid is linked with human development (Mohamed and Mzee, 2017). Second, Burnside and Dollar (1997) opened a new debate on aid effectiveness by suggesting that effectiveness depends on good policy in the host country. Several authors have contributed in this regard. However, such a debate has yet to be fully extended to the TC-human development nexus. In addition, literature remains rather thin on the effectiveness of technical cooperation in enhancing policy and institutional quality in the recipient's country, coupled with the international agenda for the SGD 2030. Finally, literature is yet to sufficiently establish the most effective channel for transmitting technical cooperation to human development, which is necessary for the achievement of the SDGs 2030 agenda.

Given these lacuna in previous studies, this research aimes to answer the following research questions:

a. Does technical cooperation impact positively on human development in SSA?
b. Is the effectiveness of technical cooperation on human development in SSA predicated on good policy and institutional quality and to what extent does technical cooperation impact positively on policy and institutional quality in Sub-Saharan Africa?
c. Is improvement in productivity a veritable channel through which technical cooperation is transmitted to human capacities in Sub-Saharan Africa?

2.1.5 Objectives

The aim of this research is to evaluate SSA's growth and development trajectories that may have been the direct and/or indirect results of technical cooperation's flow into the region in the last five decades, using HDI as a proxy for development. Thus, based on SDGs, the specific aims are to:

(i) Examine the effectiveness of technical cooperation on human development in Sub-Saharan Africa;

(ii) Examine whether the effectiveness of the impact of technical cooperation on human development in SSA is predicated on good policy and institutional quality;

(iii) Examine whether productivity is a veritable channel through which technical cooperation effect is transmitted to human development in SSA.

2.1.6 Significance/Contribution

The research would aid in a better understanding of the need to prioritize technical cooperation flow as a special case of development aid in Sub-Saharan Africa, as well as its potential in the region's human capability development. The output of this research also seeks to draw government and policymakers' attention to the important role a nation's productivity level and institutional quality play as channels for transmitting TC and enhancing its effectiveness.

This study adds to the general debate on the effectiveness of aid in five dimensions. Even though the general aid effectiveness literature has been over-flogged, the specific effect of different aid types in terms of aid effectiveness when aid heterogeneity is considered is under-studied. More importantly, there is sparse evidence in the area of technical cooperation effectiveness and its implications for human development. We contribute to the literature in this regard. We address this gap by investigating technical cooperation effectiveness and its

implications on human development using a more efficient method of data analysis; system GMM and sequential regression.

The remaining part of this research progresses in the following order: A review of theoretical and previous studies is undertaken in Section Two, while the theoretical framework and methodological procedure are set out in Section Three. Section Four discusses the results, while in Chapter Five we present our conclusion and policy remedies

2.2 Literature Review

2.2.1 Technical Cooperation: Conceptual Formalization and Earlier Literature

2.2.1.1 Technical Cooperation

According to Cabraal (2010), assistance is seen by the "Development Assistance Committee (DAC)" as financial flows, technical assistance, and commodities designed with the major goal of promoting economic progress and well-being (excluding military or other non-developmental commitments) offered in the form of grants or sponsored loans. After World War II, the United States realized that it needed to intervene to rebuild Europe in order to have a stable and formidable Western Europe that could withstand the spread of communist and Soviet Union ideology. This led to the formulation of the Marshall Plan in 1947, which funneled $12 billion to 16 Western European nations. In recent years, foreign assistance has been a common weapon for wealthy countries to use in their international policy (Tamer, 2012). Between 1950 and 1970, a number of foreign initiatives were launched, including the "UNDP in 1965, the International Development Association (IDA) in 1960, and the OECD's Development Assistance Committee (DAC) in 1961," all of which assisted in focusing on the decision-making strength of the developmental assistance regime of advanced nations (Jean-Philippe, 2002). Foreign aid has been around for a long time in poor countries, and most of it comes from businesses, missions, and migration (Adane, 2015).

The aggregate measurement of international aid is official development assistance (ODA), which consists of many categories of aid such as humanitarian or emergency aid and technical cooperation. The technical cooperation component is a form of aid for the purpose of developmental assistance (Ishnazarov & Cevik, 2017). It is foreign aid in the form of "civilian or military goals, technical help in consulting and training" (Tamer, 2012). It is all "training, advisory services, human resource development, and service delivery are all resources that assist the development and usage of services, skills, knowledge, and technology. Long-term and short-term competence from domestic and international channels, as well as coaching, materials and machine support, consultancies, study visits, and workshops assistance to national authorities aimed at assisting them in setting national initiatives aimed at poverty reduction "(Baser & Morgan, 2001).

The Organisation for Economic Cooperation and Development/Development Assistance Committee (OECD/DAC) defines two broad strands within development cooperation:

“The first comprises physical infrastructure, including the buildings, utilities, transport and machinery necessary for production. The second consists of the skills and productive aptitudes available in the economy. Technical co-operation (TC) addresses the second strand, and comprises activities designed to increase the capacity of developing countries. It can in turn be divided into two categories, since the increase can be achieved either through direct supply of skills from outside, or by efforts to enhance the capacities of the local population.” (OECD, 2006, p. 112)

Within this, the OECD divides up the TC into three categories (OECD,

2006, p. 112):

- Study assistance through scholarships and traineeships;

- Supply of personnel, including experts, teachers and volunteers, from the donor country, or funding of such personnel from the recipient country or other developing countries (South-South co-operation);
- Research on the problems of developing countries, including tropical crops and diseases.

2.2.1.2 South-South and Triangular Technical Cooperation

After having experienced a phase of demobilization in the 1980s and 1990s (Lachini, 2006; Morais, 2009), "South-South Cooperation (SSC) has re-emerged in the 2000s as a multifaceted force in international relations and agenda" (Leite et al., 2015). South-South Cooperation refers to "practices such as coalitions aimed at enhancing the bargaining power of developing countries in multilateral negotiation, trade investments, technological and scientific cooperation, regional integration, and south-south aid or south-south development cooperation." According to Scott (2009), a major consensus in the South-South Cooperation literature suggests that the core objective of TC is capacity building. To this end, Goodfrey et al. (2009) believe that all technical cooperation should be linked to capacity building.

South-South Cooperation has its own distinct characteristics and values. According to Alden et al. (2010) and Golub (2013), the approach of the SSC is founded on "third world solidarity, horizontal exchange, mutual respect, and complementarity." Abdenur and da Fonseca (2013)Amanor and Chichava (2016) find that SSC is making development cooperation increasingly multilateral and multipolar. Lin and Wang (2015) observe that SSC/TC‘s framework is a core condition but not of globalisation. Another noticeable feature of SSC is that it merges modern investments with the traditional symbol of third world solidarity, as in the case of China and Africa (Scoones et al., 2016).

Although South-South Corporations (SSC) and Triangular Technical Cooperation (TTC) have come a long way, they are still faced with some challenges. According to Zahran (2011), the challenges include: lack of a uniform definition; lack of specialized intra-agency support structures; inadequate overall SSC governance; poor implementation of rules and advice; a lackluster reporting system under functioning; an ambitious mandate not matched with resources; and a lack of coherent strategy and policy, among others. Abdenur (2015) examines the organization and structure of the Brazilian SSC as it relates to the politics of cooperation. He finds that the organizational structures involved in "Brazilian SSC are tightly interfaced with the political motivations behind the provision of such cooperation." Hasono (2013) evaluates the significance of SSC/TTC on capacity building using a case study of the PROSAVANA project that is implemented by the Japan-Brazil Partnership Programme (JBPP) as a full-scale triangular cooperation. He concludes that where SSC/TC has a cooperative advantage over other forms of TC, it should be maximized. The paper stresses a cooperative process of mutual learning and co-creation of creative solutions (both technology and systems) based on a deep understanding of the challenges at hand. He believes this perspective presupposes endogeneity and inclusiveness in capacity development.

2.2.2 Theoretical Review

The aid effectiveness discussed in the last five years has now been dominated by kinship models, in which development assistance is conditional, requiring a term of aid engagement (Jensen & Paldam, 2006). These two models are the "good policy model" and the "medicine model," which are perceived as being the most prominent paradigms of aid effectiveness (Hudson, 2004). The Good Policy Model, which claims that assistance provides programs an additional push, is the most prominent. Solid economic measures improve, whereas poor policies deteriorate. As a result, help should be focused on nations with sound policies (Jensen & Paldam, 2006). A number of funders, especially the "World Bank," have adapted their

assistance programs to fit the model. Dollar and Burnside's (1996, 2000). The Good Policy Model contains two relationships, the second of which determines the Good Policy Index, Zit. It is scaled such that z0 in nations with terrible policies and z > 0 in nations with excellent policies, with a mean for all nations of roughly 0 "(Jensen & Paldam, 2006). Hadjimichael et al. (1995) introduced the Medicine Model, which was popularized by Tarp and Hjertholm (2000). The "Medicine Model" incorporates both help with a positive sign and aid squared with a negative value. Aid benefits all nations, but only up to a point, according to the model. More assistance is becoming progressively dangerous. As a general defense against help, it should be supplied according to GDP and never exceed the optimum dosage (Jensen & Paldam, 2006). According to the paradigm, help works when provided in the proper amount, but causes damage when given in excess.

2.2.3 Empirical Review

The argument about foreign assistance effectiveness in engendering economic progress, which is generally referred to as the aid effectiveness debate in the literature, is still raging. The role and effectiveness of aid, or development assistance in general, has been repeatedly questioned right from the beginning of its establishment (Andrzejczak and Kliber, 2015). The challenge of this study, however, is that aid or foreign assistance is usually treated as a lump sum, whereas it has many components and flows through three major media. Aid can come in the form of loans, grants, or technical cooperation. These different types of aid have different goals and targets, and aggregating data to analyze their effectiveness cannot give valid empirical results. This study deviates by focusing on technical cooperation. However, literature on general aid will still be reviewed to capture the contemporaneousness of the debate. As noted by Sawada (2012), only a few studies consider the heterogeneity of aid, and as such, the evaluation of the effectiveness of TC aid on human development is still green. This is corroborated by Scott

(2009), who noted that much of the literature on aid effectiveness is indirectly relevant to TC because the literature on TC is a subset of the aid effectiveness discourse.

To this end, this study looks at the following areas to help position its research within the framework of the debate: We review literature directly related to our course. These include studies on south-south and triangular technical assistance (SSC/TTC), as well as studies that are biased in favor of or against TC/aid effectiveness.

The foundation for aid-development protagonist study was laid by Papenek (1973) and Levy (1988). They conclude that aid engenders growth through the instrumentality of saving, financing, investment, and capital stock. Furthermore, they submit that aid leads to productivity boosts through health and education programmes, coupled with the positive effect of the transfer of knowledge and technology. Gibson et al. (2015) argue that technical assistance has both positive and negative effects on the democratization process. They conclude that in earlier periods, aid increased the assistance provided for patronage, but not in the 1980s and 1990s. They disaggregate aid data and conclude that technical corporation is connected with a higher level of donor monitoring than other assistance modalities and should have a little impact on reducing fungible resources and fostering liberalization.

In examining the extent to which technical assistance has impeded or catalyzed democratization in Africa, particularly in the 1990s in an earlier study, Gibson et al (2014) argue that after the Cold War donors increased their use of technical assistance in aid packages, improving development monitoring capacity and as a result reduce autocrats' ability to use aid for patronage. They use the Arellano-Bond estimator with data covering 14 years from 1985 to 1998 and estimate this with respect to the panel data set of all SSA countries. They find that technical assistance offers an explanation as to the timing and extent of Africa's democratization, even when other factors might have played a core usefulness in the region's

political liberalization. They conclude that increased levels of technical assistance reduce African incumbents' patronage resources, which eventually drives them to negotiate political and economic rights to secure political positions. Some other studies have also suggested that technical assistance may have positively influenced the democratization process in Africa, which invariably spills over to good governance and, by implication, to economic and human development (e.g., Resnick and Van de Walle, 2013, Gibbon et al., 1992; Nelson, 1990). This is a case of indirect influence on the course of this study.

Sauda et al. (2012) construct logistical and experimental models. They employ the nonlinear least square regression approach to evaluate the model, utilizing layered specification. They discover that TC enhances the transfer of technology from developed to underdeveloped nations. Hanson and Tarp (2000) undertook a meta-analysis of thirty (30) articles published between 1968 and 1988. They discovered that foreign aid boosts investment in recipient nations. They undertake a fresh analysis using new data encompassing 56 countries from 1974 to 1993 and discover that foreign aid enhances the level of investment in recipient nations. According to Mogilevsky and Atamonoy (2008), TC has had a substantial influence on the development of nongovernmental stakeholders' and civil society's capabilities. They point out that this did not impose an agenda on them since they addressed domestic concerns and articulated the perspectives of domestic interest groups without excessive donor influence. They also discovered that TC has had a significant influence on the growth of local consulting sectors, stating that the bulk of local consulting experience was developed as a result of TC.

In furtherance of efforts to make technical cooperation more effective, three years after the Paris Declaration on Aid Effectiveness, the OECD conducted a study on the level of TC effectiveness viz-a-vis the post Paris Declaration (aside from the general aid effectiveness study) and found that donors' efforts have made some important contributions in improving TC effectiveness, although difficulties still abound (OECD, 2008). In the same vein, Fcyzioglu

et al. (1998) examine the effect of foreign assistance on investment and find that foreign assistance significantly affects investment in a positive way. They used a sample of 38 countries for a period of 20 years (from 1971 to 1990). Their findings are supportive of aid effectiveness. Other studies that find a direct relationship between foreign assistance and economic progress include Durberry et al. (1998), Dalgaard and Hanson (2000), and Hanson and Tarp (2000 and 2001).

Foreign assistance has started getting better since almost inception. This anti-aid stance started with the writings of Friedman (1958) and Bauer (1972). Their call for the cancellation of foreign assistance was hinged on the following premises: that it leads to corruption, limits private sector investment and encourages public sector growth, which eventually hinders growth and development. The submissions of Friedman and Bauer were later subjected to empirical analysis by Griffin and Enos (1970), who found a negative relationship between foreign assistance and growth for twenty-seven countries using simple correlation analysis. Some studies have suggested that foreign assistance has influenced the clinching to power of autocratic rulers by increasing the resources available to them for political patronage. Andrzejczak and Kliber (2015) contend that the motivation of donor countries is a crucial factor in development assistance. They estimated a series of dynamic models to determine whether poverty-related factors play a dominant role in the distribution of assistance, but discovered that political and economic dependence, colonial history, and oil and gas reserves are the primary motivators.

Aid money sent directly to a non-governmental organization or a project coordinator, for example, tends to have significantly different consequences than direct budget support to a government institution, according to the literature (Wright and Winter, 2010). Also, Tew (2013) did not feel convinced that TC had achieved its objective, particularly in the area of

capacity building. Other studies that concluded the same way include Wangwe and Madete (2002); Culpeper and Morton (2008); Kelgama and de Mel (2007); etc.

In a quantitative study of technical cooperation, Mogilevsky and Atamanov (2008) discovered that TC has begun to diminish overtime in the poorest nations, as well as a reduction in TC per capita in Africa and LDCs. They also discovered that the bulk of TC comes from a limited number of donors and that TC is mostly used in the social sector. According to Oxford Policy Management (OPM, 2003), TC is also donor-driven, but detached from recipient-country needs and market principles. Easterly, Rajan, and Subramanian are three additional significant opponents of foreign aid (2008). They use a cross-sectional and panel data framework to create credible exogenous instruments for foreign aid during a time span of 1960 to 2000, divided into four time periods. They found scant evidence of a strong link between foreign aid and economic development. Similarly, they find little or no evidence that help succeeds under most of the criteria often described in the literature, such as a better policy or institutional environment, geographic context, or that one kind of assistance performs better than the other.

Easterly (2001 and 1999) attempted an empirical test of the two-gap model and discovered that foreign aid has no significant effect on growth.In furtherance of his research, he made a case study of Zambia and revealed a difference between the growth line predicted by the two-gap model and the actual growth line of Zambia. This substantiated his claim that aid has no effect on growth.He stresses further that there are two possibilities. One, the fungible aid did not go into investment as expected, and two, those that did go into investment did not translate into economic growth.

Boone (1996) analyses the impact of foreign assistance on a number of macro-economic variables and different development indicators and finds that there is no significant positive relationship between foreign assistance and investment and economic growth in recipient

countries. During the years 1971–1990, he conducts research in 96 countries. His findings show that foreign assistance does not significantly affect all the indices usually proposed as justification for assistance policy. Morgan and Baser (1992) attempt an analysis of the means of making TC more effective by employing the use of new approaches by the international world. TC is also plagued by a lack of sustainability and a lack of skills.

A common outcome of previous studies is that aid-growth relationships are subjected to diminishing returns. The implication is that the returns to growth of foreign assistance are not constant and, in most cases, do not increase proportionately. Hence, according to Collier (2006), doubling assistance to Africa, for instance, will not have a double impact on growth.

2.3 Theoretical Framework and Research Methodology

2.3.1 Theoretical framework

Literature abounds on the means through which aid impacts growth. However, according to Bhattarai (2016), clear specification of and a consensus on the theoretical model for the TC component are yet to emerge in the development literature. This section makes an effort to build an analytical general equilibrium model to explain the aid/technical cooperation channel of growth and development, the foundation being the famous neoclassical growth model. The model formulated is an adaptation of Bhattarai (2016)'s aid-growth model with modifications from Park (2006) and Hansen and Tarp (2000)'s human capital-growth and aid-saving-growth models, respectively. The conceptualization begins with the idea that growth is motivated by the productivity of capital, savings rate, and population growth, which accounts for the growth of labor and technology advancement.

(1) $$Y(t) = K(t)^{\alpha} \; [\, A(t)\, L(t) \,]^{1-\alpha}$$

Where $0 < \alpha < 1$, α is output elasticity of capital and $1-\alpha$ is output elasticity of labour.

We start by dividing the world into two, the developed economies (DE) and the less developed economies (LDE) represented by Sub-Saharan African economies in this instance. The DEs are mostly members of the OECD with more stable and well developed economies, usually with high labour productivity and technologically more advanced. The SSA economies are either underdeveloped or are in the developing stage and are usually constrained in their developmental efforts mostly by low capital and human productivity (in terms of skills and physical capital availability). Let subscript *d* denote DE and *p* denote SSA. Assuming the growth rate of DE is denoted by g_d and starting from the initial income $Y_{d,0}$, its level of income at time *t* will be Y_{dt}:

(2.a,b) $$Y_{d,t} = Y_{d,0} e^{g_d t} \quad , \qquad Y_{p,t} = Y_{p,0} e^{g_p t}$$

Given the neoclassical background, the growth rate in both countries is influenced by the capital output ratio (COR):

(3.a,b) $$g_{d,t} = g\left(\frac{K_{d,t}}{Y_{d,t}}\right) \quad , \qquad g_{p,t} = g\left(\frac{K_{p,t}}{Y_{p,t}}\right)$$

Assuming the COR, *v* is constant, the production growth rate in both economies will be given as

(4.a,b) $$g_{Yd,t} = \frac{\dot{Y}_{d,t}}{Y_{d,t}} = v\,\frac{\dot{K}_{d,t}}{Y_{d,t}} \quad , \qquad g_{Yp,t} = \frac{\dot{Y}_{p,t}}{Y_{p,t}} = v\,\frac{\dot{K}_{p,t}}{Y_{p,t}}$$

Similarly, the saving rate is a constant function of output in both countries

(5.a,b) $$S_{d,t} = s_d Y_{d,t} \quad , \qquad S_{p,t} = s_p Y_{p,t}$$

Capital accumulation in the two countries takes the following:

(6.a,b) $$K_{d,t} = (1-\delta_d)K_{d,t-1} + I_{d,t} \qquad \text{and} \qquad K_{p,t} = (1-\delta_p)K_{p,t-1} + I_{p,t}$$

The net investment ($I_{d,t}$) in DE equals saving minus depreciation minus foreign outflows to LDEs

(7) $$I_{d,t} = S_{d,t} - \delta_d K_{d,t-1} - \theta_d Y_{d,t}$$

Similarly, net investment ($I_{p,t}$) in SSA equals saving minus depreciation plus foreign inflows from DEs

(8) $$I_{p,t} = S_{p,t} - \delta_p K_{p,t-1} + \theta_d Y_{d,t}$$

$\theta_d Y_{d,t}$ can be broken down as:

(9) $$\theta_d Y_{d,t} = A_t + F_t: \quad \text{where } A_t = F_a + T_a \quad , \quad F_t = F_{p,t} + F_{o,t}$$

where A_t= aid, F_a= Financial aid and T_a= Technical assistance or Technical cooperation, F_t=foreign inflows, F_p= foreign private inflow like FDI and F_o=other foreign inflows like remittances. Hence the net investment in SSA can be re-written as:

(10) $$I_{p,t} = S_{p,t} - \delta_p K_{p,t-1} + (F_a + T_a + F_{p,t} + F_{o,t})$$

Since aid is usually tied and colonial affinity is subtly reflected in SSA aid modality, let $\theta_p Y_{p,t}$ represent the reverse flow from aid and other foreign inflows. Also, SSA countries export more primary commodities that command lesser and fluctuating prices at the international market. The implication of this is that negative net investment is possible in the SSA. Hence the net investment is given as:

(11) $$I_{p,t} = S_{p,t} - \delta_p K_{p,t-1} + \theta_d Y_{d,t} - \theta_p Y_{p,t}$$

The term $\theta_d Y_{d,t} - \theta_p Y_{p,t}$ represents the net gain from aid, technical cooperation and other foreign inflows. The net investment in DEs will also be given as:

(12) $$I_{d,t} = S_{d,t} - \delta_d K_{d,t-1} - \theta_d Y_{d,t} + \theta_p Y_{p,t}$$

In a nutshell, the economy that gains or loses is determined by the value of the term $\theta_d Y_{d,t} - \theta_p Y_{p,t}$

- The DE gains more if $\theta_d Y_{d,t} - \theta_p Y_{p,t} \prec 0$
- The SSA gains more if $\theta_d Y_{d,t} - \theta_p Y_{p,t} \succ 0$
- No gain or nil net effect of aid or other foreign inflow if $\theta_d Y_{d,t} - \theta_p Y_{p,t} = 0$

Concentrating on the SSA and analyzing the impact of aid on domestic savings and its implication on how macroeconomic effectiveness of aid is assessed, we recall from equation (5) that $g_{Yd,\,t} = \frac{\dot{Y}_{d,\,t}}{Y_{d,\,t}} = \nu \frac{\dot{K}_{d,\,t}}{Y_{d,\,t}}$ and allowing for constant depreciation rate of capital:

$$g_{Y_t} = \nu \frac{\dot{I}_t}{Y_t} - \delta = \nu i_t - \delta \quad (13)$$

Even though one can replace investment ratio i with the domestic saving ratio *s* in a closed economy, but the relationship between saving and investment in an open economy is given as:

$$I_t \equiv S_t + F_t = S_t + A_t + F_{p,t} + F_{o,t} \quad (14)$$

If saving and foreign inflows are expressed as in terms of Y_t we obtain:

$$i_t \equiv s_t + a_t + f_{p,t} + f_{o,t} \quad (15)$$

If we assume that aid does not have direct impact on private and other foreign flows, i.e., $\frac{\partial f_{p,t}}{\partial_{a,t}} = \frac{\partial f_{o,t}}{\partial_{a,t}} = 0$ the marginal effect of aid on investment is given as:

$$\frac{\partial i_t}{\partial a_t} = \frac{\partial s_t}{\partial a_t} + 1 \quad (16)$$

The above simply implies that the aid-savings link affects the investment ratio positively.

