Universidade do Minho
Escola de Economia e Gestão

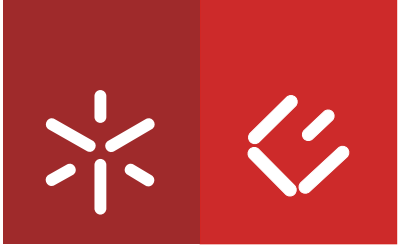
Mathias Karangwa

Economic Growth in Sub-Saharan Africa

October 2022

Mathias Karangwa **Economic Growth in Sub-Saharan Africa**

UMinho | 2022



Universidade do Minho
Escola de Economia e Gestão

Mathias Karangwa

Economic Growth in Sub-Saharan Africa

Doctoral Thesis
PhD in Economics

Work carried out under the supervision of
Prof. Francisco José Veiga

October 2022

DIREITOS DE AUTOR E CONDIÇÕES DE UTILIZAÇÃO DO TRABALHO POR TERCEIROS

Acknowledgments

Special appreciation goes to my supervisor, Prof. Francisco José Veiga for his constructive criticisms and guidance that imensely contributed to my professional career development. Without his guidance, encouragement and support, this thesis would not have been completed on time.

I sincerely extend my appreciation to every one and every institution that positively influenced my education, at all levels. First, I express gratitude to the Government of Rwanda for the financial support that enabled me to pursue my Bachelor's degree at the University of Rwanda. Second, special appreciation goes to the National Bank of Rwanda for granting me a study leave and financially supporting my PhD studies. Third, I wish to sincerely thank the Germany Exchange Services/Deutscher Akademischer Dienst (DAAD) and the African Economics Consortium (AERC) for financially facilitating me to obtain a Master's degree in Agricultural and Applied Economics. Finally, my heartfelt appreciation goes to my family who offered me moral and financial support throught my entire education journey.

I also thank the academic staff of the School of Economics and Management at the University of Minho and at the University of Coimbra for the knowledge they imparted in me during my PhD studies. Many thanks to the administrative staff, especially Ms. Estela Vieira, for all the support they accorded to me during my stay in Braga, Portugal. I also acknowledge my classmates, especially Mr. Nuwagira Williams Wilberforce and Mr. Placide Aime Kwizera, for the cooperation, moral support and encouragement that always kept my spirit alive. The technical discussions we had helped to shape my thinking and contributed to my success in various PhD level courses.

Lastly but not the least, I sincerely appreciate the support, love and patience from my family members: Irene Kemirembe, Ryan Karangwa, and Bryan Karangwa, who are my wife, first son, and second son, respectively.

Statement of Integrity

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

Crescimento Económico na África Sub-Sariana

Resumo

Esta tese centra-se na exploração da importância do desenvolvimento financeiro, da ajuda externa e das instituições no desempenho económico da África Subsariana (ASS), uma sub-região que continua a ser a mais pobre do mundo e, no entanto, ainda subdesenvolvida. Para evitar um preconceito de heterogeneidade de amostra, concentramo-nos nos países em desenvolvimento da ASS. O capítulo 2 examina o efeito do desenvolvimento financeiro sobre o rendimento per capita utilizando indicadores novos e tradicionais de desenvolvimento financeiro. Os principais resultados apontam para o facto de que a profundidade das Instituições Financeiras (PIF) tem um efeito positivo e significativo no desenvolvimento da ASS, confirmando a importância dos indicadores de desenvolvimento financeiro baseados nos bancos. Geralmente, nenhum dos indicadores tradicionais de desenvolvimento financeiro tem um efeito significativo, em linha com a afirmação na literatura empírica de que estes não captam adequadamente todas as facetas do desenvolvimento financeiro. O terceiro capítulo examina a ligação entre a ajuda externa e o desempenho económico na ASS. Os principais resultados mostram que, o efeito da APD (como % do PIB) é negativo mas insignificante. Embora insignificante, o coeficiente estimado das subvenções é positivo enquanto que o dos empréstimos é negativo. O termo de interacção entre crises governamentais e a APD (% do PIB) tem um efeito significativo negativo sobre o PIB real per capita. Além disso, o termo de interacção entre crises governamentais e subvenções (% do PIB) tem um efeito negativo e significativo. Assim, as crises governamentais agravam a eficácia da ajuda na ASS. Os testes de não-linearidade confirmam que cada uma das variáveis da ajuda tem um efeito não linear sobre o PIB per capita na ASS. Utilizando variáveis institucionais como variáveis de limiar, a APD (% do PIB) só é significativa quando as purgas são utilizadas como variável de limiar e tem um efeito negativo no regime superior (ou seja, com má qualidade institucional). Os empréstimos de ajuda (% do PIB) só têm um efeito significativo negativo no regime superior quando a guerrilha é utilizada como variável de limiar.

No quarto capítulo, examinamos o efeito das instituições no crescimento económico numa amostra de países em desenvolvimento da ASS. O enfoque nos países em desenvolvimento da ASS visa compreender melhor como as instituições afectam o crescimento neste grupo de países, na sua maioria pobres, e reduzir quaisquer preconceitos que possam resultar da heterogeneidade da amostra. Examinamos o efeito individual de cada uma das variáveis institucionais a partir de cinco fontes diferentes. Os resultados das estimativas mostram que a governação, a liberdade económica, a democracia e a estabilidade política são importantes motores do desempenho económico na ASS. Individualmente, sistemas legais e direitos de propriedade, dinheiro sólido, liberdade de comércio internacional, regulamentação, controlo da corrupção, eficácia governamental, qualidade regulamentar, Estado de direito, voz e responsabilidade, lei e ordem, democracia igualitária e menor risco de ter conflitos internos e externos têm um efeito positivo significativo no PIB real per capita na ASS. Em contrapartida, a instabilidade do regime e do governo (ou seja, crises e revoluções governamentais) têm um efeito significativo negativo. Em todas as estimativas, o atraso do registo do PIB real per capita, do crescimento da população e da abertura comercial têm um efeito significativo positivo, o que apoia a hipótese de convergência condicional, a hipótese dos dividendos demográficos e a eficácia do canal de comércio.

Palavras chaves: Crescimento Económico, Desenvolvimento Financeiro, Ajuda Externa, Qualidade Institucional, África Sub-Saariana

Economic Growth in Sub-Saharan Africa

Abstract

This thesis, focuses on exploring the importance of financial development, foreign aid and institutions on the economic performance of Sub-Saharan Africa (SSA), a sub-region that remains the poorest in the world and yet still under-researched. To avoid sample heterogeneity bias, we focus on developing SSA countries. Chapter 2 examines the effect of financial development on per capita income using new and traditional indicators of financial development. The main results point to the fact that Financial Institutions Depth (FID) has a positive and significant effect in developing SSA, confirming the importance of bank-based indicators of financial development. Generally, none of the traditional indicators of financial development has a significant effect, in line with the claim in empirical literature that these do not adequately capture all the facets of financial development. The third chapter examines the link between foreign aid and economic performance in SSA. The main results show that, the effect of ODA (% of GDP) is negative but insignificant. Though insignificant, the estimated coefficient of grants is positive while that of loans is negative. The interaction term between government crises and ODA (% of GDP) has a negative significant effect on per capita real GDP. Also, the interaction term between government crises and grants (% of GDP) has a negative and significant effect. Thus, government crises worsen aid effectiveness in SSA. Non-linearity tests confirm that each of the aid variables has a non-linear effect on per capita GDP in SSA. Using institutional variables as the threshold variables, ODA (% GDP) is only significant when purges are used as the threshold variable and it has a negative effect in the upper regime (i.e. with poor institutional quality). Aid loans (% of GDP) only have a negative significant effect in the upper regime when guerrilla is used as the threshold variable.

In the fourth chapter, we examine the effect of institutions on economic growth in a sample of developing Sub-Saharan African (SSA) countries. The focus on developing SSA countries is aimed at better understanding how institutions affect growth in this group of mostly poor countries and reducing any biases that may result from sample heterogeneity. We examine the individual effect of each of the institutional variables from five different sources. Estimation results show that governance, economic freedom, democracy and political stability are important drivers of economic performance in SSA. Individually, legal systems and property rights, sound money, freedom to trade internationally, regulation, control of corruption, government effectiveness, regulatory quality, rule of law, voice and accountability, law and order, egalitarian democracy and lower risk of having both internal and external conflicts have a positive significant effect on per capita real GDP in SSA. Conversely, regime and government instability (i.e., government crises and revolutions) have a negative significant effect. In all the estimations, the lag of log of per capita real GDP, population growth and trade openness have a positive singificant effect, which supports the conditional convergence hypothesis, the demographic dividend hypothesis and the effectiveness of the trade channel.

Key words: Economic Growth, Financial Development, Foreign Aid, Institutional Quality, Sub-Saharan Africa

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CHAPTER 1

GENERAL INTRODUCTION

While the interest in unpacking the drivers of economic growth and development started with mercantilism as far back as in the 15^{th} century, it was the work of Adam Smith on "The Wealth of Nations" published in 1776 that influenced economists and policy makers to acknowledge that sustained economic growth and development have a positive bearing on the welfare of the people in any country and that differences in growth and average income imply large differences in various measures of well-being, such as literacy, infant mortality, life expectancy and nutrition. However, the welfare of people continues to differ across countries and time. Also, some countries have experienced positive growth rates of income per capita over long periods of time, and, some countries have grown rapidly while other countries have stagnated. Thus, several growth economists have focused on upacking the reasons behind such cross-country differences in economic growth and welfare of the people (Durlauf, 2005; Acemoglu & Robinson, 2010a; Weil, 2012; Jones, 2016).

Empirical research on drivers of economic growth has reached inconclusive results. As a result, several schools of thought have emerged, each giving its own explanations on the drivers and dynamics of economic growth. The literature is divided between those that support "proximate" and "fundamental" causes of economic growth (North & Thomas, 1973; Acemoglu & Robinson, 2010a). Neoclassical economists emphasized that economic growth and steady-state level of income was driven by exogenous factors, notably technology, the rate of saving, and population growth (Ramsey, 1928; Solow, 1956; Cass, 1965; Swan, 1956).

There is consensus in the economic growth literature that Africa has continued to lag behind in terms of economic growth and development (Heshmati, 2018). The continent also faces high levels of income inequality as documented in the 2020 African Economic Outlook of the African Development Bank. Cross-country income and welfare differences are also visible within Africa, with Sub-Saharan Africa featuring as a major sustainable growth and development disaster over several decades (Durlauf, 2005; Adedokun, 2017; Jones, 2016). Sub-Saharan Africa remains the poorest sub-region, with 41.2% (2017 data) of its population living under the international poverty line and a per capita income of $3775.28 (2017 data). It is followed by South Asia, with 17.1% (2013 data) of its population living under the poverty line and with a per capita income of $5769.18 as of 2017 (table 3.1). Thus, the present concern of African countries is to generate sustained economic growth aimed at improving people's welfare as claimed, first in the Millennium Development Goals (MDGs) and currently, in the Sustainable Development Goals (SDGs). In addition to being poor, the Sub-Saharan African sub-region remains underresearched, and thus any

empirical investigation on the potential drivers of economic growth is important.

Given this backdrop, most of the growth literature focuses on developing a coherent framework to investigate the above mentioned cross-country differences in economic growth and welfare. Most of the early theoretical and empirical economic growth studies attributed cross-country divergences in income per capita on differences in resource endowments, notably physical and human capital (Barro, 1991; Mankiw, Romer, & Weil, 1992), innovation (Romer, 1986; Rebelo, 1991), and technological diffusion (Grossman & Helpman, 1991; Aghion & Howitt, 1990; Barro & Sala-i-Martin, 1997).