2.3.2 Model Specification

One major focus of the continuously increasing studies on aid is its effectiveness on economic performance, so far as African economies are concerned (Akinkugbe 2009). Neo-classical growth theory forms the bedrock of most of these aid-growth models. This study follows suit. Arising from the theoretical framework, we understand that SSA economies are either underdeveloped or in the developing stage and are usually constrained in their developmental efforts mostly by low capital and human productivity (in terms of skills and physical capital availability). We also understand that because SSA countries export more primary commodities that command lower and more fluctuating prices in the international market, negative net investment is possible. Hence, net foreign aid is factored into SSA's net investment and treated as part of capital accumulation as seen in equation 11 in the theoretical framework section. This is in line with what we found in equation 16. The marginal effect of aid on investment is good.

Aid's direct influence on social and economic progress should be used as the key metric of its efficacy. As a result, instead of using net investment in the neoclassical growth model (equation 10), we utilize the Human Development Index (HDI) as the explanation variable to represent the direct effect of assistance on socio-economic development. HDI is a weighted average of per capita income (productive capacity and level of business activity), life expectancy at birth (health and wellness), and educational attainment (human capital and capacity to unlock the potentialities of men, women, young, old, abled and less-abled) in a society. People and their abilities should be the main thing to look at when evaluating a country's progress, not just how much money it makes (UNDP, 2014).

The Human Progress Index (HDI) is undoubtedly the most well-known and extensively used composite index of overall well-being or human development. However, the picture of HDI in

Sub-Saharan Africa is not encouraging. The HDI report for 2015 shows that no African country has a very high HDI and the highest ranked HDI in Africa is ranked 63rd in the world (WDR, 2015). Similarly, in 2014, the average HDI in SSA, East Asia, the world and the OECD was 0.518, 0.710, 0.711, and 0.880, respectfully. This shows SSA coming last and far below the world's average. Despite two decades of growth resurgence since the 1990s, extreme poverty is still not decreasing in Africa as much as it is actually decreasing in other regions of the world (Fosu, 2015; World Bank, 2015; Caulderwood, 2015). Thus, this creates the need to evaluate aid effectiveness from a socio-economic development point of view.

On the core variable of interest, aid, we use technical cooperation, which is a special branch of aid. We opt for TC in line with recent arguments in the aid literature about the heterogeneity of aid. A number of studies have investigated the impact of disaggregating aid into different components. However, the majority of the analysis is based on horizontal decomposition, which is at sectoral level. Since our interest is in evaluating aid effectiveness from a human development point of view, we use technical cooperation. This is predicated on the fact that, according to Akinkugbe (2009), the creation, upkeep, and improvement of basic human and social capital are all part of a country's growth, which technical cooperation potentially contributes to. In addition, according to Berg (1993), the proximate objective of TC is to raise the productivity of existing stocks of factors of production, while the ultimate objective is to increase self-reliance. These objectives specifically address the issues of human development in particular and socio-economic development in general.

There have been criticisms about TC's effectiveness. The delivery of technical cooperation was questioned just as the fund being used to service the donor's consultants was also questioned (Tew, 2013). Its ability to meet its capacity development goal has also been questioned (See Culpeper and Morton, 2008; Kelegama and de-Mel, 2007; Wangne and Madete, 2002). et al. (2002) believe that it may have positive capacity-building effects at the individual level only.

Technical cooperation is also criticized for being bundled with aid (Watson et al., 2007; Ajayi and Jerome, 2002). It should, however, be noted that despite the avalanche of criticism about the efficiency of its present operations, its need was never a subject of debate.

Notwithstanding, According to Akinkugbe (2009), underdevelopment and inadequate capability are not always the causes of TC failure. They think that TC should be required to contribute favorably to existing capability and to collaborate constructively to help greater forces that have the potential to alter a nation. Also, according to Berg (1993), TC raises productivity temporarily through skill gap filling and permanently through skill and technical know-how transfer to the local people. This is needed to address the lack of absorptive capacity identified by Berg (1993) and Bräutigam & Knack (2004) as a bane of aid effectiveness. Also, according to Fields and Browne (2002), institutional weakness and skill deficiency account for poor development performance in SSA and TC addresses these problems. Given this connectivity between the objectives of TC and the import of HDI, it is expected that the effectiveness of TC should enhance the performance of HDI.

In conclusion, Tew (2013) identified that only a few studies have been done in terms of examining how targeted aid affects development in Sub-Saharan Africa. We will contribute to the literature in this direction. Thus, the objectives here are: (1) to analyze the effect of technical cooperation on the human capabilities index (Baseline model); (2) to determine whether the effect is predicated on good institutions and policy; and (3) to examine the mechanism through which this effect is transmitted (transmission mechanism model). To achieve these objectives, two models were developed as follows:

2.3.2.1 Model I: Aid Effectiveness Model

Model I comprises two equations or sub-models designed to address the first and second objectives respectively. Akinkugbe and Yinusa (2009) still remains the major study that

evaluated aid effectiveness via technical cooperation and human development. However, the study is a preliminary study and the authors acknowledged the limitation in their methodology. The problem of endogeneity and other associated problems in dynamic panel model could not be solved by the fixed effect estimator used by the author. Hence, this justifies our choice of generalized method of moment (GMM) particularly as suggested by the authors. We develop a dynamic panel model that extends Akinkugbe (2009) original static set-up by endogenous regressors. Our model specification is hinged on the theoretical framework formulated in the earlier section, reviewed literature and related theoretical and methodological considerations. It is further motivated by the works of Kosack and Tobin (2006) and Gyimah-Brempong, et al. (2012). Our model differs from Gyimah-Brempong et al in that we use human development index to capture socio-economic progress as against economic growth. We also focus on human development as against economic growth used by them. A major departure from Kosack and Tobin (2006) is the introduction of geography and ethnic fractionalization variables as suggested by Dalgaard, Hansen, and Tarp (2004). We formulate the following model based on the above and following Gyimah-Brempong et al (2012) we allow TC to enter in a quadratic form as well as to interact with institutional quality variable.

$$h_{it} = \alpha_0 + \alpha_1 h_{it-1} + \alpha_2 t_{it} + \alpha_3 pr_{it} + \alpha_4 ip_{it} + \alpha_{5i} W + \alpha_{6i} Z_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad \text{.....17}$$

$$h_{it} = \alpha_0 + \alpha_1 h_{it-1} + \alpha_2 t_{it} + \alpha_3 pr_{it} + \alpha_4 ip_{it} + \alpha_{5i} W + \alpha_{6i} Z_{it} + \alpha_7 t2_{it} + \alpha_8 tip_{it} + \alpha_9 t2ip_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad \text{.....18}$$

The first objective which evaluates aid effectiveness via technical cooperation and human development is analysed using equation 17. The second objective is analysed using equation 18. In our baseline model *h* represents human development index. This is our dependent variable and its choice has been well explained earlier. $h_{i(t-1)}$ is the dependent variable lag to capture persistence and thus establish the dynamism of the model. *t* represents the flow of

technical cooperation to SSA countries scaled by the per capital GDP. This is our variable of interest. We use disbursed data and not commitment data because commitment data does not reflect actual money disbursed. Donors do fail to meet up with their promises sometimes. *Pr* represents the growth rate of labour productivity. This is computed by dividing the per capita income by the number of people employed in the economy. We use the per capita income because we scale the macroeconomic variables in the model with per capita income to reflect the income base in the dependent variable, HDI. According to Berg (1993), technical cooperation raises the productivity of existing stock of recipient country's factors of production. Following Gyimah-Brempong et al. (2012), we specify policy and institutional quality as a vector of policy and institutional quality environment, and good governance. This is also in line with Burnside and Dollar (1997) although the specification differs. Technical cooperation interacts with institutional variables to bring about the needed change in development.

World Bank's Worldwide Governance Indicators (WGI) data are used. This is made up of six indexes, as follows: "Voice and Accountability, Political Stability and Lack of Terrorism/Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Corruption Control". These reflect different aspects of institutional and policy framework which are very strategic to TC's effectiveness. Also, of paramount importance is the control of corruption index. As noted before, corruption is one major hindrance to aid effectiveness. Because of the problem of multi-collinearity, we condensed the six sub-variables of policy and institutional quality. We use the principal component analysis (PCA) method to achieve this. Thus, our variable for policy and institutional quality is represented in our model by *ip* as deduced from the PCA. *W* is a vector of time varying control variables. These include labour participation rate (*lpr*) and HIV prevalence (*hiv*) as suggested by Akinkugbe (2009) and also Foreign Direct Investment (*fdi*) to capture the effect of other means of external fund and technology transfer.

As noted earlier, we include many time invariant variables in our model because it has support in the literature. Secondly, because we are dealing with human development as against economic growth, *Z* is a vector of time invariant variables. These variables are used in different specifications. They include initial HDI (*inih*) to reflect the initial condition of the recipient country's development status and to capture convergence as noted in Dalgaard et al (2004). According to Havrylyshyn et al., (1998), initial condition is according to growth theory and the findings of most research, long-run economic progress is tied to it.

Others are initial GDP per capita (*inig*) to capture initial economic performance of recipient country. Also included is official language variables (*frn*) for French and (*eng*) for English to capture the official language of the recipient country and her colonial affiliation. It has been debated that developmental assistance is allocated based on colonial affiliation, hence the need for these variables. We include fractionalization (*frc*) as suggested by Dalgaard et al. (2004). This is a principal component of ethnic fractionalization, religious fractionalization and language fractionalization. We compute their principal component variable to reduce the problem of multi-collinearity. The impact of regional groups is also examined by the inclusion of (*sadc*) for Southern African countries, (*ecowas)* for West African countries and (*centaf*) for Central African countries. In addition, we conclude (*linc*) as dummy variable for low income countries, (*hipc*) for highly indebted poor countries and (*incgrp*) for income groups to capture the impact of each country's income grouping status. Finally, landlocked is included to examine the effect of countries that are not accessible by international waters. We index each variable by country (i) and time (t). α_1 *to* $\alpha 8$ is a vector of the coefficients of estimation, $\gamma_i + \delta_t + \varepsilon_{it}$ are error terms.

The second equation of the model, Equation 18, is developed to demonstrate the interaction of technical cooperation with policy and institutional quality. This is where we determine whether

the influence of technical cooperation on human development is contingent on good institution. It also contains the quadratic terms. The quadratic terms help us to examine the diminishing return hypothesis. In the equation,*t2* represents technical cooperation squared while *tip* represents technical cooperation multiplied by policy and institutional quality.*t2ip* is the interaction of technical cooperation squared with policy.

2.3.2.2 Model II: Transmission Mechanism Model

Model two is used to evaluate the third objective of the study. Technical cooperation may influence human development through different channels. This included supplementing domestic resources that leads to higher rates of accumulation (Gyimah-Brempong et al. 2012). According to Berg (1993) it also temporarily augments the stock of human resources through imported scarce skills, and permanently by transferring skills and technical know-how to local people. It might also assist recipient nations in funding structural and institutional improvements.

Thus, taking a cue from Gyimah-Brempong and Traynor, (1999) and Gyimah-Brempong et al. (2012), we investigate the mechanism through which domestic productivity performance transmits the effect of technical cooperation on human development by analysing a simple accelerator equation of productivity (*pr*) that permits technical cooperation (*t*), policy and institutional quality variables (*ip*), lagged productivity (pr_{t-1}), HDI (*h*), other control variables and time-invariant variables.

$$pr_{it} = \alpha_0 + \alpha_1 pr_{i(t-1)} + \alpha_2 t_{it} + \alpha_3 h_{it} + \alpha_4 ip_{it} + \alpha_{5i} W + \alpha_{6i} Z_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad \text{.....19}$$

Other control variables are investment (*inv*) measured by gross fixed capital formation and openness (*open*) defined as export plus import divided by per capita GDP. The time-invariant variables used in this model are initial productivity (*inipr*) to capture convergence and initial

GDP per capita (*inig*) to examine the influence of the initial economic performance on productivity. Others are regional groupings i.e. (*ecowas*), geographical factor (*landlocked*), income status i.e low income countries (*linc*) and indebtedness classification of the recipient country (*hipc*), all as earlier explained. We index each variable by country (ì) and time (t). α_1 *to* α_{6i} is a vector of the coefficients of estimation. $\gamma_i + \delta_t + \varepsilon_{it}$ are error terms.

2.3.3 Techniques of Analysis

The method of estimation of the first model, which evaluates aid effectiveness via technical cooperation and human development, and the second model, which investigates the mechanism through which domestic productivity performance transmits the effect of technical cooperation to human development, was carried out using "Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) devised the generalized method of moment (GMM)" as the main estimation technique, in addition to sequential regression, because our models have many time-invariant variables, particularly in the area of initial condition, regional affiliation, geography, fractionalization, and ethnicity. The two techniques used in the study are discussed as follows:

2.3.3.1 Generalized Method of Moment Estimator.

Models I and II are dynamic in that the left-hand side variables (dependent variables) depend on their own past realizations. Also, the correlation of the lagged dependent variables with the fixed effect in the error term gives rise to dynamic panel bias as established by Nickell (1981). This renders OLS inefficient in our empirical analysis because it negates its assumption of consistency. One way out of this is to perform Least Square Dummy Variable (LSDV) estimation and correct the result for bias. The limitation of this is that it does not address the problem of endogeneity, and it is not appropriate when there is a gap in the panel data set. Given the above, we follow the literature and apply the generalized method of moment

estimation technique developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). It is a dynamic panel data estimator. The choice of the technique is based on the following:

First, this dynamic model estimator conveniently deals with endogeneity problems in the model. Second, it makes possible the use of all variables from the model that are not correlated with the error term as valid instruments. Also, the estimator is preferred where there is heteroskedasticty and autocorrelation within individuals, though not across them. In addition, our model has a lower number of time periods compared to individuals. That is, our time period (T) is less than the number of groups (N). According to Roodman (2009), GMM is appropriate under such circumstances. Furthermore, our independent variables are not all strictly exogenous, and our model also exhibits fixed individual effects. In addition, this type of model estimation gives room for studying the dynamics of adjustment, as opined by Baltagi (2008). It also implies being saved from omitted dynamics. Finally, establishing the short-run and long-run impacts of TC on HDI is made possible with the Arellano and Bond estimators.

Having concluded on the method of analysis, it is imperative to choose between its two major types. That is the difference between GMM (DGMM) and system or efficient GMM (SGMM or EGMM). We opt for system GMM because DGMM magnifies gaps in unbalanced panels. Also, it is inappropriate where time-invariant variables are used, e.g., our initial conditions and other time-invariant variables like regional groupings, landlocked, language and colonial affiliations etc. In addition, some of our macro-economic variables have random-walk features. According to Roodman (2009) and Baun (2006), SGMM is more appropriate in such a situation. Finally, according to Baltagi (2008), SGMM reduces finite sample bias and hence produces more efficient estimates. It should be noted that there are various variants of the SGMM. We use kripfganz's (2017) version of the estimator developed for STATA users named xtdpdgmm. This method is preferred to the other methods because it allows us to use both

traditional linear moment conditions and those suggested by Ahn and Schmidt (1995) under the axiom of serially uncorrelated idiosyncratic errors.

The extra moment conditions permit the ability to overcome the weak instrument issue of the Arellano and Bond (1991) difference-GMM estimator when the autoregressive coefficient approaches unity. Furthermore, the Ahn and Schmidt (1995) estimator is also robust to deviations from mean stationarity, a situation that would invalidate the Blundell and Bond (1998) system-GMM approach. The Gauss-Newton technique is used to minimize the GMM criterion function. With the vce (robust) option, the Windmeijer (2005) finite-sample standard error correction is computed for estimators with and without nonlinear moment conditions. In addition to the GMM estimation of Model I and II, we used sequential regression to account for the effect of time invariant in the variables on the model. We discussed the choice of this technique as follows:

2.3.3.2 Sequential Regression

This estimator implements sequential regression for linear panel models with the analytical second-stage standard error correction of Kripfganz and Schwarz (2015). It is imperative to use this additional method because our models have many time invariant variables particularly in the area of initial condition, regional affiliation, geography, fractionalization and ethnicity. Hence, in addition to the system GMM we also apply sequential regression estimator. According to Kripfganz and Schwaz (2015), the current method being used to estimate dynamic panel data models with time invariant regressors can be very imprecise or are not able to handle these regressors. They therefore developed a two-stage estimation procedure to address this problem.

At the first stage, the time-invariant regressors are subsumed under the unit-specific effects and the coefficients of the time-varying regressors are estimated. At the second stage, the first-stage

residuals are regressed on the time-invariant regressors. Both time-varying and time-invariant variables that are assumed to be uncorrelated with the unit-specific effects qualify as instruments at the second stage. Identification is achieved using instrumental variables in the manner of Hausman and Taylor (1981), and the second-stage standard errors are modified to account for the first-stage estimating error. The estimator also provides a correction term for the standard errors in the second stage. Unlike conventionally estimated standard errors, the modified second-stage standard errors in this approach adequately account for the first-stage estimate mistake. The proper correction of the second-stage standard errors is critical for accurate inference. Ignoring the corrective term may result in incorrect conclusions (Kripfganz and Schwarz, 2015).

A major advantage of the two-stage approach is the invariance of the first-stage estimates to misspecifications regarding the model assumptions on the correlation between the time-invariant regressors and the unobserved unit specific effects. Second, the researcher can exploit advantages of first-stage estimators that rely on transformations to eliminate the unit-specific heterogeneity such as first differences or forward orthogonal deviations.

2.3.4 Data

We have been extremely careful in selecting the data for the study. According to Ravallion (2014), a large number of datasets emanating from other regions outside Europe are bedeviled by inconsistencies. Hence, we choose data that emanate only from accredited sources and are acknowledged in relevant literature. We align with Barro (2000) on the need to balance the trade-off between sample size, richness, and explanatory variable power and to reduce the missing values in the data as much as possible. Hence, we drop those countries with too much insufficient data on core variables.

The study uses a panel data set of 47 selected SSA over the time period 1990–2018. Somalia was dropped from the list of SSAs in the pool because there were too many variables with

missing data points. In the same vein, South Sudan only became independent in 2011, and hence data prior to this period are not available. We start with 1990 because that was when UNDP began to provide consistent information on our core dependent variable, HDI. In the "Credit Reporting System (CRS)" of the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development, the OECD is mentioned.

The World Development Indicators provide data on all other macroeconomic factors. The World Bank's World Governance Indicators (WGI) provide information on the policy environment. Data on heavily indebted poor countries are sourced from the International Monetary Fund (IMF) Fact Sheet. Data on fractionalization are obtained from Alesina (2002), while all other non-invariant data, with the exception of initial conditions, are obtained from the Central Intelligence Agency's World Fact Sheet. These are statistics on the official language, geography (including landlocked areas), regional affiliation, and income group

Table I: Descriptive Statistics

Variable	Obs.	Mean	Standard Deviation	Minimum	Maximum	Correlation with Hdi	Skewness	Kurtosis
h	1169	0.4439	0.1167	0.081	0.782	1.000	0.3524	1.3462
t	1216	85.534	73.281	1.96	356.6	-0.0620	0.2723	1.1578
pr	1100	10093.5	13683.87	438.9	82570.99	0.8306	1.2416	2.1346
ip	798	-3.88e-09	0.6796	-1.6629	1.8541	-0.2992	1.1746	2.4577
lpr	1152	78.1	19.1221	23.711	108.085	-0.1926	0.2153	1.6437
hiv	1115	5.364	6.7581	0.1	29.6	0.2044	1.0657	2.74657
fdi	1186	4.4266	10.292	-82.892	161.824	-0.1444	1.6105	2.2348
iinv	1089	2.72e+08	4.02e+08	-93179952	3.91e+09	0.0799	1.1263	1.2137
ipp	798	8.02e-09	2.1865	-5.6889	5.6408	0.7067	0.1697	1.4326
open	1150	0.4591	0.3330	0.1118	2.6433	0.2336	0.6555	1.4368
govt	842	3.49e+09	1.08e+10	3.09e+07	8.48e+10	0.3875	0.1441	1.0889
geege	420	16.706	5.5984	4.7707	37.6869	0.0729	0.1445	1.2316
nrr	1122	13.943	15.3912	0.0012	86.132	0.1771	1.3453	2.3912
urbpopp	1218	36.529	16.140	5.416	87.156	0.4237	0.1466	16.5134
gdpc	1200	1094.125	2868.81	115.436	20172.31	0.8677	1.3156	2.8921
expcimp	833	8.12e+11	1.63e+12	4.50e+07	1.40e+13	-0.1473	0.4667	1.3468

Source: Author's computation, 2020

Finally, we report the summary of the data used in Table 3.4.1 above. This includes the mean, median, minimum and maximum scores of the variables. As can be observed above, there is no cause for alarm in the data. The last column also reports the correlation coefficients of the variables with the main dependent variable HDI and there is no problem of multi-collinearity.

2.4 Analysis of Results

As noted in section 2.3, all specifications in models I and II are analyzed via "system GMM of Arellano and Bover (1995) and Blundell and Bond (1998)" in order. In particular, we use the variant developed by Kripfganz (2017), which is a user-written command operationalized in STATA 14.2. We estimate the model for the period 1990–2018 for all SSA countries whose data for the key variables are available (47 in all). As suggested by Roodman (2009), we report all our specification choices. We use a two-step estimation method with error correction that is based on Wendmeijer-corrected Cluster-robust errors. We use the collapse method in instrument lag count in order to minimize the number of instruments without compromising efficiency. Overall, our results for Model I and II are robust across all specifications and variants. This conclusion, which determines the validity of our result, is based on the statistical diagnostics of the models.

In addition, our statistical diagnostics of autocorrelation tests are supportive of the validity of our model specifications, both the main models and their variants. According to Arellano and Bond (1991), first-order serial correlation is necessary in GMM estimation, but second-order serial correlation is predicted to be non-significant. In their first-order serial correlation, all of our specifications reject the null hypothesis of no serial correlation, but not in their second-order serial correlation. The Hansen's J-test result also confirms the accuracy of our model parameters, as well as the validity of over-identifying limitations and the instruments utilized. The Hansen tests do not reject the null hypothesis for both models and all of their varied specifications.

This further confirms the overall suitability of the model (Buam, 2006) and its goodness of fit. We further validate our models by checking the "steady state" assumption suggested by Roodman (2009). This requires that the estimated lagged dependent variable be less than one in absolute terms. In all specifications of our two models using GMM, the estimated coefficients of the dependent variable range from 0.5 to 0.96. Roodman (2009) further requires that the convergence process should not be associated with the fixed effects. Our inclusion of initial conditions in each variant of the model creates this additional requirement. Last but not least, the Wald test of joint significance shows that all of the equations and their specifications are important and thus reliable, so this is the last test.

2.4.1 Model I–Aid Effectiveness Model

The results of aid effectiveness captured in the baseline model are reported in Tables II (a) and II (b). Equations I and II in Table II (a) and Table II (b) display the results of system GMM and sequential regression of the baseline model, respectively, without considering the interactive and quadratic variables and the time-investment variables. Equations III to VII report specifications with interactive, quadratic, and time variables, respectively. The results are the same because the base estimator used for the sequential regression is the system GMM to ensure consistency. The results confirm the dynamism of the model. The coefficient of HDI lag, the explained variable, is 0.96, which is highly significant at a 1% level.

Table II(a): Technical Cooperation and Human Development

Variables/Equations	I (GMM)	II (S. Reg,)	III	IV	V	VI	VII
Dependent Variable: Human Development Index (h)							
h_{t-1}	0.96***	0.96***	0.96***	0.96***	0.96***	0.96***	0.96***
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
t_{t-2}	0.011**	0.011**	0.011**	0.011**	0.011**	0.011**	0.011**
	0.036	0.036	0.036	0.036	0.036	0.036	0.036
pr_{t-4}	0.0002**	0.0002**	0.0002**	0.0002**	0.0002**	0.0002**	0.0002**
	0.033	0.033	0.033	0.033	0.033	0.033	0.033
Ip	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
lpr	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**

	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Hiv	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fdi	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Inih			0.167***			0.096***	
			0.002			0.029	
Inig				5.25e-06*			1.07e-06
				0.094			0.677
Frn					0.024**	0.022**	0.021**
					0.018	0.046	0.032
Eng					0.030**	0.013	0.021*
					0.015	0.197	0.091
Frc			-0.009*	-0.007*	-0.008*	-0.01**	-0.007*
			0.083	0.099	0.050	0.018	0.062
Sadc				0.028**			
				0.041			
Ecowas					-0.022*	-0.034***	-0.022*
					0.069	0.002	0.050
Centaf					-0.031**	-0.045***	-0.032**
					0.021	0.002	0.012
Landlocked			0.024**	0.020**			
			0.039	0.046			
Linc							-0.018*
							0.096
Hipc							-0.014*
							0.081
Incgrp					0.018**		
					0.018		
Con	-0.037	-0.037	-0.64	-0.018	-0.032	-0.038	0.021
	0.346	0.346	0.004	0.042	0.012	0.346	0.160
No of observations	667	667	667	630	636	667	630
No of groups	43	43	43	40	41	43	40
No of instruments		51	5	5	7	7	9
AR 1 (prob>|z|)	-3.37***	-3.37***					
	0.0007	0.0007					
AR 2 (prob>|z|)	-0.48	-0.48					
	0.6293	0.6293					
Hansen's J-test	32.71	32.71	32.71	2.71	2.71	2.71	2.71
(prob> chi2)	0.9903	0.8727	0.8727	0.8727	0.8727	0.8727	0.8727
Moment condition (Linear)	51						
Moment condition (Non-linear)	11						
Wald test	3011.08***	3010.55***	4349.57***	3637.90***	5040.49***	5075.49***	4839.90***
Ptob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' computation, 2020.

This shows that persistence is an important factor in human development in SSA. The figure also falls within the expected range of less than unity. It also implies that a 1% increase in the

previous HDI will result in at least a 0.9% increase in the current year. Similarly, a unit percent increase in HDI in the current year results in a 0.9 percent increase in HDI the following year. This has very serious implications for development planning in SSA. It means every effort counts at every point in time, and hence, all hands must be on deck to continually improve human development every moment to take advantage of the persistency and avoid its disadvantages.

To our interest, the co-efficient is positively related to HDI as expected and significant at a five per cent level of significance. The coefficient shows that a 1 percent rise in technical cooperation brings about a 0.011 percent increase in HDI. One noteworthy point here is that the human development index responds to technical cooperation changes after two years. It takes a lag of two to generate the desired response from human development. This needs to be put into consideration in making plans for human development in SSA. It is also a pointer for policy actors and donors alike in making decisions on technical cooperation policies. In addition, our policy and institutional quality variables also behave well in the model. The coefficient of the policy and institutional quality variable is significant at the 5% level of significance. It also comes out positive, thereby implying that a unit percentage improvement in the policy and institutional quality index will bring about a 0.01 percent point improvement in the human development index in SSA.

It is obvious that, even in the absence of interaction, policy and institutional quality contribute directly to improvements in human development in SSA.We further examine the effect of productivity on HDI. Productivity improves HDI in SSA. Our findings confirm that a unit percentage increase in productivity results in a 0.002 percent increase in human development in SSA.According to Berg (1993), one of the core objectives of technical cooperation is to raise the level of productivity of factors in the recipient country's economy. It should be noted, however, that although productivity improves human development in SSA, HDI is not quick

in responding to changes in productivity. It has had a four-year feedback effect. This implies that efforts to improve HDI via productivity must be put in place four years in advance in order to be productive. Looking further at the results, the labor participation rate is also seen to be effective in improving human capabilities in SSA. This is also part of the variables that TC targets. Of significant importance is the result of the HIV variable. The result shows a negatively significant coefficient. HIV reduces human development in SSA by 0.003 percent at a highly significant level of 1%.This has farreaching implications. HIV is more affected, particularly in Southern African countries. This result is consistent with Ssozi and Amlani (2015), which shows that at a threshold of 10%, HIV/Aids has a very high damaging effect. Countries in that range (mostly Southern African countries) have seen their life expectancies nosedive. Finally, FDI also asserts that there is a significant effect on human development in SSA, but with a negative sign. The negative sign may not be unconnected with the findings of Siyanbola (2005) that some countries "enjoy" more of the cost side of FDI than the benefit side. Most Sub-Saharan African countries do.

Next, we analyze the specifications with time-invariant variables. Equations III to VII in Table II (a) report these specifications. Perusing the equation results, one obvious and consistent outcome is the positive and significant initial HDI. The results suggest the importance of the initial conditions in human development in SSA. This supports the convergence hypothesis established by Dalgaard et al. (2004). It also provides insight into long-run economic performance (Havrylyshyn et al., 1998).GDP per capita, however, shows a mixed result.

Another consistently significant time-invariant variable in this section is fractionalization (frc). As noted earlier, our fractionalization variable is an index of three variables: ethnic, religion, and language fractionalization. We obtain their principal component to remove the problem of multi-collinearity. Fractionalization exerts a negative influence on human development in SSA. The result is significant across all five specifications. This is in line with Dalgaard et al.

(2004)'s findings. Similarly, variables of official languages, which also define colonial affiliation, turn out to also positively influence human development in SSA.

The French and English languages as official languages and colonial affiliations help to improve human development. This also shows that most aid is based on colonial affiliation and that the influence spills over to human development. Income groups also positively influence human development generally, but when broken down, low income groups have lower human development and ditto for highly indebted poor countries. This has far-reaching implications for aid allocation to SSA. It shows that countries with low income and highly indebted countries should be allocated more aid in general and more technical cooperation in particular

Table II (b): Technical Cooperation and Human Development with Policy Interaction

Variables	I	II	III	IV	V
h_{t-1}	0.941***	0.941***	0.941***	0.941***	0.941***
	0.000	0.000	0.000	0.000	0.000
t_{t-2}	0.011**	0.011**	0.011**	0.011**	0.011**
	0.010	0.010	0.010	0.010	0.010
$p^r t-4$	0.0002*	0.0002*	0.0002*	0.0002*	0.0002*
	0.081	0.081	0.081	0.081	0.081
Ip	0.011***	0.011***	0.011***	0.011***	0.011***
	0.000	0.000	0.000	0.000	0.000
Lpr	0.001**	0.001**	0.001**	0.001**	0.001**
	0.042	0.042	0.042	0.042	0.042
Hiv	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	0.000	0.000	0.000	0.000	0.000
Fdi	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	0.009	0.009	0.009	0.009	0.009
t_2	-0.028	-0.028	-0.028	-0.028	-0.028
	0.178	0.178	0.178	0.178	0.178
Tip	0.018	0.018	0.018	0.018	0.018
	0.493	0.493	0.493	0.493	0.493
t_2**ip**	-0.047	-0.047	-0.047	-0.047	-0.047
	0.264	0.264	0.264	0.264	0.264
Inih				0.0998**	
				0.016	
Inig			4.73e-05*		1.10e-06
			0.094		0.634
Frn				0.022*	0.020*
				0.082	0.067
Eng				0.009	0.014
				0.404	0.260
frc			-0.010*	-0.01**	-0.006*

			0.068	0.039	0.075
Sadc			0.026*		
			0.066		
Ecowas				-0.036***	-0.024**
				0.003	0.036
Centaf				-0.049***	-0.037**
				0.005	0.011
Linc					-0.023*
					0.061
Hipc					-0.014*
					0.096
Con	-0.043	-0.043	-0.011		0.026
	0.363	0.363	0.090		0.115
No of observations	667	667	630	667	630
No of groups	43	43	40	43	40
No of instruments		15	4	7	9
AR 1	-3.4501***	-3.4503***			
(prob>|z|)	0.0006	0.0006			
AR 2	-0.4585	-0.4584			
(prob>|z|)	0.6466	0.6466			
Hansen's J-test	31.7455	31.7436	31.7436	31.7436	31.7436
(prob> chi2)	0.9842	0.8211	0.8211	0.8211	0.8211
Moment condition (Linear)	51				
Moment condition (Non-Linear)	11				

Source: Authors' computation, 2020.

Furthermore, memberships of regional groups also influence human development. This finds support in the work of Akinkugbe (2009). However, while there is a positive influence in Sadc countries, the influence is negative in ECOWAS and Centaf countries. Finally, contrary to expectations, landlocked countries are not disadvantaged by their land-lockedness when it comes to human development in SSA. They may be disadvantaged in economic growth, but most of our specifications here show a positive relationship with human development.

Next, in Table 4.1 (b), we report the estimates of the second equation in Model I. Here the quadratic and interactive terms are introduced. These are generated from the second variant of the model, as seen in Equation 18. The introduction of the interactive term is meant to examine whether there is a significant interaction among technical cooperation, human development, good policy and institutional quality. Our results show that this hypothesis is insignificant at

any acceptable significance level. Although the negative sign of TC squared and TC squared multiplied by policy and institutional quality is suggestive of the fact that there is optimization possibility, they are insignificant at any recognized significance level.

2.4.2 Transmission Mechanism Model

The goal of this equation is to examine the channel through which TC is transmitted to human development. As earlier noted, enhancing the productivity of existing resources is the proximate objective of TC where as the ultimate objective is achieving self-reliance which is synonymous to sustainable development. Hence, we attempt to establish a transmission modernism of TC through productivity. The results of this model are reported in Table III. Equations I and II reports the system GMM and the two-stage sequential regression respectively. As noted earlier, the results are almost the same for reasons given above. The sequential regression results in equation II is without time invariant variables. Similarly, this result also confirms the dynamism of the model with a lagged measure of dependent variable of 0.56. This is also significant at 1% level of significance. Technical cooperation is also positively related to productivity at five per cent significance level. This illustrates that TC significantly influence productivity. We recall that productivity has been established in the earlier section to significantly influence.

Table III: Transmission of Technical Cooperation to Human Development through Productivity

Variables/ Equations	I	II	III	IV
pr_{t-1}	0.554***	0.554***	0.554***	0.554***
	0.000	0.000	0.000	0.000
t_{t-2}	3621.25**	3621.25**	3621.25**	3621.25**
	0.025	0.025	0.025	0.025
h	18737.7***	18737.7***	18737.7***	18737.7***
	0.003	0.003	0.003	0.003
ip	3299.46**	3299.46**	3299.46**	3299.46**
	0.029	0.029	0.029	0.029
inv	0.20e-08	0.20e-08	0.20e-08	0.20e-08
	0.881	0.881	0.881	0.881

open	-2740.9*** 0.009	-2740.86*** 0.009	-2740.86*** 0.009	-2740.86*** 0.009
inipr			0.203** 0.019	
inig				1.313121*** 0.006
ecowas			1783.7* 0.084	
centaf				
landlocked			4364.3* 0.069	
linc				2455.043 0.185
hipc			-6295.81** 0.043	-3606.44 0.117
con	-3076.73 0.193	-3076.73 0.193	1312.5 0.525	2570.996 0.341
No of observations	642	642		642
No of groups	43	43		43
No of instruments		50		4
AR 1 **(prob>|z|)**	-2.074** 0.0381	-2.074** 0.0381		
AR 2 **(prob>|z|)**	-0.786 0.4321	-0.786 0.4321		
Hansen's J-test **(prob> chi2)**	34.0302 0.8606	34.0302 0.8606	34.0302 0.8606	34.0302 0.8606
Moment condition (Linear)	50			
Moment condition (Non-Linear)	0			
Wald test	391.29*** 0.000	391.29*** 0.000	1557.9*** 0.000	2886.35*** 0.000

Source: Authors' computation, 2020

HDI. It goes without saying that the theoretical hypothesis of productivity being a transmission mechanism of technical cooperation to human development is empirically verified. It shows that productivity is a stepping stone objective of technical cooperation with sustainable human development as the ultimate goal. In addition, HDI is also seen to positively influence productivity at 1% level of significance. Policy and institutional quality is also positively related with productivity at 5% level of significance. Investment has positive relationship with productivity as expected but surprisingly not significant at any known level of significance. Openness is significant but negatively related. This is similar to the FDI result in the previous section and the same explanation suffices its outcome.

Section III and IV display the results of sequential regression with time invariant variables. Initial condition of productivity is seen to be significantly positive at 5% level of significance. This also shows convergence to productivity in SSA. Initial GDP per capita, *land locked* and *ecowas* are positively related to productivity at one per cent and ten per cent significance level intermittently.

2.4.3 Robustness

To achieve robustness, we align with Rajan and Subramanian (2008). We employ different types of our core variable (technical cooperation aid), different sources, different periods, and sample size. Because our primary dependent variable (the Human Development Index) is only available from one source (the UNDP), we develop a log-linear equation to test its robustness. Our results are not significantly different from what we earlier obtained. As can be seen in Table V below, the results posted in the first specification (Equation 1) show the result of the log-linear equation. The dependent variable h in the earlier baseline equation is changed to the log form lh. The results show that all the variables that were significant in the earlier specification are also significant here and with the same sign. The levels of significance are the same while the magnitude of the variable is almost the same.

Table V: Robustness for HDI Model

Variables/Equations	I lh*	II wt*	III tb*	IV tm*	V >2000	VI 1990-2004
h_{t-1}	0.96***	0.94***	0.95***	-0.074***	0.96***	0.6880***
	0.000	0.000	0.000	0.000	0.000	0.000
t_{t-2}	0.03**	1.35e-08**	0.014**	0.011	0.011**	0.06**
	0.029	0.014	0.029	0.252	0.036	0.026
pr_{t-4}	0.0005**	0.0002*	0.0003**	0.0002**	0.0002**	-0.0009
	0.010	0.051	0.014	0.039	0.033	0.146
Ip	0.026***	0.012***	0.012***	0.012***	0.01***	0.0083**
	0.000	0.000	0.000	0.000	0.000	0.013
Lpr	0.0023**	0.0015**	0.001**	0.0011	0.001**	0.0007
	0.047	0.014	0.055	0.140	0.034	0.536
Hiv	-0.0082***	-0.0036***	-0.004***	-0.004***	-0.003***	-0.0068*
	0.000	0.000	0.000	0.001	0.000	0.086
Fdi	-0.0006***	-0.00026***	-0.0002***	-0.0003**	-0.0002***	-0.0005***
	0.005	0.001	0.007	0.021	0.005	0.000
Con	-0.166	-0.0695	-0.049	-0.034	-0.032	0.2320
	0.113	0.166	0.327	0.545	0.012	0.063

No of observations	667	667	667	630	636	667
No of groups	43	43	43	40	41	43
No of instruments		51	5	5	7	7
AR 1	-2.9772***	-3.3348***	-3.3297***	-3.3988***	-3.3741***	-2.4851**
(prob>|z|)	0.0029	0.0009	0.0009	0.0007	0.0007	0.0130
AR 2	-0.7459	-0.5439	-0.4982	-0.5798	-0.4826	
(prob>|z|)	0.4557	0.5865	0.6183	0.5621	0.6293	
Hansen's J-test	30.1899	32.3789	31.95642	39.7651	32.7123	23.8540
(prob> chi2)	0.9903	0.9941	0.9926	0.9261	0.9903	0.8727
Moment condition (Linear)	51	51	51	51	51	51
Moment condition (NonLinear)	11	11				
Wald test	3011.08***	3010.55***	4349.57***	3637.90***	5040.49***	5075.49***
	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' computation, 2020

The second specification shows the result of technical cooperation data from CRS being replaced with TC. The results are also similar to the first. The significant levels of all the variables are almost the same except for productivity, which changed from a five per cent level of significance to a 10 per cent level of significance. The magnitude of the coefficients of the variables only changed marginally too. All the signs are as earlier determined. The third and fourth specifications display the results of types or sources of technical cooperation. We concentrate on the two major types of sources. The third specification shows the results of using bilateral technical cooperation. The results are almost a replica of the earlier results. On the contrary, there are a few differences between using multilateral technical cooperation and Technical cooperation is not seen as significant when it is from a multilateral organization.

Table VI: Robustness for Productivity Model

Variables/ Equations	I wt*	II tb*	III tm*	IV >2000	IV 1990-2004
pr_{t-1}	0.5645***	0.555***	0.5919***	0.5541***	1.7293
	0.000	0.000	0.000	0.000	0.000
t_{t-2}	0.0028	3684.609**	5549.702	3707.354**	-582.6614
	0.154	0.025	0.770	0.025	0.885
h	16104.41***	18085.27***	19384.5***	19206.15***	15630.13
	0.009	0.003	0.008	0.003	0.247
Ip	3220.278**	3273.896**	2936.547**	3307.093**	312.6537
	0.034	0.030	0.025	0.030	0.587
Inv	-3.53e-07	1.64e-07	-8.81e-07	4.00e-08	-1.54e-06
	0.702	0.784	0.438	0.962	0.185
open	-2644.49***	-2720.698***	-4720.278**	-2804.351***	-2812.256
	0.008	0.009	0.046	0.006	0.328

con	-1346.77 0.519	-2772.421 0.221	-2204.204 0.436	-3128.06 0.169	-10334.64 0.048
No of observations	642	642	642	526	236
No of groups	43	43	43	43	40
AR 1 (prob>|z|)	-2.0768** 0.0378	-2.0689** 0.0386	-2.1200** 0.0340	-2.0849** 0.0371	-1.3101 0.1902
AR 2 (prob>|z|)	-0.7937 0.4274	-0.7891 0.4301	-0.7799 0.4355	-0.7825 0.4339	
Hansen's J-test (prob> chi2)	38.0408 0.7293	33.7926 0.8672	35.1994 0.8256	35.4083 0.8189	25.1892 0.3955
Moment condition (Linear)	50	50	50	50	30
Moment condition (Non-Linear)	0	0	0	0	0
Wald test	391.29*** 0.000	391.29*** 0.000	1557.9*** 0.000	2886.35*** 0.000	

Source: Authors' computation, 2020

The same is demonstrated in the productivity model in Table 4.3.1 and the policy and institutional quality model in Table 4.3.2. This has far-reaching implications for this study and future research on technical cooperation aid. It also buttressed our earlier finding that colonial affiliation had been significant in improving HDI via technical cooperation. The higher significance of bilateral TC implies better performance of TC when it is from an individual donor to an individual recipient.

The fifth and sixth specifications displayed the time and sample size dimensions of the model. Equation V accounts for the post-millennium period. The results show almost the same turnout as in the earlier specification. Except for marginal variation in the coefficients of the variables, the other outputs approximate them very closely. The level of significance of the variables and the signs are as earlier reported. The results for the pre-millennium period are similar, but with a slight difference. Except for productivity and labor participation rate, all of the other key variables are significant. The level of significance of policy and institutional quality dropped from 1% to 5%, while that of HIV/Aids dropped from 1% to 10%. The Millennium

Development Goals of the UNDP may be to blame for how well the post-millennium period did.

Table VI displays the results of the robustness check for the productivity model. The behavior is similar to the earlier version and to the above-described behavior of the HDI/Baseline model. The only difference is that the technical cooperation data from World Development Indicators is not very significant here. Others follow the pattern of the baseline model robustness check above, including the time period and sample size analysis. The post-millennium period also behaved better than the pre-millennium period.

2.5 Conclusion

This study attempts a critical evaluation of aid effectiveness from the standpoint of technical cooperation's effect on human development. Even though the aid-growth literature seems rather over-flogged, little has been achieved by way of decomposition of aid architecture and peculiarization of associated impacts. Clemens et al. (2004) started a new series on aid effectiveness by calling for the decomposition of aid and evaluating it based on the purpose it is meant for. The majority of responses in this regard have been to vertical decomposition or sectoral allocation of aid. We contribute to previous studies in this perspective by considering the horizontal decomposition of aid. Hence, we examine the effect of technical cooperation aid on human development.

We build on the works of Akinkugbe (2009) and use an econometric method that addresses the shortcomings of their methodology. The findings of the study indicate that technical cooperation significantly influences human development in all our specifications. Although there are very few studies that examine the impact of technical cooperation on human development, those that examine the impact of general aid or ODA on human development also find similar results.