According to the financing gap theory (Harrod, 1939; Domar, 1946), countries whose domestic savings cannot fully cover investment in physical and human capital as well as in Research & Development aimed at creating more efficient production technologies are forced to find alternative sources of financing. Heshmati (2018) notes that the alternative sources of financing, to complement domestic savings, in Africa are chiefly foreign direct investments, remittances and foreign aid[1] (both loans and grants).

A more comprehensive view is fronted by the poverty trap theory, with proponents like Collier (2006) noting that the world's poorest societies are caught up in poverty traps due to internal conflict traps, natural resources traps, land locked by bad neighbor traps and bad governance traps. To escape from the poverty trap, such countries need the "big-push" in investment that will move the countries to a certain threshold of capital, economic growth and welfare status. Such big-push can be in the form of large enough infusion of foreign direct investments, remittances and foreign aid that can help developing economies to 'jump' to a higher income per capita equilibrium level. The poverty trap however implies that, any such big push in investment needs to be accompanied by political stability and development of good quality institutions if sustainable economic growth and development are to be attained.

Before resorting to external sources of financing, however, nations should try to mobilize and rely on domestic savings and this brings in the role of the financial sector. The neoclassical growth models assume that financial systems function efficiently to optimally mobilize and allocate financial resources, resulting into optimal levels of capital accumulation and economic growth. However, taking financial development as a given is overly simplistic. Following earlier works by Bagehot (1873) and Schumpeter and Backhaus (2003), there has been a proliferation of theoretical and empirical studies examining the link between financial sector development and economic growth.

As noted by Khan and Senhadji (2003), empirical results on the effect of financial development on economic growth depend on different indicators of financial development, estimation method, data frequency, and the functional form of the relationship. Ibrahim and Alagidede (2018) note that though still underdeveloped, the financial sector in Sub-Saharan Africa has recorded significant improvements yet the sub-region remains poor. Most studies on the link between financial development and economic growth used M3, credit to the private sector and stock market capitalization – all as ratios to GDP[2]- as indicators of financial development. These measures, however, do not fully capture financial development. Consequently, Sahay, Čihák, Barajas, N'Diaye, et al. (2015) developed a more comprehensive IMF[3] financial development database. In chapter two of this thesis, we exploit this new IMF data base to assess the effect of financial development on economic performance in developing Sub-Saharan African countries. We also conduct a similar assessment using the traditional indicators of financial development.

[1] Note that this includes financial aid as well as technical cooperation.

[2] GDP: Gross Domestic Product.

[3] IMF: International Monetary Fund.

Among the external sources of financing, foreign aid has been the most debated in the literature. Generally, empirical results on the effect of aid on economic growth are quite mixed, with some claiming that aid positively affects economic growth (Hudson & Mosley, 2001; Roodman, 2007; Selaya & Thiele, 2010) while others argue that the effect of aid is null or even negative (Easterly, 2007). The differences in empirical findings have been attributed to the heterogeneity of aid recipients, different aid motives on the part of donors and differences in analytical approaches (Selaya & Thiele, 2010). Other scholars have reported the tendency for some empirical studies to fall under the trap of 'reluctance or publication bias' (Roberts & Stanley, 2006), which is the unwillingness to produce negative results just to appease development partners, who often fund these studies.

Compared to other parts of the world, Sub-Saharan Africa has since 1960 enjoyed a high flow of net Official Development Assistance (ODA), ranging between 14-37 percent of the World net ODA and official aid (figure 3.2). On average, net ODA, as a percentage of the global average, stood at around 30% for Sub-Saharan Africa, during the same period, the highest figure compared to other regions. Despite attracting huge sums of aid, Sub-Saharan Africa remains the poorest sub-region.

Generally, the effect of aid on growth in Sub-Saharan Africa remains a highly unsettled debate (Kanbur, 2000). Aid is either more ineffective (Easterly, 2003) or less effective (Burnside & Dollar, 1998, 2000) in Sub-Saharan Africa compared to other regions. Other authors like Riddell (1999) and Collier (2006) argue that Sub-Saharan Africa has the potential to reap from the benefits of foreign aid and other forms of foreign capital inflows. Moyo (2009) argued that government to government aid has been detrimental to growth by propping-up corrupt dictatorships that either embezzle the funds or invest in "white elephant projects", incapable of increasing the productive capacity of countries. Aid can also reduce government efficiency by crowding out domestic tax revenue collections (Benedek, Crivelli, Gupta, & Muthoora, 2012; Gupta, Clements, & Tiongson, 2004; Clist & Morrissey, 2011). In chapter three of this thesis, we use a less heterogeneous sample of aid recipients (i.e. developing countries of Sub-Saharan Africa) to re-examine the conditional effect of aid and its components on economic performance.

In chapter four of this thesis, we investigate the relationship between institutions and economic performance in developing Sub-Sahran Africa, given the argument of neo-institutional economists that due to imperfect information, the efficient creation and allocation of resources is impossible through the market mechanism and therefore, institutions play an important role in addressing such challenges (North, 1990, 1994, 1997). Thus, factors such as physical and human capital are merely proximate causes of growth whereas "institutions" are the true "fundamental" causes of economic growth (North & Thomas, 1973).

Most of the studies on Africa treat geographical and/or income sub-regions as dummy variables, explaining each sub-region's growth by the differences between the estimated coefficient of its dummy variable from that of a chosen baseline sub-region or region (Anyanwu, 2014). Indeed, the few studies on Sub-Saharan Africa often do not explore in detail all the available indicators of institutional quality. Just like in chapters two and three, we address this gap in chapter four, by focusing on developing countries of Sub-Saharan Africa.

1.1 Research Objectives

In this thesis, we investigate how financial development, foreign aid and institutions affect economic performance in Sub-Saharan Africa, a sub-region that remains poor and under-researched. We deal with heterogeneity bias, that has plagued most empirical studies including on those on the sub-region, by focusing on a sample of developing Sub-Saharan African countries. We also do cross-sample comparisons in chapters 2 and 3. Unlike in most empirical works on Sub-Saharan Africa, we show that the Bias Corrected Least Squares Dummy Variable (BC-LSDV) model is more robust, given its finite sample properties, than the System Generalized Method of Moments (SGMM). Also, the estimation results of the BC-LSDV are closer to the Fixed Effects (FE) estimations and this is expected in macroeconomic data with short panels. The main research objectives addressed in this thesis are:

1. To investigate the link between financial development and economic growth in developing Sub-Sahran Africa (SSA), using both traditional indicators and a set of new IMF indicators of financial development;
2. To investigate the direct effect of foreign aid on economic performance in SSA;
3. To examine if foreign aid components (i.e., loans and grants) have oppposite effects on the economic performance of SSA;
4. To investigate the joint effect of aid (and its components) and institutional quality in SSA;
5. To investigate whether the effect of foreing aid and its components in SSA is non-linear or not;
6. To examine whether the effect of foreign aid depends on the level of institutions or not;
7. To examine the direct effect of institutions on economic performance in SSA.

1.2 Structure of the Thesis and Summary of the Main Results

This thesis is made of five chapters. Chapter one gives the general introduction, focusing on the motivation and research objectives. Chapter two covers the empirical and theoretical literature on the link between financial development and economic growth. The chapter also gives a descriptive and empirical analysis of the effect of financial development on economic performance in SSA and compares results across various sub-samples. The importance of the financial sector is mainly to mobilize domestic savings and to efficiently channel these savings into productive investments. In Chapter three, we focus on investigating the effect of foreign aid, another important source of development finance, on economic performance in SSA and also do cross-sample comparisons. In chapter four, we investigate the direct effect of institutions, using variables from five data sets[4], on the economic performance of SSA. The wide coverage of a large set of institutional variables in a single empirical analysis is one of the contributions of this thesis.

[4]These are: the Cross National Time Series (CNTS), The International Country Risk Guide (ICRG), the Wordwide Governance Indicators (WGI), the Economic Freedom of the World Report of the Fraser Institute, and the Varieties of Democracy (V-DEM).

The main results from this thesis are that bank-based measures of financial development, particularly Financial Institutions Depth (FID) are important drivers of economic performance in SSA. The fact that none of the traditional indicators of financial development has a significant effect suggests that these do not accurately measure financial development. Indeed, in most if not all of the SSA countries, credit to private sector and broad money have a small share of GDP. Also, government crises and grants jointly have a negative and significant effect, suggesting that political instabilities worsen aid effectiveness. Additionally, ODA (% GDP) has a negative effect in the upper regime (i.e. with poor institutional quality) when purges are used as the threshold variable. Aid loans (% of GDP) also have a negative significant effect in the upper regime when guerrilla is used as the threshold variable. Finally, our empirical results also show that economic freedom, democracy and political stability positively and significantly affect economic performance in SSA.

CHAPTER 2

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

2.1 Introduction

As documented by prominent economic growth economists (Durlauf, 2005; Acemoglu & Robinson, 2010b; Jones, 2016; Weil, 2012), there has been keen interest in explaining the observed strikingly huge differences in income per capita across and within countries over time. For example, it is important to explain why some countries experienced positive growth rates of income per capita over long periods of time, and, why some countries grew rapidly while others stagnated. Understanding the underlying factors behind such cross-country and within country differences in growth over time is therefore paramount for policy makers who wish to design policies aimed at pushing their societies towards prosperity and improved well-being.

For several decades, theoretical and empirical research has focused on unpacking the drivers of economic growth in both country and cross-country context. The growth literature is awash with disagreements on the key drivers of economic growth and this may be partly attributed to the lack of a generalized or unifying economic growth theory (Artelaris, Arvanitidis, & Petrakos, 2006) and differences in methodological approaches (Khan & Senhadji, 2003), among others.

Generally, theoretical and empirical economic growth studies have attributed cross-country divergences in income per capita to differences in: resource endowments (or state factors), notably physical and human capital(Barro, 1991; Mankiw et al., 1992), innovation(Romer, 1990; Rebelo, 1991), technological diffusion(Grossman & Helpman, 1991; Aghion & Howitt, 1992; Barro & Sala-i-Martin, 1997), initial conditions (Myrdal, 1957), financial development (Ang, 2008), socio-cultural conditions (Granovetter, 1985; Knack & Keefer, 1995, 1997), political environment (Lipset, 1959; Brunetti, Kisunko, & Weder, 1998), geographical conditions (Gallup, Sachs, & Mellinger, 1999), demographic conditions (Brander & Dowrick, 1994; Kalemli-Ozcan, 2002), and recently, on the development and quality of institutions(North & Thomas, 1973; Rodrik et al., 2004; Acemoglu & Robinson, 2010b, 2012). In view of this, different schools of thought on economic growth have emerged, with close or disparate views on the main drivers of economic growth.

Theoretically, the starting point is the Solow neoclassical growth theory (Solow, 1956) whose basic assumptions are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labor. The model asserts that saving or investment ratio is the main driver of growth in the short-run while sustained technological progress is the main driver of long-run economic growth (Petrakos, Arvanitidis, & Pavleas, 2007). In the long-run, the rate of per-capita growth equals the rate of technological progress. However, since the model assumes that technological progress is exogenously determined, it cannot within itself explain the factors that drive long-run growth, which is its main drawback but also the loophole that alternative growth theories, especially the endogenous growth theories, came to address (Thompson, 2008).