In addition, it is more reasonable to build men who can then be better equipped to build physical infrastructure and the economy as a whole. In view of the above, we recommend that more resources be allocated to technical cooperation than ODA and the UN-recommended 0.7% aid/GNI ratio should be effectively implemented in the TC sub-level of aid.

Going further, our finding on the interaction of TC with policy and institutional quality has very important implications for aid effectiveness research. This study finds that technical cooperation impacts positively on human development in countries with good policies. However, it could not be demonstrated at any significant level that the positive effect of technical cooperation on human development can be achieved only in countries with good policies. This is not surprising because one of the major targets of technical cooperation is the improvement of institutional capacity in the recipient country. Where good institutional capacity does not exist, the impact of technical cooperation may not be very great on human development. Our resultant policy model confirms this. Therefore, donors should not withdraw or give less to countries with poor institutions as suggested by Burnside and Dollar (1997) and other aid-policy literature.

Finally, we account for the indirect effects of TC by considering a transmission mechanism through which TC impacts human development. We explore and find the mechanism of productivity as a good channel through which TC transmits to human development, as suggested by Berg (1993). We also find TC spilling over to human development through policy and institutional quality variables. These are areas that effectively influence growth as well. The implication of this is that giving more to TC will influence human capabilities and even growth more rapidly than concentrating on ODA.

In conclusion, the novelty of this study lies in its horizontal decomposition of aid and evaluating its efficiency according to purpose. The import of our findings is to provide empirical and

informed support for the need to increase technical cooperation flow to Sub-Saharan African countries far beyond the current level and other forms of developmental assistance. TC seems to pass the litmus test where ODA fails. Over-emphasizing other forms of developmental assistance such as grants, humanitarian aid, debt relief, and food aid over and above technical cooperation is like putting the cart before the horse. We are hoping our findings will stimulate further research, particularly in the area of finding other channels through which TC influences human development and how it transmits to growth.

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Chapter Three

Technical Cooperation and Educational Development in Sub-Saharan African Countries

3.1 Introduction

3.1.1 Background of the study

Attention of policymakers at all levels have shifted towards the need to develop human capabilities, with the hope that poverty and unemployment will be ameliorated. This has equally gained the attention of the research community. In every productive activity, human resources are germane as they provide both the labour and the entrepreneurial resources necessary to produce. Hence, the quality of human resources determines the success and progress as well as the survival of any nation. This is why the United Nations initiated the Sustainable Development Goals (SDGs) in 2015, which emphasises three areas: human capabilities, infrastructure, and human rights. The aim is to enhance living standards. The human capital objective covers nutrition, healthcare, and education intended to expand human capital and improve means of productivity (UNDP, 2013).

Education is a critical pillar of national prosperity and individual socioeconomic status (El Namrouty et al., 2022). Education is also considered a private good, the consumption of which improves an individual's opportunities and is regarded as a vehicle for differentiation and advancement, (UNESCO, 2021). This implies that those who manage to climb the education ladder are better placed to achieve a higher standard of living and higher returns than others, who are not privileged to. However, the endowment and/or availability of these resources is not evenly distributed across countries, geographical groupings, and individuals. According to Sterber and Hultman (2018), people exist and operate in an unequal world. Thus, the share of a person's wealth and possibilities can be fundamentally different from those of others. However, for some countries or regions to come out of the poverty trap, and meet up with the

challenges of funding their education, they require resources from outside their country or region in form of foreign assistance.

According to Cabraal (2010), foreign aid is defined as financial flows, technical aid, and commodities with the principal aim of promoting economic progress and wellbeing. This excludes military or assistance for non-developmental programmes and it is provided as grants or subsidized loans by the Development Assistance Committee (DAC) of the Organization for Economic Co-operation and Development (OECD). Generally, foreign aid is granted to reduce the savings-investment gap and the import-export gap, that is, deficits in the balance of payment (BOP) and deficits in savings (Anwar & Aman, 2010). Aid or any form of developmental assistance is given for many reasons. Some are given for political objectives, such as peacekeeping. Others are awarded for particular development goals, such as boosting industry capacity, decreasing poverty, or enhancing education or health care. Some are also offered for better trade conditions, while some may be donated for humanitarian help in extreme situations like hunger and natural catastrophes (Tamer, 2012). The technical cooperation component is a form of aid for the purpose of developmental assistance (Ishnazarov & Cevik, 2017). For the purpose of this study, technical cooperation includes training, advisory services, consultancies, study trips, seminars, development of human capabilities, and service delivery. These are all examples of resources that assist economic progress and the usage of services, skills, knowledge, and technology.

There is rising concern that many of the world's poorest nations lack the resources to achieve the UN Sustainable Development Goals for education (Burnett et al., 2022). The objectives are too lofty to be achieved without extraordinary and unlikely quantities of outside funding. The majority of the costs of sustainable educational development must be covered by domestic revenue, but this will not be enough to meet the objectives. Global education strategies and educational development agendas are becoming more out of sync, especially in light of

environmental issues, demographic changes, labor market shifts, and the lessons learned from five decades of curriculum, learning, and assessment innovations (Burnett, N., et al, 2022).

It is obvious that human capacity development through education and health is a precondition for the development of the productive capacity of a nation, the expansion of the level of employment, and the improvement of the living standards of its people. Human development is most commonly defined as "enlarging people's choices in which improving the health, education, and standards of living of people consistently form part of its major components (Oseitutu, 2017). It is "the process by which individuals, organizations, institutions, and societies develop abilities to perform functions, solve problems, and set and achieve objectives" (UNDP, 1997). The objective of human capacity development, though now the target of every nation, regions, continents and the world at large, cannot be achieved when the necessary resources are not available or are in short supply. Meanwhile, the endowment and or availability of these resources is not evenly distributed across countries and geographical groupings. According to Sterber and Hultman (2018), people exist and operate in an unequal world. Thus, the share of a person's wealth and possibilities can be fundamentally different from those of others. Thus, for some countries or regions to come out of the poverty trap, they require resources from outside their country or region. This provided the basis and impetus for foreign aid. It is one of the ways that people try to make sure that everyone has the same resources and abilities.

Education is critical for the impoverished who depend on the selling of their labor to make a living (Ziesemer, 2016). Because of the critical importance of education in human growth, universal primary education is a top priority on the list of Sustainable Development Goals (MDGs). Donors have allocated a growing amount of assistance money to the education sector in recipient countries in order to achieve this goal (Thiele, Nunnenkamp & Dreher 2006). This is to guarantee that all children throughout the globe have the opportunity to finish a primary

school education (Yogo and Douzounet, 2015). Thus, the flow of developmental assistance, particularly technical cooperation, is likely to affect education through government spending channels. According to McGillivray and Noorbakhsh (2004), aid induced an increase in economic growth and well-being, mainly through an increase in expenditure on health and education and an increase in wages owing to higher labour demand. Given that most assistance comes into the coffers of the public sector in developing nations, it might also be used to directly fund increases in spending on health and education. According to Kosack and Tobin in 2006, when development aid improves education and health, economic growth rises because more people can work, which changes how production works and how flexible it is, as well as the variety and complexity of economic output.

3.1.2 Motivation

A major issue affecting the performance of developmental assistance is that, at times, donors are motivated by personal interests, which might be political in the form of supporting nations with similar ideologies or economies in the form of financial gains (Todaro & Smith 2012). There have been instances where donor aid has been utilized by governments to battle the policies and affinities of sovereign recipients. This technique has resulted in situations such as famine as a result of trade assistance cuts, as well as strong unfavorable feelings (Cabraal, 2010). A donor, for example, may provide development assistance in the form of infrastructure construction in order to extract resources or gain commercial access in the receiving country. While technical assistance, which is a key component of ODA, was formerly thought to be a technical procedure involving the straightforward transfer of information or organizational patterns from developed to poor nations, recent experiences have shown otherwise.

Partner nations, as well as foreign development partners (DPs), have expressed concerns about the present assistance structure's overall lack of confidence. A considerable chunk of this budget has been discovered to be utilized to serve "consultants and experts" operating in Africa,

apart from the problem of diminishing technical cooperation flows in recent years (Akinkugbe & Yinusa, 2009). As a result, the Washington Consensus and the "Augmented Washington Consensus" were formed in 2005 (Rodrik, 2006). They are a group of economic and political changes that are meant to move the ownership of aid programs away from donors and toward recipients, such as by agreeing that both sides should respect each other's freedom to make and implement their own development policies (Wang & Ozanne, 2010).

Meanwhile, in emerging nations' growth processes, emphasis has typically been focused on human capacity development as the most reliable source of growth (Teixeira & Queiros, 2016). In many developing nations, however, investment in human capacity is substantially below the minimal required due to a savings deficit. As a result, foreign assistance is often seen as an alternative tool for achieving economic development (Fashina, Asaleye, Ogunjobi & Lawal, 2018). As a result, foreign aid has been a major source of income for most nations in Sub-Saharan Africa (Azarnert, 2007). Aid, which is one of the most potent weapons in the fight against poverty, is now underutilized and mistargeted. This is due to the fact that there is too little help and too much of it is unrelated to human growth (United Nations Development Programme, 2005).

Furthermore, donor practices such as requiring the use of specific procurement sources in order to channel funds and work to the donor's preferred contractors, suppliers, consultants, and technical assistance teams have led the developing world to view project or development financing as benefiting the donor country rather than utilizing local human resources for the program (Cabraal, 2010). Foreign aid received by African countries in general amounts to more than 17 percent of GDP, yet the per capita growth of the region's median country is not significantly different from zero (Ogundipe & Ola-David, 2017). This observed decline in living standards in Africa in spite of aid flow has cast doubt on the effectiveness of foreign

assistance and its ability to improve the wellbeing of the recipient countries (Williamson, 2009).

3.1.3 Gap in the Literature

The majority of empirical research on the impacts of aid continues to use aggregate aid data, ignoring the distinctions between project and programme help, as well as commodities and technical support (Axel, Peter & Rainer, 2006). In that case, these studies produce a result that is not robust in terms of aid-effect on growth (Harms & Lutz, 2005). The few studies that consider different types of aid, distinguishing between project and program aid or between grants and loans, do not give due consideration to the sectoral dimension of aid (Axel, Peter & Rainer, 2006). Most studies on the factors that affect educational attainment proxied with primary school enrollment only look at market factors like "per capita income, adult literacy, school size, and urbanization," but they don't take into account the effects of factors like cash transfer in terms of government expenditure on education as a percentage of GDP and institutional quality on year of completed schooling as a proxy for educational quality. This is because these factors aren't always easy to measure.

A detailed study of the influence of specific components of aid, as well as the implications of both supply and demand side variables on educational outcomes, is required to understand the role that individual components of assistance might reasonably be expected to play in achieving universal primary education (Pettersson 2006). The way aid is measured isn't the only factor in how effective it is at getting people to go to school. Axel, Peter, and Rainer (2006) say that aid's effectiveness at getting people to go to school is also dependent on how aid is measured, how much aid the recipient government in terms of cash transfer spends on education, and how strong a link there is between government spending and educational outcomes.

To explain these discrepancies, this research examines public spending in terms of cash transfer and institutional quality as drivers of educational results. Thus, it is thought that including institutional quality would capture the relationship between institutions and assistance. According to Pritchett (2001), this is critical since investment in education may have a greater social benefit if aid-recipient countries build their local institutional structure. Gender disparity is also included in the model. This is not unrelated to the fact that, in recent years, donors have continued to raise the percentage of aid resources allocated to the education sector in recipient countries in order to eradicate gender disparities in education and contribute to the attainment of universal primary education (Thiele, Nunnenkamp & Dreher 2006).

Fundamentally, there is a disconnect between how people perceive the goals of external aid to education and the best ways to raise and disperse funds, use grants, and lend responsibly. Also, there are issues of concerns like what should be done to improve domestic revenue and other safe sources of recurrent funding? What modifications are required to the global framework for development and education? Literature is yet to sufficiently address these issues. For instance, according to Lewin (2017), in SSA alone, there is a shortfall of around $45 billion annually between what is allocated and what is required. Also, foreign aid received by African countries in general amounts to more than 17 percent of GDP, yet the per capita growth of the region's median country is not significantly different from zero (Ogundipe & Ola-David, 2017). Furthermore, according to Roberts (2003), it is unclear if more resources equate to improved educational results. Similarly, Roberts (2003) opined that it is unclear if more resources equate to improved educational results

To close this gap, we contribute to the literature on aid effectiveness by unbundling foreign aid and exploring its vertical decomposition. To the best of our knowledge and through a careful search of the major peer reviewed databases, literature is still very lean on the contribution of the technical cooperation component of aid to educational attainment. Hence, this study

examines the impact of technical cooperation on educational attainment as one of the 2030 SDGs agenda in SSA.

Specifically, our study aims to answer the following research questions:

i. What is the trend of the flow of technical cooperation and education in Sub-Saharan Africa?
ii. What is the dynamic relationship between technical cooperation and educational attainment as part of the 2030 SDGs agenda in Sub-Saharan Africa?
iii. What is the effect of demand and supply factors of technical cooperation on educational attainment as part of the 2030 SDGs agenda in Sub-Saharan Africa?

3.1.4 Objective of the Study

The aim of this research is to examine the contribution of technical cooperation to education as one of the 2030 SDGs agenda in SSA. The specific objectives? are to:

a. Analyse the trend of technical cooperation and quality of education in Sub-Saharan Africa;
b. Estimate the dynamic effect relationship between technical cooperation on educational attainment as one of the SDGs in Sub-Saharan Africa;
c. Compare the effect of demand and supply factors of technical cooperation on educational attainment as one of the SDGs in Sub-Saharan Africa;

3.1.5 Significance/Contribution

The research would be of immense benefit to the empirical and theoretical literature on development assistance. In terms of methodological literature and policy-wise, the outcome of the study will also be invaluable. Empirical-wise, the study adds to the ongoing debate on aid fungibility by disaggregating aid into components while exploring the implications of the technical cooperation components on development as it affects education. This no doubt will hopefully help to reveal the impact of technical cooperation as compared to aggregate foreign aid on educational outcomes, which can help in the effective distribution of aid to the recipient

countries. On the theoretical ground, the existing theories like educational outcomes of foreign aid are explored with the hope of articulating the channels and the environment in which the provision and receipt of foreign aid can be translated to improve human welfare and overall development of recipient countries and the world at large.

Methodologically, the study would add to the existing literature by focusing on a group of countries, which would aid in capturing the impact of technical cooperation on the group of countries. Furthermore, the study's use of the dynamic panel estimation technique and panel vector autoregressive would be a significant innovation to the methodologies used in existing aid studies, as it would help to address the dynamic issues surrounding the provision and utilization of aid, potentially yielding more informed results.

The study would highlight the performance of technical cooperation and the challenges limiting its efficiency for policy purposes, allowing the government to put policies in place to address the challenges and improve performance will also be richly blessed by working with donor countries who will be able, through the outcome of the study, to enhance their activities. Finally, the study will provide a reliable source of reference materials for future studies on development assistance and human development.

3.2 Literature review

3.2.1 Conceptual review

This section conceptualizes, theoretically, and empirically places technical cooperation and education as a component of human development. Foreign aid is "voluntarily transferred money sent by individuals, organizations, foundations, religious groups, or governments" (sterberg & Hultman, 2018). The "IMF and World Bank (the IFIs), the UN, the OECD's Development Assistance Committee (DAC), and development ministries" in donor nations and their equivalents in receiving countries manage the foreign aid system (Brett, 2016).

The DAC defines aid as cash flows, technical support, and commodities delivered as grants or subsidized loans "with the primary goal of promoting economic growth and welfare (excluding aid for military or other non-development goals)" (Cabraal, 2010). Humanitarian or emergency aid, charity-based help, and systematic aid are the three primary forms of international assistance (Moyo, 2009). Assistance delivered in the aftermath of a natural catastrophe is an example of emergency aid. Charitable organizations provide funding to certain institutions in order to attain specified objectives. There are two types of aid: bilateral aid and multilateral aid. Bilateral aid is a type of long-term help that is given by one government to another (Clemens et al., 2004)

The aggregate measurement of "foreign aid" is official development assistance (ODA), which consists of multiple types of aid, including, among others, humanitarian or emergency aid and technical cooperation (Ishnazarov & Cevik, 2017). Technical cooperation on the other hand is in the form of technical consultancy and training for civilian or military reasons (Tamer, 2012). Coaching, advisory services, human capability development, and service delivery are all examples of resources that assist in the development and use of services, skills, knowledge, and technology. It also include long-term and short-term expertise from "national and international sources, as well as training, supporting materials and equipment, consultancies, study visits, and seminars-development assistance to national governments aimed at assisting them in implementing national policies aimed at poverty reduction" (Baser & Morgan, 2001).

According to the United Nations Development Programme (2011), "HDI is a new measure of development that combines indicators of life expectancy, educational outcomes, and income. The HDI sets a minimum and maximum for each dimension, called goalposts, and then shows where each country stands in relation to these goalposts, expressed as a value between "0 and 1, which reflects GDP per capita, life expectancy at birth, adult literacy rates, and the combined gross educational enrolment ratio at the primary, secondary, and tertiary levels" (UNDP, 2012).

According to Oseiutu (2017), human development is most commonly defined as "enlarging people's choices," of which improving the health, education, and living standards of the population consistently forms a part. Education, according to Enamiror (2007), is a method for transferring and transforming culture via the official and informal education of individuals in a community. Thus, education is concerned with a society's people's mental, physical, psychological, and social growth. Gbore (2006) defined educational attainment as the behavior exhibited by a person that is noticeable after undergoing a programme of instruction in a school.

3.2.2 Theoretical Review

The two competing theories advanced as conceptual consensus surrounding the effectiveness of development assistance in the recipient countries after the Chenery and Strout (1966) two-gap model are the public interest model and the public choice model (Omoruyi (2015). The public interest theory argues that official development assistance (ODA) plays a vital role in filling investment or funding gaps and assists in lifting developing nations out of poverty traps (Sachs, 2005; Abuzeid, 2009). The model believes that donor countries pursue the development interests of recipient countries in their decisions to render development assistance, whether in the form of loans and/or grants. However, the model failed to consider cross-country differentials with respect to the effect of aid on development performance (Ogundipe & Ola-David, 2017). The public option, on the other hand, is based on the belief that the decision-making process surrounding assistance distribution is encumbered by many stakeholders, special interests, and rent-seeking activities (Williamson, 2009). Individuals act in their own interests and concerns, and the concept applies the same rationale to public actors. Both donor and recipient governments and assistance organizations will be influenced by voter behavior and special interest groups. People participating in the process may fail to foster the coordination and collaboration required for progress. Instead, by pursuing their own limited

interests, these numerous organizations may actually contribute to the perpetuation of low growth (Williamson, 2009).

According to Easterly and Pfutze (2008), special interest incentives lead to three inefficient aid channels: linked aid, food aid, and technical support. In the case of linked assistance, for example, recipients are compelled to purchase a certain number of commodities from the donor country, a practice that leads to donor manufacturers overcharging recipients due to their increased market power and preventing recipients from purchasing goods cheaply elsewhere. Another unproductive method that is often favoured by donor special interest groups is food assistance. Food assistance has been utilized by high-income nations to dump surplus agricultural goods on developing-country markets (Williamson, 2009). Another inefficient aid route is technical support in operations that give developing nations specific skills or technical expertise (Williamson, 2009). Technical help, according to Easterly (2006a), is worse than other types of linked aid since donors often need these technicians to be from the donor nation. After that, the people who get the help give it back to people in the donor country who may or may not know about the local issues (Williamson, 2009).

In recent years, the debate over aid effectiveness has been driven by new family models in which development assistance operates on specified conditions, necessitating the use of aid interaction terms (Jensen & Paldam, 2006). The two models, excellent policy and medicine models, are often regarded as the most successful help models (Hudson, 2004). The Good Policy Model, which suggests that assistance provides programs and additional push, is the most influential. Good economic policies improve, whereas poor policies worsen. As a result, help should be focused on nations that have effective policies. (Jensen & Paldam, 2006). Hadjimichael et al. (1995) introduced the Medicine Model, which was popularized by Tarp and Hjertholm (2000).It incorporates both help with a positive sign and aid squared with a negative sign. The concept proposes that assistance benefits all nations, but only to a certain extent.

More help is becoming more detrimental. As a general defense for help, it should be provided according to GDP and never exceed the optimum dosage (Jensen & Paldam, 2006). According to the model, when help is given in the right amount, it is good, but when it is given too much, it can be bad.

3.2.3 Empirical Review

Empirical studies on the performance of development assistance, particularly technical cooperation, can be streamlined along three dimensions. The first dimension, which is the specific interest of the present study, focuses on the implication of developmental assistance on human development as a composite measure and human development indicators including education and health. McGillivray and Noorbakhsh's (2004) study of 2001 HDI levels in a sample of 94 poor countries looked at the influence of aid on the Human Development Index (HDI), with a specific focus on the relationship between conflict, aid, and human development. The major conclusions are that conflict and assistance are adversely correlated with HDI levels, indicating that help does not compensate for war's detrimental effect on human development. In a similar line, Ishnazarov and Cevik (2017) investigated the influence of foreign assistance categories on the components of the Human Development Index (HDI). Based on yearly data from 2002 to 2015 for OIC member nations, the research takes into account the level of civil conflict, population growth, foreign direct investment, income, urbanization, and regime type (whether a government is democratic or autocratic). The findings show that ODA is a useful tool for human development, with a stronger and more efficient influence on human development than the other development instruments studied. Civil violence was also shown to be an effective HDI deterrent.

Ogundipe and Ola-David (2017) examine the relationship between foreign aid and income per capita in West African states. Using disaggregated aid into seven sectors, they find that, in most cases, aid becomes significant when conditioned on sound macroeconomic policy, whereas

institutional quality and infrastructural development have little impact on the aid-growth relationship. A diminishing return to help was also proven, since the marginal influence of aid on growth seems to be minimal. Kleemann, Peter, and Rainer (2016) conducted a similar study to examine if recipient countries with persistent gender inequality in schooling receive more education aid and if female leadership of relevant ministries in donor countries results in better targeted aid by directing education aid to places where girls receive less schooling than boys. The findings imply that, rather than giving help for education according to general or gender-specific requirements, both female and male leaders have rewarded nations with more years of schooling for all children, or especially for females. In the distribution of educational funding, female leadership seems to have a little influence. In a similar vein, Axel, Peter, and Rainer (2006) looked at the impact of aid on education for about 100 countries from 1970 to 2005, using instruments to control for aid endogeneity and a measure of institutional quality estimated through a system of equations to see if aid encourages institutional reforms. Aid was shown to enhance elementary school enrollment by a substantial amount. This link, however, is unaffected by the level of institutional excellence. For example, Maria (2017), looks at the impact of foreign assistance agreement stability on income redistribution across countries. The results suggest that stability has a favorable impact on economic mobility from affluent to poor nations, thereby lowering global income disparity

Similarly, Ziesemer (2016) uses dynamic models to investigate the influence of development assistance on low-income countries' education and health. Growth rates or levels of assistance per capita, rather than levels of life expectancy and illiteracy, were shown to have a statistical significance. It was also shown that polynomial distributed lags had a significant impact on the pace of illiteracy increases. Both impacts are tiny in terms of growth rates in the short run-in simulations, but they add up to significant amounts over time.

Another aspect of the examination of development assistance performance, especially through technical collaboration, is the efficacy of development aid. For example, Yogo and Douzounet (2014), looked at the efficacy of assistance in attaining universal primary education in 35 SSA nations from 2000 to 2010. According to the findings, increased educational help boosts primary school completion rates dramatically. The use of several estimation techniques, the inclusion of an instrument to account for assistance endogeneity, and the collection of control variables included in regressions all contribute to this outcome. Adedokun (2017) examines the link between foreign assistance, governance, and economic development in SSA from 1996 to 2012, using the system generalized methods of moments (system GMM) methodology to test for heterogeneity in aid recipient nations. The findings reveal that foreign assistance has little impact on SSA's overall economic development.

In SSA, however, one size does not fit all, since assistance recipient variability has an impact on aid efficacy. Furthermore, in order to boost development in SSA, governance and aid must work together. Andy and Jonathan (2015), using the most current generation of cross-country research, look at aid effectiveness in terms of development assistance's impact on economic growth and poverty reduction. It indicates that the data examined shows hints of convergence in a number of key categories that are directly relevant for assistance policy choices and conversations about aid effectiveness. Aid levels, domestic political institutions, assistance composition, and aid volatility and fragmentation are among the topics covered. It also cites two areas where the data shows little convergence: the necessity or otherwise of "excellent" macroeconomic policies, i.e., orthodox policies, and whether grants are more successful than loans. Similarly, Asongu and Ssozi (2015) used quantile regressions on a panel of 78 developing nations over the period 1984–2008 to determine whether foreign help is useful in combating terrorism. Foreign aid (bilateral, multilateral, and total) has been shown to help fight terrorism only in countries with the most transnational terrorism.

Studies on the effectiveness of development aid have highlighted the importance of institutional quality in the receiving countries. For example, by concentrating on political rights, aid volatility, and the post-Berlin Wall period, Asongu and Nwachukwu (2016) add to the current literature on the assistance-institutions nexus. The results reveal that although foreign assistance has no substantial impact on political rights, foreign aid volatility has a negative impact on democracy in recipient nations. Populist parties might take advantage of such volatility to push a neocolonial agenda, instill patriotic feelings, and strengthen their hold on power. This is particularly true when funders demand criteria that the vast mass of the public opposes and political leaders refuse to execute. Andrea, Andrew, and Arilton (2017) used a regional panel vector autoregressive model (P-VAR) using Ugandan districts to construct a measuring technique for the effect of foreign assistance. Satellite sources for socioeconomic activity, geolocated assistance disbursements, and conventional household surveys were used to compile data for the regional units (ADM2). According to the findings, shocks have a statistically significant, favorable, and long-lasting influence on evening illumination. Non-random assistance assignment raises endogeneity problems, which the P-VAR overcomes. Kosack and Tobin (2006), in a similar spirit, establish that assistance and FDI have differing effects on development, both conceptually and practically. Help makes a significant contribution to both economic growth and human development, and the better a country's human capital, the more aid it receives. There is little evidence that the level of democratic responsiveness in government influences the success of assistance or FDI, while we do find that democracy enhances human development independently in all but the most industrialized nations. The findings show that foreign direct investment and assistance are not and cannot be replacements for development in the world's poorest nations. They can't even be considered complements, at least not at the mid-to low-development stages. Finally, impoverished nations want democracy and assistance, not foreign direct investment. In another investigation, Mauro

and Rainer (2017) used a significantly enlarged and updated econometric technique based on a gravity model of international migration to review the aid-migration relationship. The researchers discovered a negative link between assistance and emigration rates. This is true even in the poorest parts of the countries that are getting migrants. This shows that money doesn't play a big role in people's migration decisions.

Shirazi, Mannap, and Ali (n.d.) investigate the link between Brazilian foreign assistance and South-South cooperation (SSC). It investigates whether a country's participation in the bloc led by Brazil in the two organizations has an impact on the amount of Brazilian foreign aid received by that country. Because decisions are made by the Executive Boards of both the IMF and the World Bank, the study focuses on alliances for the selection of representatives in those arenas. The findings support the theory that countries that participate in the Brazilian alliance for the creation of the Executive Boards of the IMF and the World Bank get more foreign assistance than those that do not. Aysen and Darja (2012) further add to the debate on the migration-development nexus by examining the impacts of remittances on human development, using OLS to compare the impact of remittances on human development to those of FDI and ODA (ODA). The data shows that remittances have a positive relationship with human development and are an effective strategy to improve human development in middle-income nations, particularly over time. Remittances have been shown to have diverse developmental benefits in nations with different migration policies. The results also disclose and compare a variety of real-world policy ideas from throughout the globe. Remittances, it is argued, have the greatest beneficial impact on human development in nations where migration is seen as a viable labor export strategy.

In conclusion, one size does not fit all in Sub-Saharan African aid-development nexus, since assistance recipients' variability has an impact on aid efficacy

3.3 Research Methodology

This study follows an ex-post factor design, which is informed by the objective the study sought to achieve and the procedures through which the data is collected and analyzed quantitatively. The research design was chosen because it is useful when the goal is to investigate the effect of explanatory variable(s) on the dependent variable, and it is not possible to manipulate or control the outcome of the explanatory variable(s) because their value has already been determined. The study makes use of a panel of 43 Sub-Saharan African countries, which consists of four (4) regions out of the five regions in Africa: East Africa with eight (8) countries, Central Africa with eleven (11) countries, West Africa with fourteen (14) countries, and Southern Africa with thirteen (13) countries, excluding North Africa. Thus, the forty-three (43) Sub-Saharan Africa countries form both the population and sample size of the study.

3.3.1 Theoretical Framework

The framework for this research was built in line with the evidence from the study conducted by Omoruyi (2015). According to Dudley and Montmarquette (1976), the framework identified three drivers of donors' intention to provide aid. The first factor is that receiving countries may trade more with donors, which would boost the economic interests of the donor economy. The other factor is that donors may care that the recipient countries enjoy a better standard of living. Also, donor countries anticipate receiving countries to support donors' interests, maybe in the sphere of international politics. Dudley and Montmarquette (1976) measured these concepts via the objective function U of the decision maker in the funder countries, as in equation 1:

$$H = f(X, H) = H \sum_{j=1}^{n} H_j \quad (1)$$

Where X denotes the consumption of a private good in donor countries and H_j represents the consumption of the subjectively proxied influence of development assistance to country j (j =

1, 2 …… m). Also, they assume the subsequent functional form for H_j: a_j as given in equation *2*

$$H_j = (n_j)^{\alpha} \left(\frac{a_j}{y_j}\right)^{\gamma} \qquad 0 \leq \alpha \leq 1 \text{ and } \gamma \leq 1 \tag{2}$$

Where n_j denotes population of the recipient countries *j,* a_j represent the per capita assistance received by the recipient country *j,* and y_j show the per capita GNP of the receiving nations *j*. Therefore, the influence perceived by donors of its development assistance to another country is assumed to be growing in the following features of the receiving nations: per capita gross national product (GNP), population, and the per capita amount of development assistance received (Omoruyi, 2015). The donor's budget constraint is written as:

$$X + \sum_{j=1}^{n} n_j, a_j = Y \tag{3}$$

In the equation, *Y* is the donor country's gross national product (GNP) used to (i) provide development assistance (ii) consumed the private good *X* (Omoruyi, 2015). Employing equations (1) via (3), the donor country's constrained utility optimization issue yields the per capita development assistance to country *j* as

$$a_j = \left(\frac{Y_k}{Y^{\gamma} n_j^{1-\alpha}}\right)^{\frac{1}{(1-\gamma)}} \qquad \text{j = 1, 2, 3, …, m} \tag{4}$$

Y represent the marginal rate of substitution between *H* and *X (*this reflects the value to the donor of an additional unit of *H* in terms of units of *X*). Equation (4) proposes that per capita development assistance to a country *j* increases when (i) the value to the donor nation providing the development assistance *(k)* is higher. (ii) recipient countries *j's* per capita income (*yj*) is lower, and on the part of (iii) the population of the country *j*(*nj*) is lower too (Omoruyi, 2015).

As contended by Burnside and Dollar (2000) in their seminal paper on aid effectiveness, aid tends to have expected impact in the recipient country if and only if good governance prevails.

The effectiveness of any form of aid cannot be properly determined in isolation of the political environment in the recipient economy (Michaelowa & Weber, 2015). Essentially, technical cooperation will only influence educational attainment alongside other relevant factors- public expenditure on education, GDP per capita (or measure of economic development), proportion of total population that of school age, public expenditure on health (affects enrolments via programme like mass deworming of children, immunisation), among other variables (see Kremer & Miguel, 2004; Andrés, Asongu & Amavilah, 2015; Lee, 2009; Mirbahar, *et al.,* 2016).

3.3.2 Model Specification and Variable Description

In this study, the focus is on educational attainment, a more specific outcome variable, instead of short-term growth outcomes as the dependent variable to make a measurable difference. Educational attainment (EDA) is measured by years of completed schooling. The choice of these indicators is because they are measures of the quality of education (Peter and Rainer, 2006). The indicator aligns with the Sustainable Development Goals (SDGs) target of universal primary education, which has yet to be achieved in the majority of Sub-Saharan African countries. In addition, primary schools provide an edge, especially where there is a high dropout rate (Yogo & Douzounet, 2014).

Aid for education impact education attainment via interventions in form of classroom construction, budget supports, conditional cash transfers feeding programmes, training teachers and possibly through curriculum development (Riddell & Nino-Zarazua, 2015; Kemal & Jilani, 2016). Studies like Michaelowa and Weber (2015), Petrakis and Stamatakis (2002), Kemal and Jilani (2016), Andrés, Asongu, and Amavilah (2015), Anwar and Khalid (2011), Asiedu (2014), specifically established a causal link between technical cooperation in education sector and educational attainment.

The main independent variable in the study is technical cooperation (TC), a kind of aid given to develop technical skills in the recipient country. According to Axel, Peter and Rainer (2006), simply taking amounts of government expenditure on education would obviously be inappropriate as amounts depend on a country's size. The demand-side factors used in the paper are per capita income (PCI) and real gross domestic product (GDP), while the supply-side factors are and gender inequality index (GEI), institutional quality (ISQ) and inflation (INF).

In modelling the relationship between educational attainment (EDA) and other explanatory variables, we assumed that EDA can be explained by technical cooperation (TC), per capita income (PCI), real GDP, gender inequality index (GEI), institutional quality (ISQ) and inflation (INF), using the panel ARDL (a, b2, b3, b4, b5, b6) specification (a is the lag order for the endogenous variable (EDA), while b1, b2, b3, b5, b6 are lag orders for exogenous variables: It can be represented as follows:

$$EDA_{it} = \beta_{1i} + \lambda_{1i}TREND + \sum_{k=0}^{a} \delta_{11ij} EDA_{it-1} + \sum_{k=0}^{b_1} \delta_{12ij} TC_{it-1} + \sum_{k=0}^{b_2} \delta_{13ij} PCI_{it-1} +$$

$$\sum_{k=0}^{b_3} \delta_{14ij} GDP_{it-1} + \sum_{k=0}^{b_4} \delta_{15ij} INF_{it-1} + \sum_{k=0}^{b_5} \delta_{16ij} GEI_{it-1} + \sum_{k=0}^{b_6} \delta_{17ij} ISQ_{it-1} + \mu_{1it} \quad (5)$$

where $i = 1, 2, \ldots, N$ represent the number of countries; $t = 1, 2, \ldots, T$ indicates the number of time periods; *EDA* is the endogenous variable; technical cooperation (*TC*), per capita income (*PCI*), real GDP, inflation (*INF*), gender inequality index(GEI) and institutional quality (*ISQ*) are the exogenous variables that take the $k \times 1$ vector of endogenous variables ($k = 6$); δ_{xij} are $k \times 1$ coefficient vectors; λ_{1i} is the vector of scalars and μ_{it} is an error term distributed with a zero mean and a finite variance.

Equation (1) can be re-written into the general VECM form in order to capture the dynamic relationship among the variables in the short and long-run, as follows:

$$\Delta EDA_{it} = \beta_{2i} + \lambda_{2i}TREND + \sum_{k=0}^{a} \delta_{21ij}\Delta EDA_{it-1} + \sum_{k=0}^{b_1} \delta_{22ij}\Delta TC_{it-1} + \sum_{k=0}^{b_2} \delta_{23ij}\Delta PCI_{it-1} +$$

$$\sum_{k=0}^{b_3} \delta_{24ij}\Delta GDP_{it-1} + \sum_{k=0}^{b_4} \delta_{25ij}\Delta INF_{it-1} + \sum_{k=0}^{b_5} \delta_{26ij}\Delta GEI_{it-1} + \sum_{k=0}^{b_6} \delta_{27ij}\Delta ISQ_{it-1} +$$

$$\theta_{21ij}\Delta EDA_{it-1} + \theta_{22ij}\Delta TC_{it-1} + \theta_{23ij}\Delta PCI_{it-1} + \theta_{24ij}\Delta ALR_{it-1} + \theta_{25ij}\Delta PTR_{it-1} +$$

$$\theta_{26ij}\Delta GEI_{it-1} + \theta_{27ij}\Delta ISQ_{it-1} + \mu_{2it} \quad (6)$$

Where: β_{it} is the intercept, λ_{2i}, δ_{2xij}, x = 1,…7, and θ_{2wi}, w = 1, …, 7, are the parameters estimate, and μ_{2it} is the disturbance term.

On the a priori theoretical position, it is expected that technical cooperation, per capita income, real GDP, and institutional quality will have a positive relationship with educational attainment while gender inequality and inflation is expected to affect educational attainment negatively.

3.3.2 Data Sources, Measurement and Estimation

The study estimates a panel regression with data covering forty-six (46) Sub-Saharan African countries over the period of 1996–2018. The choice of the study time frame is not unconnected with the need to capture the period from 2015 to 2018 when the region's population growth overshoots its growth productivity, with severe implications on the level of government expenditure. It is also meant to take into account the pre-MDG, post-MDG, and early parts of SDG. The sources of data used in the study include: "The World Development Indicators (WDI) of the World Bank, the World Governance Indicators (WGI) of the World Bank, and the United Nations Conference on Trade and Development (UNCTAD)".

In the measurement of variables, technical cooperation was proxied by technical cooperation grants in current US dollars, while educational attainment was measured by the years of schooling. Real gross domestic product was measured with real GDP ratio. Gender inequality was measured using the CPIA gender equality rating. Finally, institutional quality was proxied by CPIA policy and the institution's environmental sustainability rating.

To estimate the model, the common Panel Autoregressive Distributed Lags (PARDL) based on the "pooled mean group (PMG)" estimator technique is deployed. The choice of the technique is based on the following: firstly, "the regression residuals be serially uncorrelated and the explanatory variables are treated as exogenous." The PARDL PMG estimator controls for endogeneity problem by the inclusion of the lag value of the dependent variable as an explanatory variable in the model. This allows for feedback from past or current shocks to the "current value of the dependent variable." The problem of residual serial correlation and endogenous regressions can be corrected by augmenting the order of the ARDL model sufficiently (Pesaran, 2004). The second condition refers to the existence of a long-run relationship (dynamic stability) and requires that the coefficient of the error-correction term be negative (Loayza and Ranciere, 2006). The error-correction coefficient and its corresponding standard error fall within the dynamically stable range in the PMG. The third condition is that the long-run parameters be the same across countries.

3.4 Empirical Analysis and Results

3.4.1 Descriptive Analysis

The descriptive statistics of the data set in Table 4.1 (see appendix) revealed that the mean value of all the variables tend towards the maximum values which indicate that their values are generally high. The standard deviation of all the variables is relatively high, which indicates that a high degree deviation from the actual data resulted from their mean values. Specifically, in the case of educational attainment which is the dependent variable, its maximum value is 3.28E+08 whereas the minimum is as low as 1.28071 with a mean of 31096382 which is closer to the maximum rather than the minimum. The claim is strongly confirmed by the standard deviation since it is far away from the mean. In the same vein, the maximum value of technical cooperation, the main explanatory variable in the study is 2.01E+08 while the minimum is 2.62481 with a mean of 40670929 closer to the maximum. This also indicates a wide dispersion

from the mean. This result revealed that there is instability in the flow of technical cooperation and educational attainment in Sub Saharan Africa.

3.4.2 Empirical Results

This section presents the trend analysis and reports the results from Autoregressive Distribution Lag.

3.4.3 Trend Analysis

Figure 1 below shows that official developmental assistant in SSA. Without any doubt, ODA flow to SSA countries has been volatile fluctuating upward and downward over the period 1996 to 2018. Between 1996 and 2000 ODA to SSA falls in a stepwise version but it later increases sharply from 2000 to 2003. Between 2003 and 2008 there was another stepwise decrease in the flow of ODA to SSA after which the value rose from 2008 to 2009. From 2009 to 2014 the flow of ODA to SSA decrease sharply and after this period down to 2018 there have been a slight growth in the flow of ODA to SSA. A closer look at educational attainment in Figure 2 shows a sluggish movement in the trend primary school completion rate over the entire period.

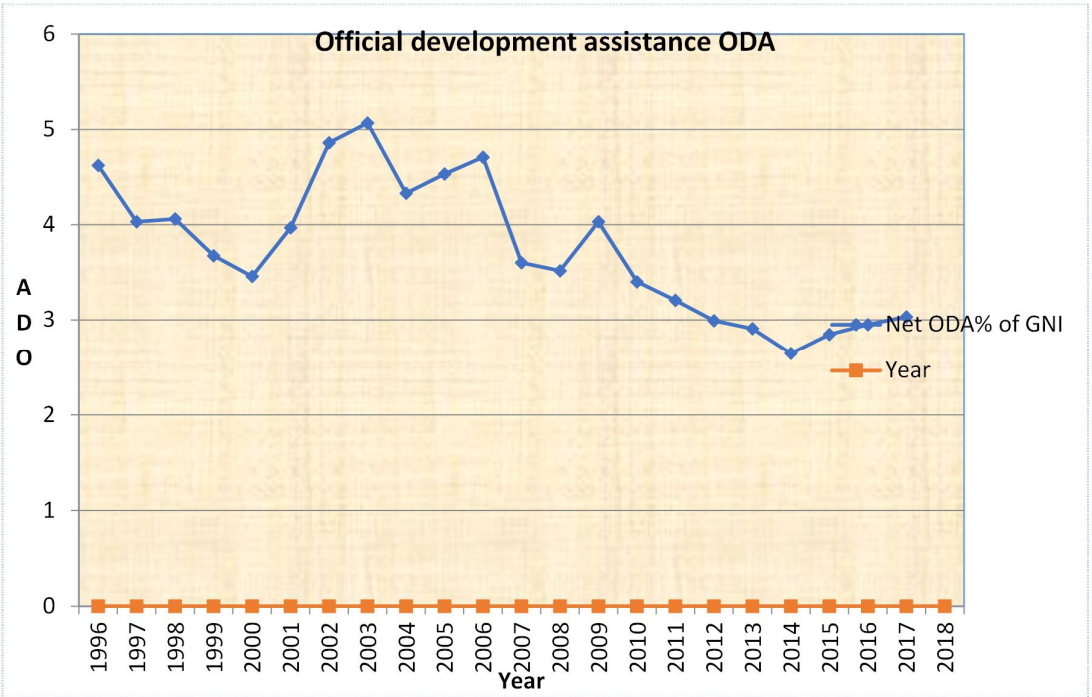

Fig. 3.1: Trend of Official Development Assistance ODA (1996-2018)

Source: Author, 2020.

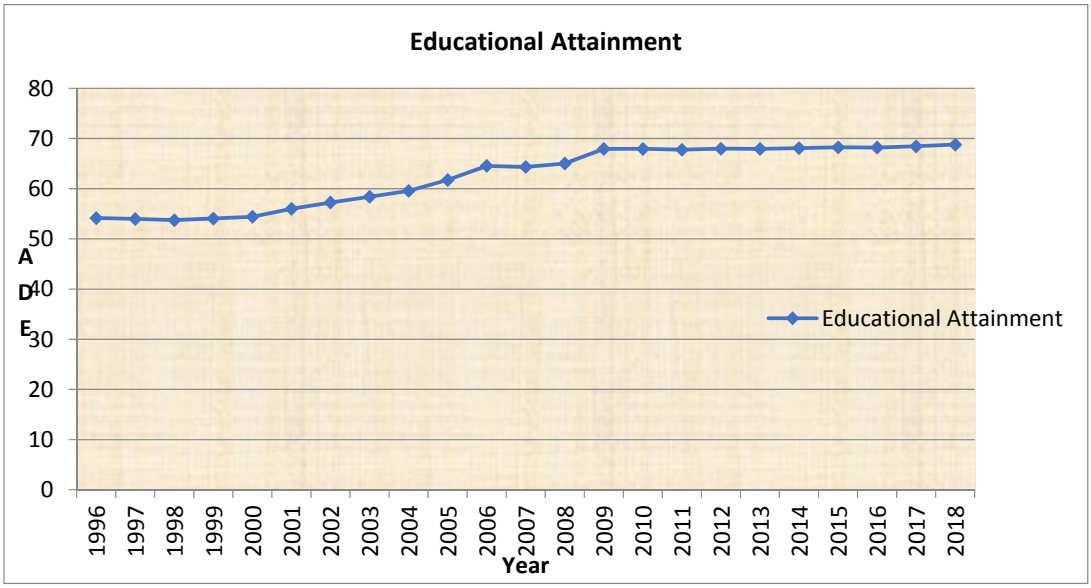

Fig. 3.2: Trend of Educational Attainment (1996-2018)

Source: Author, 2020.**Table 3.2: Panel Unit Root Test**

Table 3.4.2: Panel Unit Root Test

VARIABLES	Levin, Lin, and Chu t-stat[a]	Breitung t-stat	Im, Pesaran, and Shin wstat[b]	ADF-Fisher Chi-Square[b]	PP-Fisher Chi-Square[b]	Hadri LM test	Order of Integration
	1st Diff.	1st Diff.	1st Diff.	1st Diff.	1st Diff	Level	
EDA	-5.10250*	-7.12806*	-22.1198*	311.142*	871.571*	40.5191*	I(1)
TC	-18.8103*	-12.4192*	-19.4811*	346.257*	621.231*	36.9425*	I(1)
PCI	-24.1576*	-6.56401*	-16.7328*	571.621*	641.433*	47.5704*	I(1)
GDP	-18.6427*	-8.13038*	-18.2421*	315.048*	411.325*	54.4421*	I(1)
INF	-16.1242*	-6.66521*	-16.7012*	320.142*	924.143*	35.2134*	I(1)
GEI	-14.4492*	-7.33451*	-12.8590*	273.807*	642.532*	50.2967*	I(1)
ISQ	-7.88554*	-2.00658**	-5.42674*	400.683*	387.174*	39.1032*	I(0)

Notes: An intercept and trend are included in the test equation. The lag length was selected using the Schwarz Information Criterion. **(*), (**), (***)** denote probability statistical significance at the 1%, 5% and 10% levels respectively. **(a)** Signifies that the null hypothesis is the unit root (with the assumption that the cross-sectional units share a common unit root process). **(b)** Signifies that the null hypothesis is the unit root assuming that the cross-sectional units have individual unit root processes.