The second school of thought is the endogenous growth theory, triggered by Romer's 1986 and Lucas' 1988 seminal studies. The endogenous growth theories conceptualize channels through which constant and increasing returns to capital can be attained, and thus guarantee the attainment of long-run economic growth. The Romer model (Romer, 1986, 1990) emphasizes the role of learning by doing and knowledge spillover in influencing technological progress, which in turn ensures the attainment of unending long-run growth. Conversely, the Lucas model (Lucas, 1988) introduces human capital as a means of stopping diminishing returns to physical capital and thus ensuring perpetual economic growth. Generally, endogenous growth models show that the introduction of new accumulation factors, notably, new knowledge (Romer, 1990; Grossman & Helpman, 1991), innovation (Aghion & Howitt, 1992) and public infrastructure (Barro, 1990) ensure the attainment of sustained economic growth. Since these accumulation factors are explained within the model, the endogenous growth theories imply that policies play a crucial role in determining long-run economic growth, unlike in the case of the neoclassical growth model.

Another school of thought is the "**cumulative causation**" theory advanced by Myrdal (1957) and Kaldor (1970). According to this theory, initial conditions determine economic growth of regions or countries in a self-sustained and incremental way. Since different countries have different initial conditions, economic convergence is impossible and therefore income inequality across countries is the ultimate outcome. The theory argues that despite the possibility of spill-over (i.e. centrifugal) effects from more to less advanced economies, economic convergence is unattainable under the free market mechanism. Therefore, economic policy has to be utilized to correct for such cross-country economic imbalances.

Closely related to the cumulative causation school is the "**New Economic Geography**" school, which also emphasizes that regional or cross-country differences in economic growth tend to favor the initially advantaged economies (Fujita, Krugman, & Venables, 1999; Krugman, 1991). The theory formally explains how returns to scale, market competition and transport costs influence the concentration of real economic activities across regions or countries. For example, regions with negative externalities, high transport costs and too much competition tend to record less economic growth as firms are likely to shy away from them. Even though the new economic geography school mainly focuses on location of economic activity, specialization and agglomeration, growth outcomes can generally be inferred from its models.

Taking a wider macro-view, other schools of thought have emerged, emphasizing the significant role of non-economic factors (at least in the conventional sense) play especially in driving long-run economic growth and influencing cross-country income disparities. For example, the institutional economics school (Matthews, 1986; North, 1990; Jütting, 2003) emphasizes that institutions are the "proximate" causes of economic growth. Closely related to this, the economic sociology school argues for the impor-

tance of socio-cultural factors (Granovetter, 1985; Knack & Keefer, 1997), the political science school advocates for the role of political determinants (Lipset, 1959; Brunetti, 1997) while other researchers consider geographical factors (Gallup et al., 1999) and demographic factors (Brander & Dowrick, 1994; Kalemli-Ozcan, 2002) as the main drivers of growth and of cross-countries income disparities.

As noted by Chirwa and Odhiambo (2016), the theories of economic growth can be generally categorized with respect to what factors are conceptually considered to be the engine of economic growth, inter alia: (i) state factors (i.e. accumulation of physical and human capital); (ii) efficiency factors, which are those factors that affect the efficiency of savings and investment (such as macroeconomic stability & effectiveness of institutional framework related to political and economic governance; incentive structures & social infrastructure; the setting up of the right price and regulatory environment to clear markets); and, (iii) fundamental drivers of economic growth (i.e. institutional, legal, demographic, geographic, socio-economic and political factors).

After critically reviewing the economic growth literature with a view of identifying one integrating feature of the growth generating mechanism, Thompson (2008) notes that growth models can be categorized with respect to how they conceptualize long-run economic growth. The first category consists of those models that consider physical capital accumulation as an important driver of economic growth. These models are premised on the fact that long-run growth is attained whenever capital exhibits a non-declining marginal productivity. Under the neoclassical Solow model (Solow, 1956), a non-declining marginal productivity of capital is attainable if there is sustained technological progress such that the rate of long-run per-capita growth equals the rate of technological progress.

However, since the model assumes that technological progress is exogenously determined, it cannot within itself explain the factors that drive long-run growth, which is its main drawback but also the loophole that endogenous growth theories came to address. Other ways of attaining non-decreasing marginal productivity of capital are: (i) introducing a theory of research and development (R&D) into the growth model (Romer, 1987, 1990); (ii) bringing into the model an endogenously determined accumulation of human capital as the source of growth (Lucas, 1988); and, (iii) eliminating from the production function one of the standard assumptions of the neoclassical model, more precisely the assumption of diminishing returns to capital (Jones & Manuelli, 1990).

Empirically, initial studies focused on testing the validity of the two mainstream growth theories, i.e. the neoclassical and the endogenous growth theories, by examining economic convergence/divergence across countries. With time and following the emergence of rich data sets (such as the Penn World Tables) and novel and robust econometric techniques, empirical research shifted to the investigation of the factors determining economic growth (Kormendi & Meguire, 1985; Grier & Tullock, 1989; Barro, 1991). Nonetheless, the lack of a unifying theory on economic growth implies that empirical studies base on several theoretical frameworks while hypothesizing about and testing the drivers of economic growth. Thus, findings are often contradictory and conclusions far from safe (Petrakos et al., 2007).

While mainstream growth models attribute cross-country income differences to factors such as innovation, human and physical capital accumulation, they assume that financial systems function efficiently to optimally mobilize and allocate financial resources, resulting into optimal level of capital accumulation and economic growth. However, taking financial development as a given is overly simplistic. Following earlier works by (Bagehot, 1873, 2006; King & Levine, 1993a), there has been a proliferation of theoretical and empirical studies examining the link between financial sector development and economic

growth.

Initially, the role of finance in economic growth and development was ignored by the pioneers of economic growth and development, including three winners of the Nobel prize (Meier & Seers, 1984). Later, studies examining the nexus between finance and growth were conducted but their conclusions diverged considerably. For example, while Lucas (1988) disparages the role of finance in economic growth, Robinson (1979) supports the demand-following hypothesis (i.e. demand for financial services responds to good real sector performance). Grossman and Miller (1988) argue that the role of finance in economic growth and development is too obvious to be debated. Generally, proponents of the finance-growth nexus argue that the dynamics of economic growth cannot be fully understood once the role of financial development is omitted (Bagehot, 1873, 2006; Schumpeter & Backhaus, 2003; Gurley & Shaw, 1955; McKinnon et al., 1973; Goldsmith, 1969; Demirguc-Kunt & Levine, 2001). Empirical results on the relationship between financial development and economic growth for developing countries, particularly Africa and Sub-Saharan Africa, also remain mixed (Akinlo & Egbetunde, 2010; Ibrahim & Alagidede, 2018; Katircioglu, 2012; Ghirmay, 2004; Ngongang, 2015; Bandura & Dzingirai, 2019; Acaravci, Ozturk, & Acaravci, 2009; Aluko & Ibrahim, 2020).

As noted by Khan and Senhadji (2003), empirical results on the effect of financial development on economic growth depend on different indicators of financial development, estimation method, data frequency, and the functional form of the relationship. Ibrahim and Alagidede (2018) note that though still underdeveloped, the financial sector in Sub-Saharan Africa has recorded significant improvements yet the sub-region remains poor. Most studies, especially on Sub-Saharan Africa, examining the link between financial development and economic growth used a measure of broad money (e.g. M3), credit to the private sector and stock market capitalization – each one of them expressed as a ratio to GDP- as indicators of financial development. These measures, however, do not fully capture all the facets of financial development. Consequently, Sahay et al. (2015) developed a more comprehensive IMF financial development database, with broad-based measures covering access, depth and efficiency of both financial institutions and financial markets.

Comparatively, Sub-Saharan Africa remains the poorest sub-region. The financial systems in Sub-Saharan African countries are also underdeveloped and mainly dominated by banking institutions while capital markets are still nascent (Ibrahim & Alagidede, 2018). The aforementioned state of financial development and economic growth, the persistence of mixed results on the nexus between finance and economic growth, and this, the availability of a new comprehensive IMF financial development database motivates why chapter two has a renewed interest on Sub-Saharan Africa. After the introduction presented in section 1, section 2 gives both the theoretical and empirical literature regarding the finance-growth nexus; section 3 covers the methodology and data description; section 4 presents and discusses results and finally, section 5 gives the concluding remarks.

2.2 Literature Review on the Financial Development-Growth Nexus

2.2.1 Definition of Key Concepts: Economic Growth and Financial Development

Before exploring the theoretical and empirical literature on the financial development-economic growth nexus, it is imperative to first define the key concepts, notably economic growth as well as financial development. The latter entails understanding the meaning, scope and functions of the financial sector and thereafter explaining what the development of the financial system means.

Broadly, economic growth can be defined as the expansion in any measure of welfare or output for any country or group of countries, lumped together following a certain conventional criterion. According to Levine (1997) and King and Levine (1993a, 1993b), economic growth can be broadly viewed as growth in one of the following: (1) GDP per capita; (2) Total Factor Productivity (TFP); (3) Capital. However, in most (empirical) economic growth literature, economic growth is simply viewed as expansion in GDP per capita — or per-worker output (Barro, 1991; Mankiw et al., 1992; Levine & Renelt, 1992; Barro & Sala-i-Martin, 1997; X. Sala-i-Martin, Doppelhofer, & Miller, 2004).

The financial sector is made up of a broad array of financial intermediaries, notably financial institutions (such as banks and insurance companies), financial markets (including stock markets, bond markets, and derivative markets), and a regulatory body, mostly the central bank, to monitor and orient how these intermediaries operate (Ang, 2008; Cihak, Demirgüç-Kunt, Feyen, & Levine, 2012). Taking this definition, there are four main components of a financial system: (a) financial markets; (b) financial assets; (c) financial institutions; and, (d) financial services.

While many authors take the terms "financial system" and "financial sector" interchangeably, Schmidt (1999, p. 2) argues that a financial system is much broader because "...it encompasses not only the financial sector, but also the real sectors to the extent that they demand the financial services of the financial sector and also to the extent to which they forego using the financial sector, as well as the interaction between the demand for and the supply of the services of the financial sector. Thus for instance the extent to which internal financing of investment takes place, the extent to which saving takes the form of real investment, the extent to which banking services are appropriate to the demand for them etc., are features of a given financial system."

Most of the literature is however concerned with financial intermediation, whereby financial intermediaries bridge the gap between savers and borrowers, by efficiently mobilizing funds from savers and allocating them to the most productive sectors of the economy thereby affecting economic growth. Levine (1997) and Levine, Loayza, and Beck (2000) explain that **financial development** entails the improvement in functions provided by the financial systems. In the words of Cihak et al. (2012), financial development occurs when financial intermediaries help to: (i) enhance the quality of information about firms and hence the efficiency of resource allocation; (ii) exert sound corporate governance over the

firms to which they funnel those resources; (iii) provide effective mechanisms for managing, pooling, and diversifying risk; (iv) mobilize savings from disparate savers so these resources can be allocated to the most promising projects in the economy; and, (v) facilitate trade.

Closely related to the above, Shaw (1973) argues that financial development occurs whenever growth in financial assets outstrips growth in non-financial assets and whenever financial intermediaries can better perform their intermediation role by reducing costs related with information search, contract enforcement and settlement of transactions. This view is shared with Schumpeter and Backhaus (2003) who argues that financial development implies that the financial system plays its role in improving the efficiency of intermediation by reducing transaction cost, information asymmetries and monitoring cost, thereby leading to increased sustained economic growth. Using the "functional approach", Levine (1997) emphasizes that when the quality of financial intermediation is good (i.e. the financial system performs its functions efficiently), it can positively influence economic growth. The functional approach, which rationalizes the emergence of financial intermediaries, can be summarized in the figure 2.1 below:

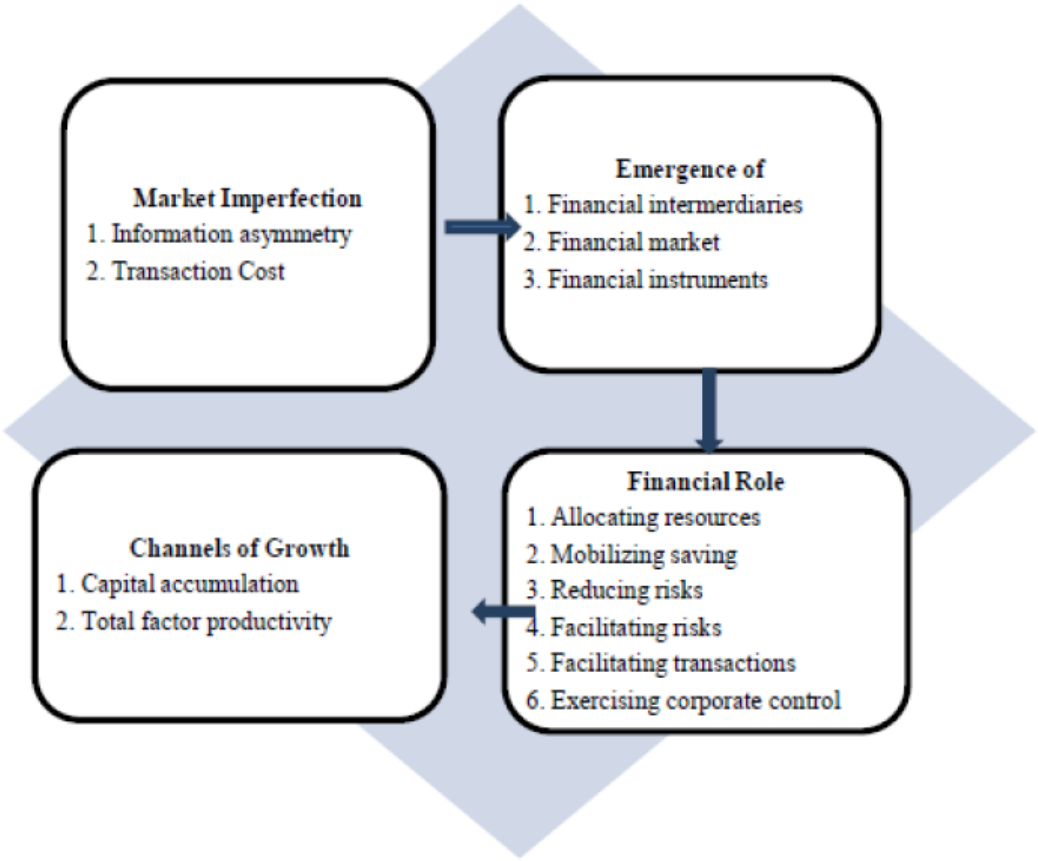

Figure 2.1: A functional approach to finance and growth
Source: Samargandi (2014) and Levine (1997).

To shed light on some of the aspects of financial development, Cihak et al. (2012, p. 2), argue that "when banks screen borrowers and identify firms with the most promising prospects, this is a key step that helps allocate resources, expand economic opportunities, and foster growth. When

banks and securities markets mobilize savings from households to invest in promising projects, this is another crucial step in fostering economic development. When financial institutions monitor the use of investments and scrutinize managerial performance, this is an additional ingredient in boosting the efficiency of corporations and reducing waste and fraud by corporate insiders. But, that is not all. When equity, bond, and derivative markets enable the diversification of risk, this encourages investment in higher-return projects that might otherwise be shunned. And, when financial systems lower transactions costs, it facilitates trade and specialization—fundamental inputs to technological innovation." Details on how financial development positively influences economic growth, under the functional approach, are given in Levine (2006).

2.2.2 Theoretical Literature

Theoretically, financial development can affect economic growth through two channels. First, through the "capital accumulation/quantitative channel", based on the "debt-accumulation" hypothesis developed by Gurley and Shaw (1955). Under this approach, financial intermediaries help to efficiently mobilize funds from savers and in-turn optimally channel these funds to productive investments, thereby facilitating the process and speed of capital accumulation. Second, through the "Total Factor Productivity (TFP)" channel through which financial intermediaries develop financial technologies/innovations/products aimed at curbing information asymmetry and moral hazard, thus leading to efficient allocation of financial resources and monitoring of investment projects to ensure high profitability. These two channels are shown graphically in figure 2.1 above, using Levine (1997)'s functional approach to explain the role of finance in stimulating economic growth. There is a huge body of theoretical and empirical literature – dating to as far back as Bagehot (1873, 2006) and Schumpeter and Backhaus (2003) - linking financial development and economic growth. In summary, the causal relationship between financial development and economic growth can take one of the six possibilities discussed in the next paragraphs.

The first is the "supply-leading" view which states that a well-developed financial system helps to stimulate economic growth and therefore financial development should come first to help in developing technological innovations which subsequently induce economic growth (Schumpeter & Backhaus, 2003). A well-developed financial system helps to efficiently mobilize savings and channel them to productive investments with minimum possible transaction costs, information asymmetries and monitoring costs, especially in the context of liberalized financial systems – free of distortionary policies such as interest rate ceilings, high reserve requirements and directed credit programs (McKinnon et al., 1973; Shaw, 1973; King & Levine, 1993a).

The second possibility is the "demand-following hypothesis" supported by Robinson (1979) and Kuznets (1955), among others. This view postulates that a boom in economic activities induces demand for investment funds and therefore motivates financial intermediaries to extend their financial services to the real sector. Therefore, it is the expansion of the real sector that induces financial sector development and not the other way around. The main idea is that, as the economy grows, demand for financial services by investors and savers increases too, hence the financial sector infrastructure services will be supplied in response to the new demand (Patrick, 1966). This has been criticized based on the fact that: (1) short-lived real activity booms can lead to business failures leading to loan defaults; (2) lending to the most active sectors may lead to saturation – where these sectors' reach maximum growth potential,

leading to stagnation and decline in credit absorption; and, (3) such discriminatory lending reduces the possibility of channeling funds to very risky sectors, such as agriculture, that are important especially in developing countries.

A third view concerns the two-way or bi-directional causal relationship between economic growth and financial sector development (Patrick, 1966; Greenwood & Jovanovic, 1990; Greenwood & Smith, 1997; Berthelemy & Varoudakis, 1996; Demetriades & Hussein, 1996) in a sense that the development of the financial sector, often considered as financial deepening, is an outcome of economic growth, which in turn feeds back as a driver of growth. The same view is upheld by a number of endogenous growth models, in which the role of financial development is explicitly modelled (Jovanovic & Greenwood, 1990; Greenwood & Smith, 1997; Berthelemy & Varoudakis, 1996; Rebelo, 1991; Pagano, 1993).

The fourth view regards the "no causality' assumption, pioneered by Lucas (1988) and supported by Stern (1989), that economists have dramatized the importance of financial factors in the explanation of cross-country income differences. In their framework, Modigliani and Miller (1958) show that real economic decisions can be independent of the financial sector developments. Their model assumes perfect markets, information symmetry and zero transaction costs, the opposite of which constitutes the tenets of Levine (1997)'s functional approach rationalizing the emergence and importance of financial systems. Using this approach, Fama (1980) shows that " in a competitive banking sector with equal access to capital markets (such that depositors can always refinance their loans to achieve the best interest), a change in lending decision by any individual bank will have no effect on price and real activity under a general equilibrium setting."

The fifth possibility is the negative association between finance and growth as documented by De Gregorio and Guidotti (1995), Van Wijnbergen (1983), Buffie (1984), Al-Malkawi, Marashdeh, and Abdullah (2012), Berkes, Panizza, Arcand, et al. (2012), among others. This view argues that if financial development exceeds a certain threshold – often modeled using non-linear and/or threshold model specifications, or when there is a financial crisis, it becomes detrimental to economic growth. For example, while banks help to exercise corporate control to ensure corporate borrowers do not default on their loans, this exercise may induce risk-averse behavior on the part of investors and promote excessive investment in tangible assets that can be used as collateral, thereby limiting firms' diversification of their investment portfolio, which in turn may adversely affect economic growth. If this happens, banking sector development will actually constrain economic growth (Morck & Masao, 1999; Morck, Stangeland, & Yeung, 1998; Morck & Steier, 2005).

In addition, the growth of stock markets can also be detrimental to economic growth if it leads to portfolio substitution from bank loans to stocks rather than accumulating and generating additional resources to fuel growth. This happens due to irrational speculation in stock markets leading to asset price bubbles, which will burst and induce economic crises in economies with fragile banking systems and where stock markets are still nascent and characterized by lack of transparency and disclosure deficiencies (Keynes, 1964; Kindleberger & Manias, 1978; Singh, 1997). Also, Feldstein (1991) argues that there is a natural progression from a robust/stable financial system to an unstable one following the cyclical position of the economy. For example, during the economic booms, most economic agents tend to be more optimistic and therefore become risk-neutral. Such kind of optimism entices them to engage in more risky and speculative activities. Such over-leveraged situation provides conditions for a crisis caused by events that induce firms to default on their loan repayments, which ultimately pushes the economy into a recession, unless timely mitigated by the monetary authorities.

The sixth view concerns those authors who assert that the strength of the finance-growth nexus depends on a country's level of development - For example, Levine (2006) argue that financial sector development has a strong positive impact on economic growth in low and middle income countries that have the potential for productivity growth compared to more mature economies. Conversely, what may be considered as the seventh view about the link between financial development and economic growth is given by authors who have found a parabolic/non-linear/threshold relationship between financial development and economic growth meaning finance has a positive effect on growth when financial development is low but its effect becomes negligible or negative at very high levels of finance.

The relationship between finance and economic growth can be such that the finance variable enters the growth equation as: quadratic (Khan & Senhadji, 2003), defined by a certain threshold (Arcand, Berkes, & Panizza, 2015; Berkes et al., 2012), inverted U-shaped (Cecchetti & Kharroubi, 2015, 2012) or even bell shaped (Sahay et al., 2015). These two views, as well as the fifth view discussed above, may be related as noted by Griffith-Jones (2016), who says that the negative relationship between financial development levels and growth is not as relevant for African Low-Income Countries (LICs), as their financial sectors are still small. However, they raise the concern that rapid financial sector growth that has been noted in African LICs can be detrimental to the economies if not accompanied by improvement in regulatory capacity or reduced exposure to external shocks, both of which are lacking in most African LICs.

2.2.2.1 Theoretical Models linking Financial Development and Economic Growth

Discussed hereunder are the theoretical models linking financial development and economic growth, mainly extracted from Samargandi (2014) and Ang (2008). The first theoretical model linking financial development and economic growth is the Keynesian model for real money balances (Keynes, 1964). According to this model, an individual decision to hold real money balances depends on the difference between the interest rate on bonds (also called the market interest rate: i) and the opportunity cost of holding money (also viewed as the liquidity trap interest rate: $\bar{i}$). The Keynesian demand function for real money balances is specified as in equation 2.1:

$$\left(\frac{M}{P}\right)^{D} = \alpha + \frac{\beta}{i - \bar{i}}; \alpha > 0, \beta > 0, i > \bar{i} \tag{2.1}$$

Where $\left(\frac{M}{P}\right)^{D}$ is demand for real money balances while α and β are parameters. The liquidity trap is defined as a situation where expansionary monetary policy leads to credit expansion but not to further decline in the interest rate. For an economic agent to prefer to speculatively hold real money balances, it must be the case that $i < \bar{i}$. Thus, market interest rates and demand for real money balances are inversely related. In this simple Keynesian model, an increase in the real interest implies that planned investment falls below planned saving under full employment and a liquidity trap, thus leading to unintended inventory accumulation. To restore the equilibrium, aggregate output must fall. Thus, the Keynesian model implies that a higher interest rate constrains economic growth.