The panel unit root test findings are summarized in Table 2. At the 1%, 5%, and 10% significant level, Levin, Lin, and Chu t-stat, Breitung t-stat, Im, Pesaran, and Shin wstat, ADF- Fisher Chi-Square, PP- Fisher Chi-Square, and Hadri LM second generation unit root test were used. All of the variables have a 1% significance at first difference, with the exception of ISQ, which has a 1% significance at level, showing that all of the variables are integrated of order zero and one.

3.4.4 Panel Autoregressive Distribution Lag result

The results from Panel Autoregressive Distributed Lag of the data set are reported as follows

Table 3.4.3: Long run Panel Autoregressive Distributed Lag (PMG) result

Variables→	Coefficients	Std. Err	P-values
TC	.0724182	3284.262	0.006
PCI	.2215942	.61497234	0.517
GDP	.1461560	4013.391	0.000
INF	-82.1242	62.61042	0.126
GEI	-18471.76	4217.071	0.000
ISQ	.0816595	3154.051	0.014

Source: Author, 2020.

In the long run, technical cooperation, real GDP and institutional quality are statistically significant. In addition, from Table 3.4.3, it is obvious that gender inequality has significant inverse relationship with educational attainment as proxied by years of schooling in SSA. However, per capita income and inflation do not affect educational attainment in SSA. The implication of this result is that in the long run, technical cooperation has significantly impacted educational attainment. This implies that an increase in technical cooperation will translate into improved educational attainment. Also, gender inequality is shown to exert negative effect on educational attainment in SSA countries. This result suggests that increase in economic growth results in the improvement of the quality of education in SSA, while gender discrimination in the region retards the desired level of educational attainment in the region.

Table 3.4.4: Speed of Adjustment

Variables→	Coefficients	t-statistics	P-values
COINTEQ01	-.2314701	-.0415814	0.0000

Source: Author, 2020.

From the Table 3.4.4, it suggests that there is a long run association between the technical cooperation and other explanatory factors. There is a long run causality jointly running from the technical cooperation, per capita income, gender inequality, real GDP, inflation and institutional quality to the educational attainment in SSA. The errors in educational attainment in the previous years will be corrected in the current year by the technical cooperation, per capita income, gender inequality, real GDP, inflation and institutional quality at an adjustment speed of 23.15% annually.

Table 3.4.5: Short run Panel Autoregressive Distributed Lag result

Variables→	Coefficients	Std. Err	P-values
DTC	319414	1841564	0.618
DPCI	-513724.2	841131.9	0.559
DGDP	61473.18	351094.7	0.752
DINF	-1742104	1692853	0.583
DGEI	-16973.13	33854.9	0.763
DISQ	-1415362	1612385	0.574

Source: Author, 2020.

In the short run, technical cooperation, per capita income, gender inequality, real GDP, inflation and institutional quality have no significant effect on educational attainment in SSA. Also, from Table 3.4.5, in the short run, technical cooperation and real GDP have positive relationship with educational attainment in SSA. However, per capita income, inflation, gender inequality and institutional quality have inverse relationship with educational attainment as proxied by years of schooling in SSA. The implication of this result is that technical

cooperation does not significantly impact educational attainment in the short run, although it has positive effect on it in SSA countries. This result suggests that to certain extent, technical cooperation and real GDP contribute positively to the desire level of educational attainment in SSA countries. The study submitted that technical cooperation has a positive significant effect on educational attainment in SSA countries given the given the increase in economic growth and gender discrimination in the region.

3.4.5 Post Estimation Results

The findings on the normality test, heteroskedasticity test and the test for serial correlation are presented in Tables 3.6, 3.7, 3.8 respectively.

3.4.6 NORMALITY TEST

Table 3.4.6: Normality Test

Test	Jarque-Bera statistic	probability
Jarque-Bera	5.1281315	0.241984

Source: Author 2022.

From table 3.4.6, it is apparent that the model is normally distributed as showed by the value of Jarque-Bera statistics of 5.13 and corresponding probability of 24.20%.

3.4.7 Heteroskedasticity Test

Table 3.4.7: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	Prob. F	Obs*R-squared	Prob.Chi-Square	Scaled explained SS	Prob.Chi-Square
1.820316	0.2153	5.431207	0.1512	12.87973	0.0113

Source: Author, 2022.

As showed from table 3.4.7 above, the R^2 statistic is 5.431207 and the corresponding probability is 15.12% (greater than 5%). It means that the model is homoscedastic.

3.4.8 Serial Correlation LM Test

Table 3.4.8: Breusch-Godfrey Serial Correlation LM Test

F-statistic	Prob. F	Obs*R-squared	Prob. Chi-Square (1)
1.931726	0.2624	3.425053	0.2316

Source: Author, 2022.

The result of serial correlation LM Test is presented in table 3.4.8 above. With the value of LM statistic test of 3.425053 and the probability value is 0.2316, it implies that the model does not have the problem of auto serial correlation.

3.5. Conclusion and Recommendations

This study assessed the effectiveness of technical cooperation on educational outcomes as part of the 2030 SDGs agenda in Sub-Saharan Africa. Despite the growth of literature on aggregate aid effectiveness, the sectoral dimension of aid has received little attention in the literature. Existing literature only focuses on the demand factors while taking cognizance of supply-side factors of aid. According to Axel,. et al (2006), the effectiveness of aid in terms of educational attainment is determined not only by how aid is measured, but also by how much aid for education contributes to the recipient government's overall educational expenditure, and other factors that affect both the demand and supply sides of aid. We add to the literature in this regard by considering the implications of both the supply and demand factors of aid effectiveness. Hence we investigate the role of institutions in the effectiveness of technical cooperation form of aid on educational attainment in SSA. Thus, the inclusion of institutional quality is believed to capture the interaction between institutions and technical cooperation. According to Pritchett (2001), investment in education may have a larger social pay-off once aid-recipient countries improve the local institutional environment.

We build on the model in the study conducted by Peter and Rainer (2006) using the panel autoregressive distributed lagged PMG estimation technique. The paper finds that technical

cooperation, real GDP and institutional quality have positive impacts on educational attainment while gender inequality has a statistically significant inverse relationship with educational attainment as measured by the years of schooling in SSA. Noteworthy is the fact that per capita income and inflation do not affect educational attainment in SSA. The implication of this result is that technical cooperation has significant impact on educational attainment in SSA countries. Also, the main channels through which the increase in technical cooperation can translate to improving educational attainment, especially real GDP and institutional quality, have also been shown to exert positive effect on educational attainment in SSA countries. This result suggests that technical cooperation, increase in economic growth and improvement in institutional quality improve the quality of education while higher levels of gender inequality in the region retard the effectiveness of technical cooperation in translating to the goal of universal primary education across SSA countries.

In view of the above, we recommend the need to improve more on the institutional and policy environment in SSA countries for better educational outcomes and also instituting a more serious and swift legal prosecution of corrupt cases, especially those that have to do with foreign aid and grants on education.

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Chapter Four

Technical Cooperation and Health Outcomes in Sub-Saharan Africa

Introduction

4.1.1 Background

Development strategy, target and objectives countrywide and world over have over the years put health and wellbeing of the people at the center stage. As such, the new Sustainable Development Goals (SDGs) for the post-2015 of the United Nations (UN) as adopted by world leaders position health and wellbeing as a key target (Ssozi & Amlani, 2015). While the target of SDGs is the achievement of wellness for all by 2030, the goals 4, 5, and 6 of the MDGs are to reduce "infant, child, and maternal mortality, control of HIV/AIDS, and increased life expectancy, especially in the developing nations, by 2015" (Ssozi & Amlani, 2015). The focus of global developmental strategy on health is not unconnected with the fact that one of the numerous causes of the gap between real income and actual possibilities is ill health, which limits the amount to which a particular level of money can be transformed into the capacity to live a decent life (Sen, 1999). Improved health, on the other hand, leads to increased productivity and a greater willingness to save and invest, both of which enhance life expectancy (Bloom, Canning & Jamison, 2004). The need for the availability of sufficient resources in terms of manpower expertise, financial and material resources as well as health facilities in order to raise health outcome have led to the recent surge in health expenditure globally (Garret, 2007).

Apart from country specific effort through increasing expenditure on health directed towards improving health outcomes, developmental assistance on health (DAH) in form of technical cooperation to the middle and lower income countries with inadequate domestic capital have been growing (Lai, Koledoye & Huang, 2009). Over the last two decades, the flow of official

development assistance (ODA) for health programs has increased dramatically, particularly in developing nations (Piva & Dodd, 2009). This suggests that the technical assistance (technical cooperation) component of ODA has been increasing over time. ODA figures include technical assistance (technical cooperation) expenditures (Akinkugbe & Yinusa, 2009). As a result, significant increases in health funding across areas have aided progress toward global health targets throughout this time (Dieleman et al, 2016). Despite significant improvements in global health conditions and status, as well as an increase in the trend of technical assistance and total ODA flows to poor nations in the Sub-Saharan African area, the region continues to face some of the world's most serious health issues (Akinlo & Sulola, 2018).

Development aid on health (DAH) refers to any financial contributions to developing nations from bilateral (national governments) and multilateral (World Bank) institutions for the goal of improving their health (Patela, Robertsb, Contehc, Guyd & Lee-Jonesd, 2011). Foreign aid or developmental assistance, according to Cabraal (2010), includes financial flows, technical assistance, and commodities with the primary goal of promoting economic development and welfare, but excludes aid provided as grants or subsidized loans for military or other non-development purposes. It is the transfer of in-kind and monetary resources from primary development channels to low- and middle-income countries in order to maintain or enhance their health (Grepin, Leach-Kemon, Schneider & Sridhar, 2011). According to Dieleman et al. (2016), health-related development assistance, including technical cooperation, is divided into MDG-related (tuberculosis, malaria, HIV/AIDS, child and newborn health, and maternal health) and non-MDG-related (tuberculosis, malaria, HIV/AIDS, child and newborn health, and maternal health) (infectious diseases, non-communicable diseases, sector-wide approaches, and other development assistance).

Given the growing trend of technical assistance with a focus on health to countries with insufficient cash for health finance, both the recipient and the donor predict a considerable

increase in SDG-related health outcomes for these countries, including those in Sub-Saharan Africa. According to the World Health Organization (WHO), between 20% and 40% of global health expenditures are squandered (Ssozi & Amlani, 2015). Furthermore, during the last several years, the bulk of technical or developmental assistance on health has focused on the SDG, with help on SDG-related health components growing at a far higher pace than aid in other areas (Dieleman, et al., 2016). SDG-related health components geared particularly at combatting HIV/AIDS, malaria, and TB, according to Liese and Schubert (2009), have increased the amount of development aid for health. The majority of help, according to Garret (2007), is for stand-alone initiatives such as HIV/AIDS, malaria, TB, maternal, newborn, and child health. Other important aspects, including as nutrition and basic healthcare, are overlooked in this stove pipe, reducing total effectiveness. Over the years, national and global development strategies, targets, and objectives have prioritized people's health and well-being. As a result, both the outgoing Millennium Development Goals (MDGs) established in 2000 and the new Sustainable Development Goals (SDGs) adopted by world leaders for the post-2015 United Nations (UN) place a premium on health and well-being (Ssozi & Amlani, 2015).While the target of the SDGs is the achievement of wellness for all by 2030, the goals 4, 5, and 6 of the MDGs are to reduce "infant, child, and maternal mortality, control of HIV/AIDS, and increased life expectancy, especially in the developing nations, by 2015" (Ssozi & Amlani, 2015). The focus of the global developmental strategy on health is not unconnected with the fact that one of the numerous causes of the gap between real income and actual possibilities is ill health, which limits the amount to which a particular level of money can be transformed into the capacity to live a decent life (Sen, 1999). Improved health, on the other hand, leads to increased productivity and a greater willingness to save and invest, both of which enhance life expectancy (Bloom, Canning & Jamison, 2004). The need for the availability of sufficient resources in terms of manpower expertise, financial and material resources as well as health

facilities in order to raise health outcomes has led to the recent surge in health expenditure globally (Garret, 2007).

Apart from country-specific efforts to improve health outcomes through increased health expenditure, developmental assistance on health (DAH) informs of technical cooperation to middle and lower income countries with insufficient domestic capital since the early 1990s, with an increase in the number of funds and distribution methods for the purpose of sustaining or enhancing health (Lai, Koledoye, & Huang, 2009).Over the last two decades, the flow of official development assistance (ODA) for health programs has increased dramatically, particularly in developing nations (Piva & Dodd, 2009). This suggests that the technical assistance (technical cooperation) component of ODA has been increasing over time. ODA figures include technical assistance (technical cooperation) expenditures (Akinkugbe & Yinusa, 2009). As a result, significant increases in health funding across areas have aided progress toward global health targets throughout this time (Dieleman et al., 2016). Despite significant improvements in global health conditions and status, as well as an increase in the trend of technical assistance and total ODA flows to poor nations in the sub-Saharan African area, the region continues to face some of the world's most serious health issues (Akinlo & Sulola, 2018).

Development aid on health (DAH) is defined as any financial contribution to developing countries from bilateral (national governments) and multilateral (World Bank) institutions with the goal of improving their health (Patela, Robertsb, Contehc, Guyd, & Lee-Jonesd, 2011). Foreign aid, or developmental assistance, according to Cabraal (2010), includes financial flows, technical assistance, and commodities with the primary goal of promoting economic development and welfare, but excludes aid provided as grants or subsidized loans for military or other non-development purposes. It is the transfer of in-kind and monetary resources from primary development channels to low-and middle-income countries in order to maintain or

enhance their health (Grepin, Leach-Kemon, Schneider & Sridhar, 2011). There are two types of health-related development aid: one that is MDG-related (tuberculosis, malaria, HIV/AIDS, child and new-born health, and maternal health) and one that is not MDG related (infectious diseases, non-communicable diseases, sector-wide approaches, and other development assistance), according to Dieleman et al. 2016.

Given the growing trend of technical assistance with a focus on health to countries with insufficient cash for health finance, both the recipient and the donor predict a considerable increase in SDG-related health outcomes for these countries, including those in Sub-Saharan Africa. The fact that the technical support has generally been unsuccessful is concerning (Williamson, 2008; Wilson, 2011). Furthermore, according to the World Health Organization (WHO), between 20% and 40% of global health expenditures are squandered (Ssozi & Amlani, 2015). Furthermore, during the last several years, the bulk of technical or developmental assistance on health has focused on the SDG, with help on SDG-related health components growing at a far higher pace than aid in other areas (Dieleman et al., 2016). According to Liese and Schubert (2009), SDG-related health components, particularly those aimed at combating HIV/AIDS, malaria, and tuberculosis (TB), have increased the amount of development aid for health. The majority of the help, according to Garret (2007), is for stand-alone initiatives such as HIV/AIDS, malaria, TB, maternal, newborn, and child health. Other important aspects, including nutrition and basic healthcare, are overlooked in this stove pipe, reducing its total effectiveness. In the meantime, both SDG-related and non-SDG-related health outcomes, such as tuberculosis, malaria, HIV/AIDS, child and new-born health, and maternal health, as well as infectious diseases, non-communicable diseases, sector-wide approaches, and other development aid, are critical to overall improvements in aggregate health outcomes. For example, mounting evidence of the illness and death caused by inadequate reproductive health care prompted a 2007 push to make universal access to reproductive health a new Millennium

Development Goal (MDG) aim (Glasier, Gülmezoglu, Schmid, Garcia, M.C., & Van, 2006). Vaccination is also one of the most cost-effective public health initiatives owing to the low cost of conventional vaccinations and their ability to save lives (Ward et al., 2019). Furthermore, to address the increased complexity of health treatments, health care workers (HCWs) need to have both general and specialized technical skills (Rowe, de Savigny, Lanata & Victora, 2005; Vasan, Mabey, 2016; Chaudhri, Brown, Epstein & Lawn, 2016; Leslie, Gage, Nsona, Hirschhorn & Kruk, 2016). NTDs, which include HIV/AIDS, malaria, tuberculosis, and diarrheal illnesses (Moran, Guzman, Ropars, McDonald, Jameson, Omune, Ryan, and Wu, 2009), are one of the most serious public health issues, affecting primarily people living on less than $2 per day (Hotez, Molyneux, Fenwick, Kumaresan, Sachs, Sachs & Savioli, 2007). As a consequence, societal shame, acute poverty among affected people, and low mortality are only a few of the causes of these illnesses' neglect (WHO, 2009).

4.1.2 Motivation

Since the late 1990s, developing nations have been receiving growing amounts of technical or development aid (ODA) for health-related projects (OECD, 2009). As a result, health-care expenditure in the area has risen (Courtenay, Sweeney, Zielinska, Brown & La Ragione, 2015; Liu, Guo, Qian, Tang, Li & Chen, 2014). Since 2000, all major categories of health spending in Sub-Saharan Africa (SSA) have increased. Meanwhile, the majority of the rise in health spending is due to development aid (Ssozi & Amlani, 2015). According to Wen, Lib, Du, Yang, Casazza, and Liu (2019), the international community has provided substantial developmental aid to Africa as a whole during the last 80 years. However, not all illnesses and health components have benefited equally from the growth in health-related development aid to poor nations (Liese & Schubert, 2009).

Despite the increased influx of DAH into the area, sub-Saharan African nations continue to face some of the world's most serious health issues (Akinlo & Sulola, 2018). Between "2000 and 2008, Sub-Saharan Africa had an under-five mortality rate of 165 deaths per 1,000 live births and an infant mortality rate of 97 deaths per 1,000 live births" (United Nations, 2010). The majority of the money raised in response to the HIV/AIDS crisis has gone to waste (Garret, 2007). This is because, owing to layers of financial bureaucracy and inefficient health-delivery systems, not all of the amounts allotted are spent properly. In addition, corruption has allowed a lot of money to seep out in the form of payments to ghost workers, inflated transportation and storage fees, drug embezzlement to the black market, and the selling of counterfeit prescriptions (Ssozi & Amlani, 2015). As a result, the effectiveness of donor support in the form of technical assistance for health in the receiving country is now being studied empirically (Dieleman et al., 2016).

4.1.3 Gap in the Literature

Different researchers have examined the effects of technical cooperation on health outcomes in Sub-Saharan Africa. However, despite the large volumes of study, there are discrepancies in the general conclusion. For example a negative influence of technical cooperation was ascertained by Akinlo and Sulola, (2018); Wen, Lib, Du, Yang, Casazza, and Liu (2019) while a positive influence was documented by Lai, Koledoye, and Huang (2009); Dieleman et al., (2016), Ssozi and Amlani, (2015). With thorough observations, the discrepancy in the general conclusion was as a result of differences in variable usage, methodology applied and scope of each researchers.

Furthermore, the literature on the impact of technical cooperation and development assistance on health as a category or form of technical cooperation used a variety of health outcome components covering SDG-related and non-SDG-related health outcomes (Liese & Schubert,

2009; Garret, 2007; Wilson, 2011). (Hsu, Berman & Mills, 2013; Tirivayi & Groot, 2011; Tranchant, Gelli, Bliznashka, Diallo, Sacko, Assima, Siegel, Aurino & Masset, 2018). Ikilezi, Augusto, Dieleman, Sherr, and Lim (2018) focused on immunization and vaccine support; Tirivayi and Groot (2011) examined food security and nutrition outcomes; and Hsu, Berman, and Mills (2013) paid attention to reproductive health among the studies on selected SDG-related and non-SDG-related outcomes. Despite the diverse health outcomes used in the existing studies, these studies have found mixed results: while some studies find direct effects, others find negative or statistically insignificant effects (Ssozi & Amlani, 2015).

To the best of the authors' knowledge, existing studies on the effectiveness of technical or development assistance for health have not examined both SDG-related and non-SDG-related health targets combined in one study, with the exception of the study conducted by Ssozi and Amlani (2015), but their focus was on the effectiveness of health expenditure rather than technical cooperation. This study is motivated to address this gap by investigating the effect of technical cooperation on both the SDG-related and non-SDG-related health targets as well as health facilities and to affirm the direction of technical cooperation on health outcomes in Sub-Saharan Africa.

4.1.4 Aim and Objectives of the Study

This research analyses the effect of technical cooperation on health outcomes in Sub-Sahara Africa. Thus, based on the SDGs 2030 agenda, specific objectives of the study are to:

a) Examine the effect of domestic health expenditure on health outcomes in Sub-Sahara Africa;
b) Investigate the effect of technical cooperation on SDG-related health targets in sub-Sahara Africa;
c) Analyse the effect of technical cooperation on non-SDG-related health targets in sub-Sahara Africa;

d) Examine the effect of technical cooperation on health facilities in sub-Sahara Africa.

4.1.5 Significance/Contribution

The study builds on previous and recent studies on developmental assistance, which encompassed millennium development goal (MDG) and sustainable development goal related health targets, but covers a more inclusive set, including the non-sustainable development goal related health targets. The goal is to encourage donors to realise the need to balance the flow of their developmental assistance across both the SDG-related and non-SDG-related health targets since both are important in realising their objective of improving the overall health outcomes in developing countries and should inform policy, which should help to improve the efficiency and impact of such developmental assistance.