The second theoretical model linking finance and economic growth is the neoclassical model, which is premised on the assumption that capital markets operate costlessly and perfectly. Though it facilitates

transactions, money does not have a direct impact on capital accumulation and therefore it is unimportant to distinguish between currency and deposits as these can be taken as outside fiat money. The neoclassical model is specified as in equation 2.2:

$$\left(\frac{M}{P}\right)^D = f(Y, R_K, R_M); f(Y) > 0, f(R_K) < 0, f(R_M) > 0 \tag{2.2}$$

Where $\left(\frac{M}{P}\right)^D$ is the demand for real money balances, Y is real income, R_K is the real rate of return on capital while R_M is the real rate of return on money. According to the transaction motive, the demand for real money balances and real income are positively related. Since money and capital in this model are assumed to be substitutes, then an increase in R_M will lead to holding large cash balances (i.e. higher demand for real money balances) and thus hampering accumulation of physical capital. Conversely, higher R_K implies less demand for real money balances and higher physical accumulation. Thus, R_K and $\left(\frac{M}{P}\right)^D$ are inversely related while R_M and $\left(\frac{M}{P}\right)^D$ are positively related.

The third theoretical finance-growth nexus model is the McKinnon-Shaw Model. This is based on two financial liberalization models (i.e. one by McKinnon et al. (1973) and the other one by Shaw (1973)) that highlight different aspects of the effect of raising the interest rates. McKinnon et al. (1973) notes that the assumption that capital markets function competitively with a single interest rate governing the markets, as in the Keynesian and neo-classical models, is not applicable to developing economies with fragmented interest rates. To him, money and capital can be considered to be complements in such developing countries with inefficient financial markets since all economic agents are forced to self-finance and money is nothing other than fiat currency issued by the public sector. Due to the fact that economic conditions are quite fragmented, coupled with the fact that firms lack access to external financing, physical capital has a lumpy nature. Given its lumpy nature, investment cannot materialize unless sufficient saving is accumulated in the form of bank deposits. Money and physical capital are viewed as complements due to the fact that money serves as a channel via which capital accumulation takes place. This is the complementarity hypothesis, which McKinnon et al. (1973) use to develop an alternative monetary model to explain the relationship between the monetary process and capital accumulation in developing countries. The model system can be stated as in equations 2.3 and 2.4:

$$\left(\frac{M}{P}\right)^D = f(Y, R_K, R_M); f(Y) > 0, f(R_K) > 0, f(R_M) > 0 \tag{2.3}$$

$$\left(\frac{I}{Y}\right) = g(R_K, R_M); f(R_K) > 0, f(R_M) > 0 \tag{2.4}$$

The complementarity hypothesis is a joint hypothesis where the demand for real money balances, $\left(\frac{M}{P}\right)^D$, and average real return on capital, R_K, are positively related, and the investment ratio, $\left(\frac{I}{Y}\right)$, raises with the real deposit rate of interest, R_M. The complementarity hypothesis implies that both $\left(\frac{M}{P}\right)^D$ and $\left(\frac{I}{Y}\right)$ react positively to a rise in R_K and R_M. To sum up, the McKinnon et al. (1973) model assumes a positive

relationship between the deposit rate and the investment rate. The model is also known as an outside money model due to the fact that all finance is raised internally: all economic agents are restricted to self-finance since financial markets are inefficient. Thus, money is fundamentally the fiat currency issued by the government.

Conversely, the Shaw (1973) model is based on the functional relationship between lending and borrowing activities: it is basically an inside-money model where finance is augmented externally (Ang, 2008). The Shaw (1973) model is based on the debt-intermediation hypothesis whereby money created as loans to the private sector is based on the internal debt to the private sector. When the money stock growth outstrips growth in the real sector activity, there is increased scope for financial intermediation between savers and investors. Higher interest rates are needed to attract savings, which in turn gives more room for financial intermediaries to supply more credit to investors and thus stimulate economic growth. In this model, an investor can borrow or lend, therefore there is no complementarity between capital and money. An investor is also not constrained to self-finance. Shaw (1973) stresses the importance of raising funds externally where money plays the role of credit and tangible medium of exchange. If institutional credit is not available, non-institutional credit will appear, that is, both the private sector and the public sector can lend or borrow. The Shaw (1973) model is summarized in equation 2.5:

$$\left(\frac{M}{P}\right)^{D} = f(Y, R_{OPP}, R_M, T); f(Y) > 0, f(R_{OPP}) > 0, f(R_M) > 0, f(T) > 0 \qquad (2.5)$$

Where $\left(\frac{M}{P}\right)^{D}$ is demand for real money balances, Y s real income, R_{OPP} is a vector of (real) opportunity costs of holding real money balances, R_M is the real deposit rate on deposits while T is the technological improvement in the financial industry, assumed to have a positive effect on demand for real money balances.

While the McKinnon et al. (1973) model stresses the importance between the deposit rate and investment, the Shaw (1973) model focuses on the importance of lending and borrowing activities. The divergence between the two models concerns how finance is raised: in the McKinnon et al. (1973) model, firms are restricted to self-finance. It is a model in which investment projects are financed by outside money, that is, money such as gold or cash that are held outside the monetary base. The Shaw (1973) model is an inside money (i.e. any debt that is used as money) model, which considers externally raised funds. In practice, firms finance their investment projects using both own funds (outside money) and borrowed funds (inside money). Thus, these two models should be viewed as complementary (Molho, 1986). This is why they are jointly cited in the literature as McKinnon-Shaw (1973) model.

The McKinnon-Shaw (1973) model implies that the real interest rate is a key indicator of financial development and that it is best to allow the real interest rate to move in line with market conditions, thus avoiding distortionary policies such as credit ceilings, regulation of interest rates, targeted/discriminatory lending and foreign exchange regulations, among others, that were key in the Keynesian monetary model. In this model, levels of real interest rate encourage both saving and investment, which is criticized by for example De Gregorio and Guidotti (1995) who reasoned that high interest rates may reflect lack of confidence in economic policy and the banking system and the adoption of more risky behavior in investment

undertakings. According to (Jefferis, Kasekende, Rubatsimbira, & Ntungire, 2020), several empirical studies argue that high interest rates indicate lack of price-based competition in the banking sector and may also signal market inefficiency related with some underlying problems such as high operating costs. However, proponents have argued that whenever there is financial deepening, the spread between the saving rate and the deposit rate narrows, resulting into more savings and pushing up investment as well. McKinnon and Shaw (1973) asserted that the process of financial development is the process of interest rate liberalization.

The last theoretical model linking finance and economic growth is the endogenous growth model. In the neoclassical model (e.g. the Solow growth model), production depends on capital stock, labor and technological progress. Assuming that labor grows at a constant rate and that there is no technological progress, then output per-worker depends on capital per-worker. Due to diminishing returns to capital, less and less additional per capita output will be produced as more and more per capita capital stock is employed. Thus, higher capital accumulation resulting from higher saving can only have a temporary effect on per capita GDP growth. In the Balanced Growth Path (BGP), all growth rates are zero: that, is there is zero growth in both per capita capital and per capita output. If the assumption of no technological progress is relaxed, then we can have long-run growth. Despite the importance of technological progress in stimulating long-run economic growth, the neoclassical model treats this as exogenous and therefore does not help in terms of providing policy advice on how to ensure sustained non-zero growth. In general, a constant rate of technological progress is assumed, leading to a constant rate of economic growth in the steady state.

The endogenous growth models came to solve this issue, by treating technological progress as endogenous and explaining dynamics behind long-run growth. The AK model, which is perhaps the simplest of all endogenous growth models, gives insights on how financial variables can affect economic growth. Pagano (1993) uses the AK model of (Rebelo, 1991) for this purpose and assumes that: capital (K_t) is the only factor of production. It is assumed that capital exhibits increasing returns to scale and depreciates at a constant rate (δ). It is further assumed that there is no population growth. This implies that the equation of motion for capital is given by equation 2.6:

$$K_{t+1} = I_t + (1 - \delta)K_t \tag{2.6}$$

Assuming that a fraction of total saving, ϕ, is used to finance investment, then $(1 - \phi)$ is lost during the process of financial intermediation. This leakage is due to the inefficiencies in the financial system. The contemporaneous saving-investment relationship can be expressed as in equation 2.7:

$$I_t = \phi S_t \tag{2.7}$$

And the steady-state growth rate (g) is given by equation 2.8:

$$g = \frac{K_{t+1} - K_t}{K_t} = \frac{I_t + (1 - \delta)K_t - K_t}{K_t} = \frac{\phi S_t}{K_t} - \delta = A\phi s_t - \delta \tag{2.8}$$

Where $S_t = s_t * Y_t = s_t * AK_t$. From equation 2.8, finance can influence economic growth through three channels, that is by: (1) increasing the marginal productivity of capital (A); (2) raising the proportion of saving channeled to investment (ϕ); (3) influencing the saving rates (s). As noted earlier, the rate of depreciation, δ, is assumed fixed. However, this simple AK model is often criticized on two grounds: (1) being a closed-economy model, it does not capture the effect of capital flows (both inflows and outflows); (2) It emphasizes the role of intermediation (i.e. bank based channels via which financial development affects economic growth) and thus ignores the role of stock markets.

2.2.3 Empirical Literature

Goldsmith (1969) was the first empirical study to investigate the nexus between financial development and economic growth. The study applies Ordinary Least Squares (OLS) as well as graphical analysis on annual data for 35 countries over the 1949-1963 period. Results from the study support the supply-leading hypothesis for developing countries but also show that there is weak and negative correlation between financial development and economic growth for the case of developed countries. Following the work of Goldsmith (1969), several empirical studies have been conducted to examine the link between financial development and economic growth. These can be broadly categorized under: **(i) cross-sectional studies; (ii) time-series studies; and, (iii) panel data studies**. The latter two have been facilitated by advances in econometric methods and availability of reliable macro-data sets, such as the Penn World tables. Pure cross-country and panel specifications of growth equations are often in line with Barro (1991) methodology while time-series studies mainly employ Granger causality tests, vector-autoregressive (VAR) models and associated cointegration tests, such as Johansen and Toda-Yamamoto cointegration tests, as well as a single-equation error-correction framework and the related cointegration tests, especially the Engle-Granger cointegration test. Each one of these methods has strengths and weaknesses and the use of different methodologies has been identified as one of the sources of the observed differences in empirical findings regarding the nexus between financial development and economic growth (Ang, 2008).

2.2.3.1 Empirical evidence from cross-sectional studies

In cross-country studies, the construction of observations for each country is done by averaging out the variables over the entire period of study. Indeed, most of the cross-sectional studies assume and therefore test one-way causality running from financial development to economic growth. Some few cross-sectional studies consider testing or controlling for reverse causality (i.e. endogeneity), mostly by use of external instruments. The key empirical findings from cross-sectional studies are presented in the following paragraphs.

Cross-sectional empirical studies that tested the supply-leading hypothesis include King and Levine (1993a, 1993b), which assess the relationship between financial sector development and economic growth using averaged cross-sectional data from 1960-1989 on 80 countries from all income groups. They use four variables representing financial development i.e. liquid assets/GDP, size of commercial bank credit vis a vis the total credit allocated by the banks and central bank (because it is expected that commercial banks are better at providing the functions of the financial system), credit to private enterprises

divided by the total credit, and, credit to private sector/GDP. They use three growth indicator variables as the dependent variables i.e. GDP per capita, productivity growth and capital growth. Using Ordinary Least Squares (OLS), they find that all financial development indicators predict all growth indicators at both statistically and economically significant levels, thereby supporting the Schumpeterian view that finance is a key driver of economic growth.

According to Levine (1998), a well-developed banking sector is important to stimulate economic growth but this is more so in countries with more efficient legal systems. In their study, they employ OLS and Generalized Method of Moments (GMM) on annual data for 42 countries averaged over the period 1976-1993. Taking a broader view of finance, Levine and Zervos (1998) show that development of both the stock markets and the banking sector positively affect economic growth, with the latter measured by real GDP per capita growth, capital accumulation and productivity growth, and the former measured by stock market size, volatility and international integration.

In his GMM results, with averaged data over the period 1960-1989 for 49 countries, Levine (1999) confirms that financial development, which is more evident in countries with highly developed legal and regulatory frameworks, is indeed a very important driver of economic growth. Applying OLS and instrumental variables (IV) techniques on annual data for 48 countries spanning the 1980-1995 period, Levine (2002) concludes that both bank-based and market-based financial systems are equally important in influencing economic growth. The study concludes that the observed cross-country differences in financial development are due to differences in legal systems and that financial development generally explains cross-country disparities in long-run economic growth.

Demirgüç-Kunt and Maksimovic (1998), using OLS on pooled data for 30 developing and developed countries for the 1980-1991 period[1], argue that the overall legal environment in a country positively influences financial development in a sense that it makes it easier for firms to obtain (long-term) external financing and therefore to grow their investments, which in turn affects the aggregate performance of the economy. There is also a complimentary role of financial development (i.e. in form of a larger banking sector and a more active stock market) and efficient legal systems in driving economic growth. Furthermore, Demirgüç-Kunt and Maksimovic (2002) first examined the link between financial development and the country's legal environment and then the relative importance of bank-based or market-based financial systems. They employed the two-stage least squares (2SLS) method on firm-level data for the largest publicly traded manufacturing firms in 40 countries covering the period 1989-1996. They conclude that the extent to which financial development, measured by both bank-based and market-based indicators, affects the growth of firms depends on a country's legal environment. However, they find no differential effect between bank-based and market-based financial systems in terms of influencing firms' access to financing.

McCaig and Stengos (2005) examined the link between financial development and economic growth using data for 71 countries averaged over the period 1960-1995. Their results indicate that there is a strong positive effect of both private domestic credit and liquid liabilities on economic growth. However, the link between the ratio of commercial bank assets to central bank assets and economic growth was found to be weak.

[1] In our cited empirical cross-sectional studies, we include all studies that used pooled cross-section methods, even if the observed units are always the same.

Applying OLS on data for 94 countries averaged over the 1960-1985 period, Atje and Jovanovic (1993) find that stock markets have both level and growth effects on economic growth. They however find no evidence that bank lending influences economic growth. Contrary to this, results from the Harris (1997) study show that stock markets have a strong and positive effect on economic activity only in more advanced compared to less developed economies[2].

Empirical evidence in favor of the negative or no-causality hypotheses is given by Ram (1999) who apply OLS on data for 95 countries averaged over the 1960-1989 period. The study finds weakly negative or negligible correlation between financial development and economic growth, even when regressions are performed on each country or on each sub-sample, where countries are grouped according to their respective levels of growth rates.

Using a threshold OLS model, with initial per capita income as the threshold variable, to run regressions on data for 80 countries averaged over the period 1960-1989, Deidda and Fattouh (2002) conclude that the higher the level of financial development, the higher the level of economic growth. However, results from the model without threshold effects shows that financial development influences economic growth only in low-income countries.

Empirical evidence shows that the relationship between financial development and economic growth has been quite mixed and generally differs according to the level of economic development, with causality reported to mostly run from financial development to economic growth, especially in developing countries where the effect of financial development on economic growth is significantly positive and quite stronger in the long run. Empirical evidence shows that financial development affects economic growth in developing countries through the investment channel resulting from efficient mobilization and allocation of financial resources to productive investments. This however means that the effect of financial development on the real sector takes time to materialize (Calderón & Liu, 2003; Mikebanyi & Kigabo, 2021).

Finally, some studies have gone even further to investigate the disaggregated effect of different indicators of financial development on economic growth. Using a set of traditional indicators of financial development generally covering the ratios to GDP of credit to the private sector, stock market capitalization, and bond market capitalization,Khan, Senhadji, et al. (2000) find that financial development significantly and positively affects economic growth in cross-sectional studies but this relationship weakens once pooled data is used. Since credit to the private sector, stock market capitalization, and bond market capitalization are generally measures of financial depth, they do not capture all the dynamics of financial sector development over time, explaining their weak link with economic growth.

2.2.3.2 Empirical evidence from time-series studies

Most of the time-series empirical literature support the supply-leading hypothesis. The first empirical evidence is given in Gupta (1984), who uses quarterly time-series data covering the period 1961Q1-1980Q4 for 14 developed economies. Results obtained using VARs and Granger-causality tests generally support the view that financial development Granger-causes economic growth. Though he finds some evidence of reverse causality, two-way causality is less significant. Similarly, Xu (2000), after estimating

[2]This study runs cross-country regressions on the two sub-samples: More advanced Vs Less advanced economies

VARs and analyzing impulse response functions and graphs using annual data for 41 countries over the 1960-1993 period, conclude that financial development drives economic growth in 27 countries. The study emphasizes the importance of the investment channel by arguing that financial development stimulates investment which in turn leads to output growth.

Arestis, Demetriades, and Luintel (2001)used quarterly data for five developed countries, namely: France, Germany, UK, USA and Japan. They use quarterly data covering the period 1972-1998 to estimate VARs, VECMs and to conduct cointegration and exogeneity tests. Their finds are that financial development promotes economic growth and that both bank-based and market-based indicators of financial development are important in these economies, though the relative importance of stock markets is quite small. The results also show that the volatility in stock markets can have detrimental effects on economic growth.

Rousseau and Vuthipadadorn (2005) use annual data for 10 Asian countries over the period 1950-2000 to estimate VARs, VECMs and to run Granger and Toda-Yamamoto causality tests as well as to conduct variance decomposition analyses. They conclude that investment is reactionary to financial development and this in turn has a positive effect on economic growth in these economies. However, the direct link between financial development and output growth is found to be quite weak.

A positive effect of stock market development on economic growth is found in Chile, Malaysia, Korea and the Philippines by Caporale, Howells, and Soliman (2005) who estimate VARs and conduct the modified WALD cointegration test (i.e. the Toda-Yamamoto cointegration test) using quarterly data over the period 1979Q1-1998Q4. Their findings also show that causality runs from stock market development to economic growth via the investment channel. Similarly, Thangavelu, Jiunn, et al. (2004) estimate VARs and perform Granger causality tests on quarterly data over the 1960Q1-1999Q4 period for Australia. When they use financial market indicators, they find ample evidence that financial development stimulates economic growth.

Using financial sector GDP as a measure of financial sector development and manufacturing GDP as a measure of economic activity, Neusser and Kugler (1998) apply various cointegration and causality tests (Johansen, Stock-Watson, Horvath-Watson, Phillips-Ouliaris, Engle-Granger) to test for the cointegration and causality between financial development and economic growth. Their study, which covers 13 OECD countries for the period 1970-1991, concludes that financial development and economic growth are cointegrated only in half of the sample of countries covered while causality tests confirm that financial development Granger-causes economic growth though there is also some evidence of two-way causality in some of the countries. Cross-country differences have been documented in some studies, for example Arestis and Demetriades (1997), which estimates VECMs and performs Johansen cointegration and weak exogeneity tests using quarterly data spanning the period 1979Q1-1991Q4. Their findings confirm the finance-leading hypothesis in Germany and the demand-following hypothesis in USA.

From the study conducted by Abu-Bader and Abu-Qarn (2008) in terms of investigating the nexus between financial development and economic growth for six Middle Eastern and North African countries, a vector autoregressive model was applied. Their findings support the hypothesis that finance leads economic growth, except in Israel where economic growth was found to lead financial development. Using annual data spanning from 1965-1992, Demetriades and Hussein (1996) supported the supply leading hypothesis views for Sri Lanka. Bist (2018) investigated the relationship between financial development and economic growth in 16 African and non-African low income countries over the period 1995-2014 and

find that financial development has a positive and significant impact on economic growth. In the case of developing countries, Habibullah and Eng (2006), examined the casual relationship between financial development and economic growth taking into consideration a sample of Asian countries that included Bangladesh, India, Indonesia, South Korea, Lao PDR, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka and Thailand and their results support the supply leading hypothesis.

Country-specific studies to investigate the link between financial development and economic growth have also been conducted and these include, but are not limited to studies on some Sub-Saharan countries. For example, the finance-leading hypothesis, as well as the importance of bank-based systems, are confirmed for the case of Korea by Choe and Moosa (1999) who reach these findings after running VARs and conducting granger-causality tests using annual data for the 1970-1992 period.

For the case of India, Bell and Rousseau (2001) estimate VARs and VECMs and also conduct Johansen cointegration tests as well as Granger-causality tests and impulse response analyses to assess the link between financial development and economic growth. Applying these empirical methods on annual data spanning the 1951-1995 period, they find ample evidence for the prevalence of the supply-leading hypothesis and conclude that finance affects investment first before it drives economic growth. They however find no supporting evidence that financial development has a positive impact on the total factor productivity (TFP) of the manufacturing sector.

Regarding the relative importance of banks or stock-markets, Caporale et al. (2005) show that stock-market development is an important driver of economic growth in Malaysia. Conversely, Arestis et al. (2001) argue that bank-based systems are more important drivers of economic growth compared to stock markets. Thangavelu et al. (2004) find enough evidence that economic growth fuels financial sector development in Malaysia, once they use proxies of financial development related to financial intermediaries. Their study reaches such a conclusion after estimating VARs and running causality tests using quarterly data for Australia over the period 1960Q1-1999Q4.

From Sub-Saharan Africa, a study on Rwanda by Kigabo, Okello, and Mutuyimana (2015) using Johansen co-integration test similarly finds that financial sector development, measured by credit to private sector boosts economic growth. Likewise, Gisanabagabo and Ngalawa (2017) find that finance precedes growth in Rwanda and a shock particularly to private sector credit rather than liquidity creates more fluctuations in growth. Both of these studies use quarterly data from 2000 to 2014 and 1996 to 2010 respectively. Okello, Kigabo, and Kitambala (2015) also find that banking development positively affects Rwanda's economic growth. They use broad money/GDP, credit to private sector/GDP and bank deposit liability/GDP as measures of the banking sector development. However, the results differ for different variables when different tests are used i.e. the Johansen test indicates a positive and significant effect when using credit to private sector and bank deposits while the money supply effect is significantly negative, but the Granger test gives positive results for bank deposits and money supply.

The Johansen test results by Okello et al. (2015) are similar to those of a study on Ghana by Adu, Marbuah, and Mensah (2013) that finds that financial development boosted growth between 1961-2010 in a statically and economically significant level using the Autoregressive Distributive Lag (ARDL) model, but this applies when private sector credit share of total credit or as a share of GDP are used as proxies for financial development. When broad money is used instead, the relationship is significantly negative. Puatwoe and Piabuo (2017) also conduct a country-specific study on Cameroon for the years 1980-2014 using an ARDL estimation and conclude that there is a positive long-run relationship between financial

development and economic growth. Measures for financial development are the same as those used in the Okello et al. (2015) study.