4.2 Literature Review

4.2.1 Conceptual Review

4.2.1.1 Technical Cooperation as a Component of Official Development Assistance

Official development assistance (ODA) is defined as "flows of official financing administered with the main objective of promoting the economic development of developing countries" (DAC, 2007). ODA includes grants provided by the government for economic development and concessional loans (IMF, 2003). Based on the criticism raised by Lin (2016) on the narrow scope of the OECD definition of ODA that its main purpose is economic development, the author defines ODA as all instruments serving the purpose of promoting economic development of developing countries, such as investments, trade, aid, and technical cooperation, as long as they support the increase of recipients' welfare (Wen, Lib, Du, Yang, Casazza & Liu, 2019). In the view of Cabraal (2010), financial flows, technical support, and commodities with the primary goal of promoting economic development and welfare are covered under developmental assistance but exclude help for military or other non-development reasons, supplied as grants or subsidized loans.

The technical cooperation component of ODA is a type of aid intended to help with development (Ishnazarov & Cevik, 2017). It is a type of counseling and training support for civilian and military objectives (Tamer, 2012). Technical cooperation, according to Baser and Morgan (2001), "includes all resources that support the development and utilization of skills, knowledge, and technology in the form of training, advisory services, human resource development, and service delivery, as well as long-and short-term expertise from national and foreign resources, as well as training, supporting materials and equipment, consultancies, study visits, and seminars-development assistance to national governments" (Baser & Morgan, 2001). Though the technical assistance program focused on small, short-term projects until the mid-1970s, its scope has recently been expanded to include programs addressing a wide range of development goals, including increased food productivity, improved health and nutrition services, improved energy development, and sustainable energy production (Casas-Zamora and Kashyap, 2013). Technical assistance is divided into two types: "substitution technical assistance," which entails the provision of consultants and advisors to fill in short-term gaps when local capacities are insufficient, and "technical assistance for institutional development," which entails the development of skills and the strengthening of institutions with the goal of capacity building and full capacity utilization (World Bank, 1996).

According to Gibson, Hoffman, and Jablonski (2014), technical assistance can be divided into three types: Technical aid is "directed at filling the knowledge gap in the recipient country through funding consultancy and advisory services, where consultants and advisors actively monitor their assigned project or program in the areas of budgets, expenditures, and staffing with the goal of reducing the amount of aid a recipient country receives directly or indirectly". The second form of help is technical assistance for institutional development, with the goal of strengthening bureaucratic procedures by monitoring and accounting for spending as a result of the donor's assessment of inefficiency in the recipient country's existing norms (Arndt,

20000). This form of support may have an indirect effect on patronage by creating standards that other government units must consider (Word Bank, 1996). The third type of aid is technical assistance, which means giving training to people in other countries so they can improve their own abilities (Helleiner, 2000).

4.2.1.2 ODA for Health and Health Outcomes

Health-related development support an essential type or form of technical cooperation is DAH-channeled support for the development and utilization of services, skills, knowledge, and technology in the health sector in the form of training, advisory services, and human resource development to improve health service delivery. DAH refers to all financial contributions to developing nations from bilateral (i.e., country governments) and multilateral (e.g., the World Bank) organizations for the purpose of improving health (Patela, Robertsb, Contehc, Guyd & Lee-Jonesd, 2011). It is the transfer of in-kind and monetary resources from primary development channels to low-and middle-income nations in order to maintain or improve health (Ravishankar, Gubbins, Cooley, et al., 2009). DAH contributes to the development of human capital, which is critical for increasing economic output. In 2019, Labonte, Gagnon, Dieleman, Cowling and other researchers found that improving health and fostering economic growth can help people live longer and happier lives. This is because they found that improving health and fostering economic growth can help people live longer and happier lives.

Developmental aid for health system support, according to Ikilezi, Augusto, Dieleman, Sherr, and Lim (2018), is defined as all disbursements aimed at overcoming current health system constraints. Support for the treatment and control of "communicable diseases; reproductive, maternal, and child health services; injury care, mental and psychosocial medical services, and degenerative conditions; disease surveillance and health information systems; supporting primary health care, hospital services, and reinforcing the medical system; and indirect

wellness programs such as water, sanitation, and food" (Patela, Robertsb, Contehc, Guyd & Lee-Jonesd, 2011). Infant mortality is the number of newborns that die before they turn one year old per 1,000 live births in a particular year. The under-five mortality rate is the probability per 1,000 that a newborn baby will die before reaching the age of five, based on age-specific mortality rates for the year (Ssozi and Amlani, 2015). Hsu, Berman, and Mills (2013) say that the main goal of reproductive health support is to help women of childbearing age get back to and improve their reproductive processes, functions, and systems. They also want to help them keep their children healthy.

4.2.2 Theoretical Review

The impact of technical help on people's overall health may be studied using the capital absorptive capacity method. Other significant ideas on this topic include Grossman's (1972) demand for health model, dependency theory, and neoclassical economic theory. According to the idea of capital absorptive capacity, developing nations have low capital absorptive capacity, which has an impact on the optimum utilization of domestic and foreign resources. However, if other conditions are satisfied, development assistance to developing countries that focuses on skill development, human capital production, the construction of technical institutions, and the training of management and technical experts may help them expand faster. According to Chenery and Strout (1966), capital-absorptive capacity is a sort of skill limitation that is more obvious in the early phases of development and precludes a high enough level of investment to meet the necessary rate of output growth (Chenery and Strout, 1966). Non-economic factors, primarily cultural-institutional bottlenecks, a lack of entrepreneurship, social impediments to technological change and innovation, a low level of education, rapid population growth, and immobility of factors of production, are believed to be major constraints on these countries' growth and development, resulting in a shortage of skilled workers, managers, and technical personnel, and thus limiting the amount of pro-growth capital available. Furthermore, the

model suggested that investment in educational and technical institutions, as well as research and development, might help generate competent personnel. In addition, skill development is a long-term process that takes a long time to develop. Less-developed countries, on the other hand, will be able to close this gap if foreign help comes in the form of a program or project that focuses on skill development (Pankaj, 2005).

In Grossman's (1972) demand for health model, an individual's underlying level of health is considered a capital good that rises with an investment in health. Because health capital cannot be gained instantly, the desire to increase one's stock of health capital over time is strong (Laporte, 2015). According to Jager (2017), the model believes that "healthy days" are created by the health stock, which provides pleasure both directly via the enjoyment of good health and indirectly by enabling time to be spent on both market and non-market activities. According to Becker (1965), although people's health as capital stock depreciates as they age, they employ medical treatment and their own time to replicate health capital. When the marginal cost and marginal gains of increased health status in the form of healthy time are equal, the optimum level of investment is reached (Jochen & Jan-Egbert, 2017). According to the two constraints on Grossman health optimisation, an increase in sick days reduces the time available for these activities due to a time constraint, whereas the income constraint stems from the assumption that people are born with a certain amount of health stock that depreciates with age and can be offset by investment activities, but when the stock reaches a critical level, death occurs. According to the model, an increase in the depreciation rate will reduce demand for health care, while an increase in wages will have an uncertain impact on the amount of health care required. The marginal productivity of health rises when wages rise because more healthy days are available to earn greater pay, generating an incentive to invest in health and demand a larger health stock.

Finally, education raises the need for medical supplies. Individuals' ability to combine their time and inputs (such as healthcare) to create health improves as a result of education. Education will move the MEC outwards as the rate of return grows, and a greater quantity of health will be sought for any given marginal cost, similar to the impact of technology on a firm's production (Jager, 2017). One common complaint is that the model has a basic indeterminacy when it comes to the appropriate amount of health spending (Ehrlich and Chuma, 1990). In order for less-developed nations to get to the stage of independence, Raul Prebisch and other economists connected with the Economic Commission for Latin America (ECLA) have advocated for import substitution and the development of tariff barriers for advanced countries' exports. In this concept, interdependence between the capitalist core and the expanding periphery was seen as mutually beneficial for both sides.According to Marxist proponents, the dependence theory describes the relationship between the capitalist core and the expanding periphery as exploitative of the latter. As a consequence, the primary reason for underdevelopment in peripheral countries is the extraction of their surplus by the capitalist core, and the capitalist metros are advancing at the expense of weak peripheral countries (Pankaj, 2005).

As a consequence, the post-World War II dependency between the capitalist metros and the underdeveloped periphery is a sort of neo-imperialism in which the capitalist metros prosper at the expense of the peripheral nations' underdevelopment. This phenomenon is referred to as "the development of the undeveloped" (Frank, 1967). The neo-classical method is based on the assumption that although the economy is open to foreign help in the form of foreign aid transactions in its steady-state growth condition, it is closed to all other sorts of contact. Given the model's single commodity class, it was assumed that the donor nation required that the assistance be utilized to boost the capital stock. Hence, the receiving country's capital-labor ratio is predicted to grow as long as help is received. Thus, the model implies that foreign help

has only a transient impact on per capita consumption, while foreign aid that directly decreases the birth rate and, thus, the natural rate of population growth and labor supply may have a long-term influence on the welfare of impoverished nations.

Consider the case when a poor nation receives technological knowledge regarding birth control devices and techniques, which it then exploits to its advantage. The donor nation may provide experienced employees to instruct local workers who will then be able to continue the birth control program after the developed country's personnel have departed. When the new, lower birth rate is established, it will be replaced by a new, lower-sloped curve, resulting in a lower steady-state birthrate (Crouch, 1973).

4.2.3 Empirical Review

Several studies abound in the literature on the effectiveness of technical cooperation as well as development assistance for health in improving health outcomes in the recipient country. Research focusing on SDG-related health outcomes, non-SDG-related health outcomes, and studies on the efficacy of expenditure and assistance on health are the three primary strands of literature that may be identified. It was also argued that the availability of low-cost NTD remedies supports the need for more funding for NTD control. Wilson (2011) used regression analysis to look at the relationship between DAH and mortality in 96 high-mortality nations.

In comparison to other types of relief, DAH was demonstrated to have no impact on mortality. Economic expansion, on the other hand, has been shown to have a detrimental impact on mortality. In a similar vein, Garret (2007) found that despite recent increases in health funding in response to the HIV/AIDS pandemic, large sums of money are leaking away without producing the desired results due to ineffective spending of most of the money as a result of bureaucracy, poor health-delivery systems, corruption, competition, and poor coordination among donor activities, resulting in overlapping programs, and that most of the money is

leaking away without producing the desired results. There is also a lot of research on health outcomes that isn't tied to the SDGs. Hsu, Berman, and Mills (2013), for example, estimated assistance to reproductive health to increase donor responsibility in prioritizing aid flows to those most in need.

Aid for reproductive health rose more quickly in 74 countdown priority countries, with more than half of the money going to HIV prevention, treatment, and care for women of reproductive age (15–49 years of age). Meanwhile, assistance to reproductive health was significantly reliant on the United States, the Global Fund, the United Kingdom, the United Nations Population Fund, and the World Bank, with ODA to general reproductive health activities averaging 159% and ODA to family planning averaging 72%. In a similar spirit, Ikilezi, Augusto, Dieleman, Sherr, and Lim (2019) use conventional time series cross-sectional techniques to explore the impacts of vaccination support while controlling for country income, governance, and population. According to the findings, aid had a significant positive impact, particularly with the newer immunizations. From both a historical and a future standpoint, the study reveals that global vaccination measures have been implemented successfully so far. Tranchant et al. (2018) examine the effect of humanitarian assistance on rural population food security using data from a unique pre-crisis baseline based on two survey rounds, five years apart, in the Mopti area of Northern Mali of 66 villages randomly chosen from inside food-insecure districts. According to the data, food assistance boosted non-food and food expenditures as well as micronutrient availability in families. When the effects on children's height, caloric and micronutrient consumption were broken down by degree of conflict exposure, it was discovered that the effects on children's height, caloric and micronutrient consumption were mostly concentrated in areas not directly affected by the conflict, as opposed to the increase in food expenditures, which was driven by households in close proximity to armed groups.

Families that received at least two forms of food assistance were also disproportionately impacted.

A number of studies have also looked at the influence of spending and support on health outcomes. From 1995 to 2011, Ssozi and Amlani (2015) used a two-step Generalized Method of Moments technique to examine the effectiveness of health expenditures in 43 Sub-Saharan African nations. (GMM). The researchers observed that the ultimate objectives, notably newborn and child mortality rates, are not yet stable in SSA and are heavily reliant on their lagged values, which have a coefficient of elasticity greater than unity.

Between 2000 and 2008, Akinlo and Sulola (2018) examined the impact of public health investment on under-five and neonatal mortality rates in 10 Sub-Saharan African countries. The data implies that government expenditure on health benefits children under the age of five and babies. The data shows that GDP per capita, health aid, HIV prevalence, and immunization have significant negative effects on infant and child mortality. According to the data, increased health-care expenditure in Sub-Saharan Africa has not resulted in a decrease in under-five mortality. Lai, Koledoye, and Huang (2009) use data from four African nations and 10 DAH projects from 1995 to 2008 to analyze Taiwan International Cooperation and Development Fund (Taiwan ICDF)-supported development aid for health DAH in Africa in terms of skills training and technology transfer. The malaria control campaign in Sao Tome and Principe was deemed the most well-received and recognized of the 10 initiatives, and so serves as a model for DAH. Multifaceted medical and health services based on strategic partnerships of mutual manpower allocation and institutional capacity development on the ground are the most important and key missions defined in growing DAH for better outcomes.

Dieleman et al. (2016) analyzed historical trends, relationships, and the future of international financial flows for health using audited budget statements, annual reports, and project-level

data from the important international organizations that disbursed DAH from 1990 to the end of 2015. According to the findings of linear regression, there have been two notable changes in DAH development during the previous 26 years. Although DAH was connected to the SDGs, it expanded the fastest of all the priority areas in the first decade of the 2000s. Despite the fact that DAH is still expanding slowly, it is moving among the key health priority areas, with very little rise in HIV/AIDS, malaria, and tuberculosis. The extension and focus of DAH will have a considerable influence on health care in a number of low-income countries. Bodenstein and Kemmerling (2015) used a regression approach to investigate the causes of variation across time and donors, utilizing aggregate data on bilateral aid and two short country studies on Germany and the United Kingdom. The panel estimate method reveals a trade-off between the total amount of money allocated and the amount delivered to poor countries. In prosperous welfare states, a similar trade-off exists between targeting and redistribution.

4.3 Research Methodology

4.3.1 Theoretical Framework and Model Building

The theoretical model employed in this study follows Grossman (1972) aggregate health production model which envisages that individual health status is a function of their inputs and is specified as shown in equation 1.

$$Y = f(W) \tag{1}$$

Where Y measures the health status of an individual and W represents the individual's input to the health function. Given this health production function, the effect of health expenditure on health status can be empirically estimated. The choice of the aggregate health production function is because it allows the estimation of the overall effect of the utilization of healthcare on the health status of the population (Murunga, Mogeni & Kimolo, 2019).

The model for this study is informed by Grossman's (1972) health production function, which serves as the theoretical framework for the study and the study conducted by Lin (2016), which added investments (FDI inflows), trade, aid (DAH), and technical cooperation to the OECD definition of official developmental assistance, which comprises of grants (humanitarian aid) and concessional loans (debt relief). The study by Patel, Roberts, Conteh, Guy, and Lee-Jones (2011) also identified humanitarian aid and aid for health as components of ODA.

Consequently, the explanatory variables in the current study are technical cooperation, including developmental assistance for health, investments proxied by FDI inflows and trade, as well as domestic health expenditure proxied by general government health expenditure and out-of-pocket health expenditure. The dependent variables are health outcomes, which include two health targets from each of the SDG-related and non-SDG-related health targets, as well as health facility availability. While the two SDG-related health targets under study are life expectancy at birth and immunization, the non-SDG-related health targets consist of infectious diseases and mortality rate, while the availability of health facilities is proxied by hospital beds.

Based on the foregoing, our model to capture the relationship between health outcomes and technical cooperation has five dependent variables (infectious diseases IFD, life expectancy at birth LE, immunization IM, mortality rate MR and health facilities proxy by hospital beds HFC), while the explanatory variables against each of the five independent variables are technical cooperation TC, developmental assistance for health DAH, FDI inflows, trade TRD, government health expenditure GHE and out-of-pocket health expenditure OPE. The model in aggregation is specified as follows:

$$HUCM_{it} = f(TC_{it}, DAH_{it}, FDI_{it}, TRD_{it}, GHE_{it}, OPE_{it}) \quad (2)$$

The a'priori expectation for the effectiveness of technical cooperation and developmental assistance on health DAH both variables should impact life expectancy and immunisation positively. Also the other control variables: foreign direct investment inflows, trade, government health expenditure and out-of-pocket health expenditure are also expected to impact life expectancy and immunisation positively. On the other hand, technical cooperation and developmental assistance on health DAH are expected be inversely relate to infant mortality rate and infectious. Also the other control variables: foreign direct investment inflows, trade, government health expenditure and out-of-pocket health expenditure should also be negatively related to infant mortality rate and infectious diseases

4.3.2 Data sources and Measurement of Variables

The study focused on technical cooperation flows to the Sub-Sahara Africa SSA region as such our sample covers the forty eight (48) countries in Sub-Sahara Africa but due to missing data on SDG and non-SDG health targets for both Zambia and Zimbabwe the two countries were excluded from the analysis. The worsening health problems in Sub-Sahara Africa despite the increase in the flow of health expenditure to the region since 2000 as a result of the increased in the inflows of technical cooperation in the past 80 years in addition to increase in the extra budgetary allocation to the sector informed our choice of Sub-Sahara Africa as the case in study. The study used annual panel data set covering the period of 1996 to 2018 with the intention of capturing the implication of the surge in the flow of technical cooperation in SSA since the introduction of millennium development goal (SDG) in the year 2000.

Table 4.1: Data and sources and Measurement

No.	Variables	Operational Definition	Source of Data
1	Technical cooperation TC	Technical cooperation grants at current US Dollar	WDI (2020)
2	Developmental assistance for health DAH	Developmental assistance for health (DAH)	OECD (2020)
3	Foreign direct investment inflows FDI	Foreign direct investment, net inflows (BOP, current US $)	WDI (2020)
4	Trade TRD	Net trade in goods and services (BOP, current US $)	WDI (2020)
5	Government health expenditure GEH	Purchasing power parity PPP domestic general government per capita health expenditure in current international US $	WDI (2020)
6	Out-of-pocket health expenditure OHE	Purchasing power parity PPP out-of-pocket per capita expenditure in current international US $	WDI (2020)
7	Infectious diseases, IFD	This is proxy by the incidence of HIV per 1,000 uninfected population aged 15-40 years	WDI (2020)
8	Life expectancy at birth LE	Total life expectance at birth in years	WDI (2020)
9	Immunization IM	Measles immunisation in percentage of children aged 12-23 months	WDI (2020)
10	Health facilities HFT	Hospital beds	WDI (2020)
11	Mortality rate MR	Infant mortality rate per 1, 000 live births	WDI (2020)

Source: Author, 2020.

The data set comprising of technical cooperation, developmental assistance on health, humanitarian aid, debt relief, foreign direct investment inflows, trade and government health expenditure and out-of-pocket health expenditure, infectious diseases, life expectancy at birth, immunization and health facilities proxy by Hospital beds were collected from the World Bank (WB) World Development Indicators (WDI) published in 2019. Details of the data measurement and sources are summarized in Table 4.1.

4.4 Results

The findings of the empirical data analysis are presented in this section. The research used pre-estimation tests such as the normality test, unit root test, multicorrelation test, and lag order selection criteria before doing empirical data analysis. The data utilized in this analysis, after omitting Zambia and Zimbabwe, is an annual panel data collection of 46 Sub-Saharan African nations from 1996 to 2018. As a result, there are 46 cross-sectional units (countries) in the research, each having a 22-year time span (t), totaling 1012 observations.

4.4.1 Pre-Estimation Tests

The normality, multiocorrelation and unit root tests performed by Jacque-Bera (JB) were used as preliminary testing. These tests are helpful in determining the nature of the dataset's distribution across time.

4.4.1.1 Normality Test

In order to determine whether or not the each of the variables in the dataset are normally distributed or not, the Jacque-Bera (JB) test was employed. Alongside the JB statistics the result of other descriptive statistics such as the mean, median, skewness and kurtosis are also captured in Table 9 as follows

Table 4.2: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Obs.
LE	59.673	59.9055	71.062	46.267	5.0223	-0.428	5.011	3.584	0.1667	18
MR	61.928	56.35	119.7	23	21.213	0.8201	4.367	3.419	0.1809	18
OHE	58.019	50.87146	149.385	24.793	32.592	1.3172	4.388	6.65	0.036	18
GEH	68.435	23.08783	459.313	8.3655	114.39	2.574	8.841	45.46	0	18
HFT	1.2	0.75	6.3	0.1	1.4246	2.7059	10.33	62.27	0	18
IM	75.389	75.5	97	33	16.335	-0.751	3.503	1.88	0.3905	18
IFD	2.0322	0.895	12.2	0.02	2.9563	2.4608	8.909	44.35	0	18
FDI	-7.39E+08	-3.95E+08	-8E+06	-2.63E+09	8.37E+08	-1.092	2.74	3.626	0.1632	18
TRD	-1.07E+09	-7.16E+08	8.95E+09	-1.38E+10	4.30E+09	-0.718	6.796	12.35	0.0021	18
TC	9E+07	84110000	1.93E+08	1E+07	6E+07	0.1997	1.701	1.385	0.5004	18
DAH	151.26	112.5925	763.798	2.148	184.01	2.2027	7.907	32.62	0	18

Source: Author, 2020.

Out-of-pocket health spending (OHE), government health expenditure (GEH), health facilities (HFT), infectious diseases (IFD), trade (TRD), and development aid for health all have a P-value less than 0.05, according to the Jarque-Bera data in Table 4.2. (DAH). As a result, at the 5% significance level, the null hypothesis that the residuals of these variables are normally distributed is rejected, meaning that the variables in the dataset (OHE, GEH, HFT, IFD, and DAH) are not normally distributed around the mean. As a consequence of this conclusion, consecutive values of these variables across time are different, and so model estimation with these variables necessitates an estimating approach that tackles the issue of normalcy. In other words, estimate approaches that do not imply normalcy are suitable for the model. Meanwhile, since their p-values are bigger than unit, the Table shows that life expectancy at birth (LE), mortality rate (MR), immunization (IM), foreign direct investment inflows (FDI), and technical cooperation (TC) are all normally distributed.