Empirical evidence by Jung (1986), which uses VARs and Granger-causality tests for 56 countries (37 less developed and 19 developed) covering the 1950-1981 period, supports Patrick (1996)'s view that the supply-leading hypothesis is more evident in less developed economies while the demand-following hypothesis is more valid for more developed economies.

Demetriades and Hussein (1996) generally support the bi-directional relationship between financial development and economic growth, after estimating VARs and VECMs and carrying out Engle-Granger and Johansen cointegration tests as well as Granger-causality tests on annual data for 16 countries: Venezuela, Spain, Portugal, South Africa, Costa Rica, Honduras, India, Korea, Mauritius, Pakistan, Turkey, Thailand, Greece, Guatemala, El Salvador and Sri Lanka. The same result is obtained by Demetriades and Luintel (1996) for the case of India, after estimating ECMs and conducting exogeneity tests and principal components analysis using annual data covering the period 1961-1991. Bi-directional causality was also confirmed for the case of India by Demetriades and Luintel (1997) who use annual data for the 1960-1991 period to carry out Engle-Granger as well as the Stock-Watson cointegration test and the principal components analysis and weak exogeneity tests. In addition to this, they find that financial repression has indirect negative effects on economic growth since it retards financial development.

Luintel and Khan (1999) estimated VARs and VECMs and carried out cointegration and causality tests using time-series data for 10 countries (Thailand, Malaysia, India, Costa Rica, Colombia, Greece, Philippines, Sri Lanka, Korea and South Africa). They conclude that there is a bidirectional relationship between financial development and economic growth in all the covered countries and that the two variables are cointegrated.

Empirical studies that support the demand-following hypothesis include Hossain, Biswas, Hossain, Poddar, et al. (2017) for Bangladesh. They use a diverse set of financial indicators covering financial depth, access, efficiency and stability but compress them into two factors using the Factor Analysis technique. They then test for granger causality between these financial development indicators and economic growth using data for the 1988-2013 period. One of their findings is that economic growth actually drove financial development when measured by depth and stability. Indeed, the validity of the demand-following hypothesis in Malaysia was not rejected by Noor, Rambeli, et al. (2017) in their assessment of the relationship using an ARDL bounds test using data between 1960 and 2010 and credit to private sector as their financial development measure.

Likewise, Ang and McKibbin (2007) find evidence that output growth granger causes financial development in the long-run. Their study used annual data for Malaysia to estimate VARs, VECMs and to run Johansen cointegration tests as well as Granger-causality tests and principal components analysis. Though their study refutes the idea that a bank-based financial system drives long-term growth of the real sector, they generally find evidence that financial development and economic growth are cointegrated.

Regarding the effect of financial repression/liberalization (i.e. in line with Shaw-McKinnon (1973) hypothesis), Demetriades and Luintel (2001) use annual data for South Korea covering the period 1956 to 1994 to estimate ECMs and to conduct principal components analyses. Their findings point to the fact that financial liberalization positively and significantly affects financial development. Further, the link between the real interest rate and financial development was not established. Contrary to this, Arestis,

Demetriades, Fattouh, and Mouratidis (2002) find differential effects of financial liberalization on financial development. Using annual data over the period 1955-1997 and for six (6) developing countries (India, Thailand, Greece, Egypt and South Korea), they estimate VARs, VECMs and perform the Johansen cointegration test as well as the principal components analysis. Their main finding is that the effect of the real interest rate on financial development is strong and positive in four (4) out of the six (6) countries covered in the study.

Lastly, though the main focus of Ang (2009) is to examine the link between Foreign Direct Investment (FDI) and economic growth, he indirectly addresses the question regarding the link between financial development and economic growth. Using annual data covering the period 1965-2004 for Malaysia, he estimates VARs, VECMs and carries out the Johansen cointegration test as well as the Granger-causality test and the principal components analysis. His main finding is that FDI and financial development are each cointegrated with output growth. Further, he notes that financial development amplifies the effect of FDI on economic growth.

2.2.3.3 Empirical evidence from panel-data studies

Following advances in econometric techniques and creation of large cross-country data sets, a good number of panel studies on the link between financial development and economic growth, using both macro and micro-level data, have been conducted. While empirical findings are mixed, the bulk of these studies support the supply-leading hypothesis.

De Gregorio and Guidotti (1995) use annual data for 99 countries covering the 1960-1985 period. After running OLS and panel data random effects models, they conclude that financial development induces economic growth, except for the case of Latin American countries where unregulated financial liberalization and expectation of government bail-out had detrimental effects. Applying the Instrumental Variables (IV) and GMM techniques on annual data for 77 countries covering the period 1960-1995, Beck, Levine, and Loayza (2000) find that financial development positively affects both per capita GDP growth and TFP growth. Similarly, Apergis, Filippidis, and Economidou (2007) find that financial development causally affects growth when they use panel data analysis methods on 65 OECD and non-OECD countries between 1975 and 2000 after confirming for heterogeneity across time and countries. The issue of heterogeneity across countries is also emphasized by Petrakos et al. (2007) who conclude that since there are country-specific drivers of growth, it is important for each country to design its unique policies to address its specific challenges.

Using GMM on data for Argentina, Chile, Indonesia and Korea for the 1965-1985 period, Benhabib and Spiegel (2000)'s empirical findings point to the fact that financial development has a significant positive effect on both investment rates and TFP growth. Their results are however sensitive to the inclusion of country fixed effects as well as to the different indicators of financial development. Levine et al. (2000) argue that bank-based indicators of financial development have a significant positive effect on economic growth in 74 countries. Their study uses data spanning the period 1960-1995 and applies the IV and GMM techniques.

Beck and Levine (2004) apply OLS and GMM on annual data spanning the period 1976-1998 for 40 countries. Their main finding is that financial development positively influences economic growth.

They show that both bank-based and market-based indicators of financial development are important to stimulate growth and that they act as complements to one another since stock markets provide services that are quite different from those provided by banks. Based on the cointegration technique, Christopoulos and Tsionas (2004) find that financial development and economic growth have a long-run relationship. Their study covers 10 developing countries (Jamaica, Mexico, Colombia, Paraguay, Ecuador, Peru, Kenya, Honduras, Thailand, and Dominican Republic) over the period 1970-2000.

Rioja and Valev (2004) divide 74 countries (including more and less developed ones) into three groups following their levels of financial development and then apply GMM on data for the period 1961-1995. Their findings point to the fact that finance positively affects economic growth in developed economies but this relationship seems ambiguous for the case of less developed economies. Without any evidence in favor of either bank-based or market-based indicators of financial development, Ndikumana (2005)'s empirical findings show that financial development has a significant positive effect on domestic investment since growth in financial systems permits easy and relatively cheap access to capital and thus leading to capital accumulation.

Regarding the source of financing, Rajan and Zingales (1998) conclude that industries which rely on external finance prosper more in countries with better developed financial systems because financial development eases the flow of external finance to the firms in need of financing. Their study used industry-level data for 41 countries for the period 1980-1990 and their empirical findings are based on OLS and panel fixed effects. Similar findings are reported in Beck and Levine (2002) who apply OLS and panel data techniques on annual data for 42 countries and 36 manufacturing industries over the 1980-1990 period. Their results show that industries that rely more on external finance tend to grow more in countries with better financial systems and with efficient legal systems. They however find no differential effect of either bank-based or market-based measures of financial development on economic growth.

Some studies focused on examining the (conditional) effect of stock-markets on economic growth. For example, empirical results from Henry (2000), who apply panel data estimation methods on annual data from 11 developing countries (Mexico, Korea, India, Brazil, Chile, Colombia, Malaysia, Thailand, Argentina, Venezuela and the Philippines) for the 1970-1990 period, show that in 9 out of 11 countries studies, private investment responds positively to stock market liberalization. Though they find weaker effects of stock market capitalization on economic performance in 47 countries after estimating panel VARs using data from 1980-1995, Rousseau and Wachtel (2000) conclude that stock market liquidity and financial intermediation positively influence per capita output.

Other studies covered the issue of non-linear relationships between financial development and economic growth. For example, Ketteni, Mamuneas, Stengos, and Savvides (2007) find that the finance-growth nexus is only linear when the non-linearities between economic growth and initial per capita income as well as between economic growth and human capital are taken into consideration. Otherwise, the finance-growth relationship becomes non-linear. Applying the IV augmented semi-parametric partial linear model on panel data from 66 countries over the period 1961-1995, Stengos and Liang (2005) show that there is a non-linear relationship between finance and economic growth but their results are sensitive to the used indicators of financial development. Using panel data fixed effects and data for 84 countries over the 1960-1995 period, Rousseau and Wachtel (2002) show that financial development has positive effects on economic growth if inflation falls below the threshold of 6%-8%. However, the link between finance and economic growth disappears when inflation exceeds a threshold of 13%-25%.

Calderón and Liu (2003) find bidirectional causality but use "Geweke decomposition test' to test which dependence is stronger. They find the dominating direction to be from financial development to growth as it explains at least 81% of the linear dependence between the two, using the sample of all countries. However, when the sample is broken into different country income levels, the linear dependence of economic growth on finance is stronger for developing countries but, for developed countries, the dependence of finance on growth is stronger.

Finally, Odedokun (1996) examines the link between finance and economic growth for the case of less developed countries. He uses a sample of 71 countries with data spanning the period 1960-1980. Empirical findings based on GLS estimations indicate that financial development fuels economic growth in at least 85% of the sample. The effect of finance on economic growth is strong and positive in less developed countries compared to developed ones. The panel data estimations show that results are not divergent across regions and levels of economic development.

2.3 Methodology and Data

A comprehensive discussion of the econometrics of finance and growth is given in Levine (2006) and Beck (2009), with the latter noting that the finance-growth nexus can be empirically summarized as in equation 2.9:

$$g(i,t) = y(i,t) - y(i,t-1) = \alpha + \beta_i f(i,t) + C(i,t)\gamma_i + \mu(i) + \varepsilon(i,t) \tag{2.9}$$

Whereby y is the log of real GDP per capita or of any other measure of welfare, g denotes the growth rate of y, f is an indicator of financial development, C is a set of control variables, μ is a country-specific element of the error term that does not necessarily have a mean of zero, ε is a white noise error term with a mean of zero, i is the observational unit, such as country, industry, a firm or even a household[3], while t is the time period. Thus, equation 2.9 captures both the cross-section and time components, which altogether constitute panel data. A good estimation technique should be the one that helps to get an unbiased estimate of β_i. As noted from empirical literature, cross-section, time-series and panel data methods have been used to investigate the link between financial development and economic growth. Earlier studies used cross-sectional methods, where equation 2.9 is restated as:

$$g(i) = y(i,t) - y(i,t-1) = \alpha + \beta f(i) + C(i)\gamma + \delta y(i,t-1) + \varepsilon(i) \tag{2.10}$$

Where variables are as defined before. In a typical cross-country OLS regression, data for each observational unit (i.e. country) is averaged over the entire sample period while homogeneity across the observational units is assumed, with $\beta_i = \beta$ and $\gamma_i = \gamma$. Cross-country OLS regressions are generally specified along the lines of Barro (1991), augmented with financial development indicators and including the lagged dependent variable ($y(i,t-1)$) as a control variable. The use of cross-country

[3]For macro-level study, such as ours, i typically stands for a country.