4.4.1.2 Correlation Analysis

The correlation matrix for the data set's variables is shown in Table 3. The strength of a linear link between two variables is shown by the correlation coefficient in the Table. The test's goal is to see whether the model has an issue with multicollinearity.

Table 4.3: Correlation Matrix

	LE	TC	DAH	FDI	TRD	GEH	OHE
LE	1						
TC	-0.029307	1					
DAH	-0.005126	0.588776	1				
FDI	-0.056986	-0.273081	-0.252169	1			
TRD	-0.213908	-0.109666	-0.199756	0.033772	1		
GEH	0.326495	-0.269232	-0.248759	-0.051846	0.029591	1	
OHE	0.239878	-0.054842	-0.050551	-0.373233	0.142039	0.239100	1
	IMR	TC	DAH	FDI	TRD	GEH	OHE
IMR	1						
TC	0.031360	1					
DAH	0.020079	0.698419	1				
FDI	0.061306	-0.201330	-0.254888	1			
TRD	0.174824	-0.367893	-0.621695	0.210239	1		
GEH	-0.532969	-0.303222	-0.228695	0.051938	0.069766	1	
OHE	-0.210182	-0.072083	-0.012277	-0.257142	-0.019798	0.287188	1
	IM	TC	DAH	FDI	TRD	GEH	OHE
IM	1						
TC	-0.129803	1					
DAH	-0.075416	0.588776	1				
FDI	0.038147	-0.273081	-0.252169	1			
TRD	-0.321009	-0.109666	-0.199756	0.033772	1		
GEH	0.345239	-0.269232	-0.248759	-0.051846	0.029591	1	
OHE	0.007838	-0.054842	-0.050551	-0.373233	0.142039	0.239100	1
	IFD	TC	DAH	FDI	TRD	GEH	OHE
IFD	1						
TC	-0.128370	1					
DAH	-0.160365	0.629592	1				
FDI	0.012443	-0.288378	-0.244981	1			
TRD	-0.011645	-0.099148	-0.207933	0.035735	1		
GEH	0.469095	-0.202028	-0.236613	-0.099005	0.026213	1	
OHE	-0.105393	-0.060570	-0.059418	-0.373452	0.140329	0.335000	1
	HFT	TC	DAH	FDI	TRD	GEH	OHE
HFT	1						
TC	-0.144282	1					
DAH	-0.257359	0.421446	1				
FDI	0.125587	-0.270466	-0.361027	1			
TRD	0.069652	-0.157213	-0.494486	0.202960	1		
GEH	0.604031	-0.366024	-0.318224	0.012484	0.103799	1	
OHE	0.115168	-0.066154	-0.135170	-0.171959	0.169580	0.131406	1

Source: Author, 2020

Table 4.3 illustrates the nature of association among the variables. This study classified a model with any explanatory variables having a correlation coefficient exceeding 0.90 as suffering from a multicollinearity problem, in line with Bryman and Cramer (2001). The result of the

correlation analysis demonstrates the absence of multicollinearity problems in all the five models. As shown in the table, the correlation coefficient in all five models falls somewhere between 0 and 0.7.

Meanwhile, technical cooperation, developmental assistance for health, foreign direct investment inflows and trade have a negative association with life expectancy, while out-of-pocket health expenditure and government health expenditure show a positive association with life expectancy. The study also shows that technical cooperation, developmental assistance for health, foreign direct investment inflows and trade have a positive association with infant mortality rates, while out-of-pocket health expenditure and government health expenditure show a negative association with infant mortality rates. Also, technical cooperation, developmental assistance for health and trade show a negative association with immunization, while foreign direct investment inflows, out-of-pocket health expenditure, and government health expenditure show a positive association with immunization. Furthermore, technical cooperation, developmental assistance for health, out-of-pocket health expenditure, and trade show a negative association with infectious diseases, while foreign direct investment inflows and government health expenditure show a positive association with infectious diseases. Finally, technical cooperation and developmental assistance for health show a negative association with health facilities, while out-of-pocket health expenditure, trade, foreign direct investment inflows, and government health expenditure show a positive association with health facilities.

4.4.2 Data Analysis and Estimation

The estimation method used for analyzing the nexus between technical cooperation and health outcomes is Multilevel Mixed-Effect Linear Model (MMLM). We estimate equation 4 using this method. A number of researchers have used this model in aid-related research (see Azam & Feng, 2021).

A multilevel mixed effect model is a statistical model containing both fixed effects and random effects. These models are helpful in a broad diversity of disciplines in the physical, natural science and social sciences. It is too much useful in settings where recurrent and frequent measurements are prepared on the same statistical units (longitudinal study), and whenever where measurements are made on clusters of related statistical units. It is also very useful for handling missing values and can also be used for longitudinal studies, as with growth studies, to separate changes within one individual and differences between individuals. It is usually preferred over traditional methods. The multilevel models are specifically designed for hierarchical data because they take into account the clustering of data upon different categories (Snijders & Bosker, 2012).

One methodological issue with research on aid or technical cooperation aid is endogeneity and the other is the income-dependency of the effect of foreign aid on development. In fact, the objective of foreign aid per se creates an endogeneity problem for statistical analysis. In order to deal with the endogeneity problem, we follow the procedure in Azam & Feng (2021) and we situate our dependent variables at least a step ahead of the placement of foreign aid. By this design, we hope to eliminate or significantly reduce the endogeneity problem.

The analytical part of the research is aimed to present procedure for estimation of the impact of FDI inward flow on the segments of the labour market. Linear Mixed-Effects Model (LMM) is determined to estimate the overall impact of FDI inward flow on workers' indicators in transition economies in the period from 2000 to 2017.

MMLM derives from the general concept of linear: $y = X\beta + \varepsilon$ where y is the vector, X is the known covariation matrix, β is the vector of unknown coefficients, and ε is the vector of random errors of the overall regression model (known as "regression error"). It can be assumed that each measure is connected with some random effect that has not been measured or observed, and label it as α. If there is an observation yij of *i*-person in *j*-time with the αi as random effect

interconnected with *i*-person, the model will be the following: yij = x'ijβ + αi + εij. This last adopts the formulation of LMM. Therefore, the general definition of LMM is the following: y = Xβ + Zα + ε, where y is the vector of observations, β is the vector of unknown regression coefficients called also fixed effects, α is the vector of random effects, X and Z are the known covariation matrixes that connect elements of the vector β with the elements of the vector y, and ε is the vector of random errors.

LMM includes not only fixed effects but also random effects. The inclusion of random effects is usual in the studies where the measures are correlated, while allowing control of the additional sources of variability. This is one of the reasons why the control variables are not required. The outcome of measures are dependent variables while the factors that impact measures are independent variables.

LMM is developed based on the circumstances that the model does not require the balanced data. Random effects are included into the models given the fact that the effect of independent variables on dependent variable may differ from country to country. The models contain random intercepts as well, because each country in the sample exhibits its own trend of health outcome indicators. Peric & Filipovic (2021)

4.4.3 Empirical Results

Table 4.4 Results of Multilevel mixed-effect linear regression for Life Expectancy

Le	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
L2. Tc	1.04e-08***	3.80e-09	2.74	0.006	2.98e-09	1.79e-08
Dah	.0095518***	.0013507	7.07	0.000	.0069045	.0121992
Fdi	-2.08e-10***	7.37e-11	-2.82	0.005	-3.52e-10	-6.32e-11
Trd	-8.75e-12	3.90e-11	-0.22	0.822	-8.51e-11	6.76e-11
Geh	.088291***	.0230895	3.82	0.000	.0430365	.1335456
Ope	.0213477***	.005677	3.76	0.000	.010221	.0324744
_cons	51.02759***	1.403376	36.36	0.000	48.27703	53.77816

Author's computation, 2022

* indicates 10% significance, ** indicates 5% level of significance, *** indicates 1% level of significance

Table 4.5 Results of Multilevel mixed-effect linear regression for immunisation

Im	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
L2.tc	5.61e-08***	1.14e-08	4.92	0.000	3.38e-08	7.85e-08
Dah	.0092146**	.0039716	2.32	0.020	.0014305	.0169987
Fdi	-2.85e-10	2.24e-10	-1.27	0.204	-7.25e-10	1.55e-10
Trd	-1.82e-10*	1.07e-10	-1.70	0.089	-3.91e-10	2.77e-11
Geh	.0867249***	.0174239	4.98	0.000	.0525747	.1208751
Ope	.0509046***	.0154	3.31	0.001	.0207211	.0810881
_cons	62.54608***	2.974437	21.03	0.000	56.71629	68.37587

Author's computation, 2022

* indicates 10% significance, ** indicates 5% level of significance, *** indicates 1% level of significance

Table 4.6 Results of Multilevel mixed-effect linear regression for infant mortality rate

imr	Coef.	Robust Std. Err.	Z	P>z	[95% Conf.	Interval]
L2. tc	-1.22e-08	1.82e-08	-0.67	0.504	-4.79e-08	2.36e-08
Dah	-.0028363	.0042603	-0.67	0.506	-.0111863	.0055137
Le	-2.951066***	.2975393	-9.92	0.000	-3.534232	-2.367899
Im	-.2984842***	.0743165	-4.02	0.000	-.4441418	-.1528265
Geh	-.023373**	.0105558	-2.21	0.027	-.0440619	-.0026841
Ope	-.006754	.0192242	-0.35	0.725	-.0444328	.0309247
_cons	264.022***	13.57374	19.45	0.000	237.4179	290.626

Author's computation, 2022

* indicates 10% significance, ** indicates 5% level of significance, *** indicates 1% level of significance

Table 4.7 Results of Multilevel mixed-effect linear regression for infectious diseases

Ifd	**Coef.**	**Robust Std. Err.**	**z**	**P>z**	**[95% Conf.**	**Interval]**
L2. tc	-2.74e-09	1.69e-09	-1.62	0.104	-6.05e-09	5.67e-10
Dah	-.002938***	.000973	-3.02	0.003	-.004845	-.001031
Fdi	-4.99e-11	5.54e-11	-0.90	0.368	-1.58e-10	5.87e-11
Trd	4.03e-11	3.39e-11	1.19	0.234	-2.61e-11	1.07e-10
Geh	-.0325286***	.0059769	-5.44	0.000	-.0442431	-.0208141
Ope	.01334**	.0068267	1.95	0.051	-.00004	.02672
_cons	6.540852***	1.699937	3.85	0.000	3.209036	9.872669

Author's computation, 2022

* indicates 10% significance, ** indicates 5% level of significance, *** indicates 1% level of significance

Table 4.8 Results of Multilevel mixed-effect linear regression for health facility

Hft	Coef.	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
L2. Tc	1.56e-10	1.39e-09	0.11	0.910	-2.56e-09	2.87e-09
Dah	-.0012273*	.0007101	-1.73	0.084	-.002619	.0001645
Fdi	6.65e-11	7.42e-11	0.90	0.370	-7.90e-11	2.12e-10
Trd	-1.40e-11	2.58e-11	-0.54	0.587	-6.45e-11	3.65e-11
Geh	.0051077***	.0012496	4.09	0.000	.0026585	.0075569
Ope	.0012614	.001532	0.82	0.410	-.0017413	.004264
_cons	.9177821***	.1418889	6.47	0.000	.6396851	1.195879

Author's computation, 2022

* indicates 10% significance, ** indicates 5% level of significance, *** indicates 1% level of significance

This study investigates the effect of technical cooperation on health outcomes in Sub-Saharan Africa. This investigation is imperative because, despite the use of diverse health targets in the existing studies on the effectiveness of technical cooperation and development assistance on health, these studies have found mixed results. We add to the literature in this regard by considering the effectiveness of technical cooperation on both SDG-related and non-SDG-related health targets as well as health facilities in Sub-Saharan Africa (SSA). Thus, the inclusion of health facilities is believed to capture the interaction between health infrastructures and technical cooperation. We built on the model in the study conducted by Lin (2016) and Azam & Feng, 2021. We utilised multilevel mixed-effect linear regression model.

The results life expectancy model as shown in table 4.4 revealed that technical cooperation, development assistance to health, government expenditure on health, and out-of-pocket health spending are all positive and significant at 1% level. This follow our apriori expectation. It is also in consonance with most pro aid literature (see Ssozi & Amlani, 2015; Ikhide, 2016). This implies that increasing the flow of technical cooperation into Sub-Sahara Africa will increase the current rate of life expectancy. It follows that people will enjoy longevity of life and have the opportunity of being more productive in life. From the result, other factors that can drive up life expectancy in Sub-Sahara Africa are development assistance to health, government expenditure on health, and out-of-pocket health spending. The development assistance to health covers more of financial aid to the health sector. This is equally needed to facilitate the building of health infrastructures, purchasing health equipment, stocking the health facilities with necessary drugs and other associated running cost.

Two other factors that are seen to be improving the longevity of Africans in the SSA are government expenditure on health, and out-of-pocket health spending. Government spending is naturally supposed to be the key player in improving the health of the people and engendering their longevity. Other factors are meant to support government policy and spending on the health of its people. The implication of this positive relationship is that more funds should be redirected from the less productive or less important sectors of the economy to the health sector. The last one is the out of pocket spending which is the spending of the individuals on their own health. This is also positive and significant. The implication is that each individual has to take care of his health by saving towards his future health needs. This is what can assure them of higher life span and longevity. Still on the result of life expectancy, FDI is also significant but negative. This may not the unconnected with the negative side of foreign direct investment as argued in Siyanbola (2005). Finally, trade is not seen to be significant in improving life expectancy in SSA

The result of immunization model is presented in Table 4.5. It shows that technical cooperation, development assistance to health, government expenditure on health, and out-of-pocket health spending are all positive and significant at 1% level. This is in consonance with our apriori expectation. It is also supported by extant literature most especially Ssozi & Amlani, 2015; Ikhide, 2016 etc. The import of our result is that if more technical cooperation inflow is received in SSA there will be a corresponding increase in the current rate of life expectancy. Immunisation has been one of the part being played by technical cooperation. The evidence is still fresh about the way technical cooperation was deployed during the recent corona vires global epidemic.

From the result, other factors that can improve the level of immunization is Sub-Sahara Africa and make people live normal life free of preventable diseases are development assistance to health, government expenditure on health, and out-of-pocket health spending. Through development assistance to health funds can be made available for high level research as was done during the covid-19 pandemic. In addition, funds can also be made available for mass producing newly invented or old but not yet well circulate immunization. On the other hand FDI does not significantly affect immunization while trade narrowly affect it negatively at 10% level of significance.

The result of infant mortality rate and infectious disease models are presented in Table 4.6 and Table 4.7 respectively. The infant mortality rate model is well-behaved. All the parameters came out with the right signs. However, only life expectancy, immunization and government expenditure on health are statistically significant at any known level. Technical cooperation, development assistance to the health sector and hospital facility are not significant. This is contrary to our apriori expectation. But evidence of this are also in the literature (see Wilson 2011; Dieleman, Sherr, and Lim, 2019; Akinlo and Sulola, 2018).

Similarly, infectious disease model as seen in Table 4.7 is also well behaved except for out-of-pocket spending that posted wrong sign. The rest are negatively signed according to our a priori expectation. However, only development assistance to health and government expenditure on health are statistically significant with the right sign. Technical cooperation is not statistically significant. The implication of this is that infectious disease in SSA respond more to financial aid and government financing compared to technical assistance.

Finally, we report the health facility model in Table 4.8. Technical cooperation is not seen contributing significantly to the growth of health facility in SSA. This implies that the growth of infrastructure in the health sector is not directly influenced by technical cooperation. This is not too hard to unravel. The concentration of technical cooperation is training and exporting of technical knowhow. That notwithstanding, one will expect that technical cooperation should have a kind of indirect influence on health infrastructures in the recipient's country. The rationale is that if the inflow of technical cooperation is appropriately utilized more experts should be trained in the recipient's country and with more experts ready to work more health facilities will need to be built by the government or the private sector. Having said that, the result also confirm this assertion because government expenditure on health significantly influence the provision of health facilities in SSA. The implication of this is that more technical assistance should be deployed to SSA and in the right proportion so that it can continually encourage government to provide more health facilities by creating a sea of health experts.

4.5 Conclusion

The study evaluates the impact of technical cooperation on both SDG and non-SDG related health variables. This variables include life expectancy, immunization, infant mortality rate, infectious diseases and health infrastructures proxied by hospital facility. The result of our model shows that technical cooperation only significantly influence life expectancy and immunization is Sub-Sahara African countries. Development assistance to health is seen to

positively and significantly influence life expectancy, health facility, and immunization. It also mitigate infectious disease significantly. Of all, government expenditure to health behaves best as it fulfils a priori expectation in all the models and also play significant role in influencing all the dependent variables appropriately.

We conclude that government expenditure seems to be the pathway to better health in Sub-Sahara African countries. Hence government should expand its expenditures on health to ensure better health for its people. Also, encouraging private-public partnership in all the activities of the health sector will still produce good result, perhaps better result due to private sector efficiency. In addition, we recommended the need to reposition technical cooperation in way that it can directly stimulate not only immunization and life expectancy but also other SDG and non-SDG related health targets. Technical assistance providers can deploy the methods they are using to achieve results in immunization and combatting regional or global epidemics like Ebola, Covid-19 etc to other health targets. The can also engage the local governments in the provision of house-to-house technical assistance in areas that can improve other health outcomes in the region.

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Chapter Five: Conclusion

5.1 Conclusion

This study attempted a critical evaluation of the impacts of technical cooperation on the growth and development trajectories in Sub-Saharan African countries. Specifically, the thesis examined the effect of technical cooperation on human development. We explored this by developing three essays on the subject matter. The first essay is centred on the role of technical cooperation in developing human capabilities in Sub-Saharan Africa. The second essay evaluated the effects of technical cooperation on educational development in Sub-Saharan Africa. The third essay examined the impact of technical cooperation on health outcomes in SSA.

The relationship between aid and economic growth and development has become one of the most hotly debated in the last couple of decades, with a wide divergence of opinions. Even though the aid-growth literature seems rather over-flogged, little has been achieved by way of decomposition of aid architecture and peculiarization of associated impacts. Clemens et al. (2004) started a new series on aid effectiveness by calling for the decomposition of aid and evaluating it based on the purpose it is meant for. The majority of responses in this regard have been on vertical decomposition or sectoral allocation of aid. We contributed to the literature in this regard by considering the horizontal decomposition of aid. Hence, we examined the effect of technical cooperation aid on the growth and development trajectories in Sub-Saharan African countries.

We built on Akinkugbe's (2009) work on the impact of technical cooperation on human development by employing an econometric methods that addressed the limitation of their methodology. The findings of our study indicated that technical cooperation significantly influences human development in all our specifications. Although there are very few studies

that examined the impact of technical cooperation on human development, those that examined the impact of general aid or ODA on human development also find similar results.

Going further, our finding on the interaction of TC with policy and institutional quality have very important implications for aid effectiveness research. This study found that technical cooperation impacts positively on human development in countries with good policies. However, it could not be demonstrated at any significant level that the positive effect of technical cooperation on human development can be achieved only in countries with good policies. Also, on the indirect effects of TC we considered a transmission mechanism through which TC impacts human development. We explored and found the mechanism of productivity as a good channel through which TC transmits to human development, as suggested by Berg (1993). We also found technical cooperation spilling over to human development through policy and institutional quality variables. The implication of this is that giving more to TC will influence human development and engender rapid growth. Our results are in line with most pro-aid literature (see Mohamed and Mzeea, 2017; Gyimah-Brempong et al., 2012; Akinkugbe ,2009).

On the relationship between technical cooperation and educational attainment in SSA, we built on the model of Peter and Rainer (2006) using the ARDL panel estimation technique. The study revealed that technical cooperation, economic growth and institutional policy are statistically and positively related to educational attainment. Gender inequality has a statistically significant inverse relationship with educational attainment in SSA. However, per capita income and inflation do not affect educational attainment in SSA.

According to the study, the flow of technical cooperation on health outcomes in Sub-Saharan African countries leads to an increase in infant mortality and immunization. This demonstrates that the flow of technical assistance to Sub-Saharan African countries leads to an increase in

infant mortality and immunization rates while life expectancy, infectious diseases, and health facilities remain stable.

Also, the study found out that technical cooperation only significantly influence life expectancy and immunization is Sub-Sahara African countries. Development assistance to health is seen to positively and significantly influence life expectancy, health facility, and immunization. It also mitigate infectious disease significantly. Of all, government expenditure to health behaves best as it fulfilled the a priori expectation in all the models and also play significant role in influencing all the dependent variables appropriately

5.2 Recommendations

Arising from our findings, we recommend that more resources be allocated to technical cooperation. It should be increased above 25%, while the UN-recommended 0.7% aid/GNI ratio should be effectively implemented in the TC sub-level of aid. Therefore, donors should not withdraw or give less to countries with poor institutions as suggested by Burnside and Dollar (1997) and other aid-policy literature.

We recommend the need to increase technical cooperation flows to Sub-Saharan African countries far beyond the current level and other forms of developmental assistance. TC seems to pass the litmus test where financial aid fails. Over-emphasizing other forms of developmental assistance such as grants, humanitarian aid, debt relief, and food aid over and above technical cooperation is like putting the cart before the horse.

We also recommend that the governments of SSA countries should reposition the institutional and policy environment in their countries by instituting a more serious and swift legal prosecution of corrupt cases, especially those that have to do with foreign aid and grants.

The study also underscored the importance of repositioning technical cooperation in a way that it can directly stimulate, not only immunization and life expectancy, but also other SDG and

non-SDG related health targets, like infant mortality rate, infectious diseases, and health facilities. This may be through a prototype model used in the immunisation programme that engages the local government in the provision of house-to-house technical assistance in areas that can reduce infant mortality rate, infectious diseases and improve health facilities in the region.

APPENDIX

SN	Sub-Sahara Africa Countries
1	Angola
2	Benin,
3	Botswana
4	Burkina Faso,
5	Burundi
6	Cameroon
7	Cape Verde
8	Central Africa republic
9	Chad
10	Comros
11	Cotedvoire
12	Equatorial guinea
13	Eswatini (Swaziland)
14	Ethiopia
15	Gabon
16	Gambia
17	Ghana
18	Guinea
19	Guinea Bissau
20	Kenya
21	Lesotho
22	Liberia ,
23	Madagascar
24	Malawi
25	Mali ,
26	Mauritus
27	Mautiania,

28	Mozambique
29	Namibia
30	Niger
31	Nigeria
32	Rwanda
33	Sao Tome and Principe
34	Senegal
35	Sierra Leone
36	South Africa
37	Tanzania
38	Togo
39	Uganda
40	Zambia
41	Zimbabwe