OLS regressions has been criticized due to several reasons, notably: (i) the fact that data averaging over longer periods tends to mask important short-to-medium term growth dynamics; (ii) the assumption that all observational units are homogeneous is questionable, for example, it would be very hard to believe that no significant cross-country differences exist in terms of financial system development. Also, if the $\mu(i)$ is present in equation 2.10, then the problem of endogeneity arises, amplified by the presence of the lagged dependent variable. (iii) Most of these studies assume one way causality, that is, from financial development to economic growth and thus do not address the issue of possible reverse causality between the two variables.

Also, reverse causality between economic growth and control variables has not been catered for by many studies. Such a strong assumption may lead to inconsistent and biased estimates. To address the problem of endogeneity, later studies used the instrumental variables technique. Since all these studies used external instruments (unlike internal instruments, that is lags of independent variables, used in dynamic panel data models), the issue of finding the right instrument remains controversial in the literature; (iv) Data averaging also reduces the degrees of freedom and may thus lead to a spurious contemporaneous correlation between time-averaged variables, although the original series may not be contemporaneously correlated; (v) The cross-country OLS regressions are based on a one-period comparative static framework and therefore the results do not represent long-term economic behavior/relationships.

Time-series methods have also been criticized based on the fact that: (i) due to data limitations for the case of Least Developed Countries (LDCs), researchers have been forced to use smaller samples/estimation periods and thus results do not capture persistent growth dynamics. Some studies attempted to save the degrees of freedom by arbitrarily selecting one lag, an act that is highly questionable since sufficient lags are needed to model short-run dynamics and properly solve the issue of serial correlation. The results are often unstable and sensitive to the choice of lag length and the inclusion of trend terms in the model; (ii) most studies use the granger causality test, which has its own weaknesses. For example, if the demand for financial services is based on firms' expectation of a looming economic boom, this may lead to increased investment in financial services. In this case, financial development is simply a leading indicator of economic growth, rather than being necessarily its cause; (iii) Time-series studies use simultaneous equation models to deal with the issue of endogeneity. This however, does not fully address the problem, since finding the right instruments (or confounding variable) remains a challenge and often inter-relationships turn out to be complex and difficult to model; (iv) Some studies tend to use high frequency data (e.g. quarterly data, often obtained by interpolation) or to include fewer variables in the model. This solution may lead to measurement errors and omitted variables bias.

In the context of well documented cross-country differences and unsettled debate especially on reverse causality, not only between economic growth and financial development, but also between economic growth and control variables, this study uses panel data growth regressions capable of controlling for country-specific effects and reverse causality (Roodman, 2009b; Levine et al., 2000; Adedokun, 2017). Following the empirical literature on the financial development-economic growth nexus, we specify a two-way error components model along the lines of Levine et al. (2000) and Beck and Levine (2004), presented in equation 2.11:

$$Y_{i,t} = \lambda Y_{i,t-1} + \beta FD_{i,t} + \gamma z_{i,t} + \mu_t + \varepsilon_{i,t} \tag{2.11}$$

Where the composite error term is defined as $\varepsilon_{i,t} = \alpha_i + u_{i,t}$. equation 2.11 can be transformed into equation 2.12:

$$Y_{i,t} - Y_{i,t-1} = (\lambda - 1)Y_{i,t-1} + \beta FD_{i,t} + \gamma z_{i,t} + \mu_t + \varepsilon_{i,t} \tag{2.12}$$

Or simply into equation 2.13:

$$\triangle Y_{i,t} = (\lambda - 1)Y_{i,t-1} + \beta FD_{i,t} + \gamma z_{i,t} + \mu_t + \varepsilon_{i,t} \tag{2.13}$$

Where $Y_{i,t}$ is the log of real per capita GDP and $Y_{i,t-1}$ is its first lag - thus, $\triangle Y_{i,t}$ is the real per capita GDP growth. Our main regressor is $FD_{i,t}$, which is a given indicator of financial development, $z_{i,t}$ is a set of control variables, α_i stands for time-invariant country-specific heterogeneity, potentially correlated with the regressors; "i" represents the "i^{th}" country included in the sample while "t" stands for time. Note that the inclusion of α_i is premised on the fact that the samples used in this study are not randomly selected from a larger population but rather selected following a well-defined criterion, notably income status. We also include the time dummies, μ_t, to account for macroeconomic shocks common to all countries in the sample.

The inclusion of a lagged dependent variable on the right-hand side of equation 2.11 raises several econometric issues that render standard panel data estimators inconsistent. For example consider a dynamic panel data model given by equation 2.14:

$$y_{i,t} = \lambda y_{i,t-1} + \beta X'_{i,t} + u_i + \varepsilon_{i,t} \tag{2.14}$$

Equation 2.14 tells us that the long-run effect of x_k is given by $\frac{\beta}{1-\lambda}$, which would be indeterminate in case of a unit root $(\lambda = 1)$. Also, $y_{i,t-1} = \lambda y_{i,t-2} + \beta X'_{i,t-1} + u_i + \varepsilon_{i,t-1}$ implies that $y_{i,t-1}$ and the unobserved country-specific effects, (u_i), are correlated, which implies that the OLS estimator for λ in equation 2.14 is inconsistent. For simplicity, Assume $\beta = 0$ in equation 2.14, then the fixed effects estimator for λ is given by:

$$\hat{\lambda}_{FE} = \frac{\sum_{i=1}^{N}\sum_{t=1}^{T}(y_{it} - \bar{y}_i)(y_{it-1} - \bar{y}_{i,-1})}{\sum_{i=1}^{N}\sum_{t=1}^{T}(y_{it-1} - \bar{y}_{i,-1})^2} \tag{2.15}$$

Where $\bar{y}_i = \frac{1}{T}\sum_{t=1}^{T} y_{it}$, $\bar{y}_{i,-1} = \frac{1}{T}\sum_{t=1}^{T} y_{it-1}$. N is the total number of panels and T is the total number of time periods. The estimator, $\hat{\lambda}_{FE}$ is (negatively) biased and inconsistent for large N and small/fixed T (i.e. as $N \to \infty$ but T is fixed). This is what is known in the literature as the Nickel bias as coined by Nickell (1981). This bias of $\hat{\lambda}_{FE}$ however diminishes as T becomes sufficiently large. Simulations by Judson and Owen (1999) suggest that the bias is minor in panels with more than 30 observations (i.e. when T is more than 30). Indeed, the correlation between $y_{i,t-1}$ and the unobserved country-specific effects, (u_i) violates the assumption of the random effects (RE) model, thus the RE model estimator is also inconsistent. More difficulty associated with standard static panel data models could

arise in case u_i is also correlated with other regressors in equations 2.11, 2.12 and 2.13, which is actually very likely since we may have several endogenous variables.

The only way of accounting for endogeneity in dynamic panel data models is by use of the Generalized Methods of Moments (GMM). The Anderson and Hsiao (1981) estimator[4], though consistent, is not efficient due to the fact that it is based on the instrumental variables (IV) estimator which does not exploit all the available moment conditions. The IV estimator also ignores the structure of the error component in the transformed model - the autocorrelation in the first differences errors leads to inconsistency of the IV estimator. The IV estimator is also inconsistent in case other regressors are correlated with the error term.

The Arellano and Bond (1991)[5] and Blundell and Bond (1998)[6] estimators are very useful since they enable the use of a bigger information set of instruments. One of the challenges of using these methods is related with the proliferation of instruments (r). For example, since $r = T/(T-1)/2$, as T increases, r also increases, posing challenges related with the determination of the right instruments[7], bearing in mind the challenge related with degrees of freedom. Consistency of the Blundell and Bond (1998) and Arellano and Bond (1991) estimators also hinges on the assumption of no higher order or typically no second order serial correlation in the transformed error term $E(\triangle u_{i,t}, \triangle u_{i,t-2}) = 0$. Once these challenges are addressed, the differenced and system GMM estimators are consistent – with the coefficient on the lagged dependent variable often between the FE estimator (biased downwards) and the OLS estimator (biased upwards), used in the literature as a rule of thumb to assess consistency of system GMM results.

In a nutshell, while both the Blundell and Bond (1998) and Arellano and Bond (1991) estimators deal with the endogeneity problem in dynamic panel data, the Blundell and Bond (1998) is more efficient since it not only allows the use of more instruments but is also more appropriate in case the response variable is highly persistent. However, GMM estimators are more consistent for samples with very large N and small T. For example, Moral-Benito, Allison, and Williams (2019) demonstrate that the Arellano and Bond (1991) estimator might behave poorly in finite samples when the cross-section dimension of the data is small. Indeed, when T is large relative to N the huge number of instruments produced may render the GMM estimator invalid even though the individual instruments may be valid (Roodman, 2009c). Some studies also show that using the instrumental variables technique to eliminate the endogeneity bias often leads to poor small sample properties (Kiviet, 1995; Bun & Windmeijer, 2010).

Given the above mentioned challenges associated with the System GMM (i.e. the Blundell and Bond (1998) estimator), especially in the context of this study, where both T and N are small, it is worth exploring the efficiency of the Bias Corrected Least Squares Dummy Variable (BC-LSDV) estimator. However, while the BC-LSDV is very efficient in terms of correcting for dynamic panel bias, it does not solve the problem of endogeneity.

To be able to deal with small sample bias in dynamic panel data, Kiviet (1995) pioneered the in-

[4]The Anderson-Hsiao estimator is done as follows: (1) difference the original model to eliminate the constant and the individual effect. The remaining problem however is the correlation between the differenced dependent variable and the transformed error term. Since the individual effects are now removed, then; (3) use instruments for the lagged dependent variable: usually, second and third (or even higher) lags of the dependent variable, either in the form of differences or lagged levels, are used.

[5]Arellano-Bond (AB). This is also called the differenced GMM and only contains first difference equations.

[6]Blundell-Bond (BB). This is also called the system GMM and contains both difference and level equations.

[7]For example, deciding how many moment conditions to consider.

troduction of a group of bias corrected estimators. These include models such as the bias corrected LSDV dynamic panel data estimator (estimated in stata using the command xtlsdvc[8])[9] and bootstrap-corrected fixed- effects estimation and inference in dynamic panel-data models (estimated in stata using the command xtbcfe[10])[11], which deal with dynamic panel data bias in LSDV and FE models, respectively. These were shown to possess superior small sample properties compared to GMM estimators in a sense that they have the ability to maintain relatively small coefficient uncertainty while removing most of the bias. Efficiency of the BC-LSDV estimator in small samples has been tested and confirmed in the studies by Bruno (2005a), Bruno, Choudhry Tanveer, Marelli, and Signorelli (2017) and Buddelmeyer, Jensen, Oguzoglu, and Webster (2008). More improvements on the BC-LSDV estimator were made to handle heteroscedasticity (Bun & Windmeijer, 2010; Bun & Carree, 2006; Everaert & Pozzi, 2007; De Vos, Everaert, & Ruyssen, 2015). For example, as noted by Malovana, Kolcunová, and Broz (2018), the bootstrap-based bias corrected LSDV estimator by De Vos et al. (2015) is suitable for the case where T is small (T=14) compared to the size of N (N=58). They however complemented the bootstrap-based bias corrected LSDV estimator by the GMM estimator.

In view of the above and in line with our sample (with both T and N relatively small but T significantly smaller than N), it is likely that the bias-corrected LSDV model is more appropriate. Indeed, Trabelsi (2016) uses monte-carlo simulation to test the efficiency of seven estimators (i.e. OLS, standard FE, Arellano-Bond (1991), Blundell-Bond (1998), two versions of long-differencing and BC-LSDV) in presence of endogeneity, serial correlation, missing data and unbalanced panels. The study concludes that the BC-LSDV performs better, followed by the system GMM. In view of this, the common practice is to compare the bias-corrected LSDV results with system GMM results as in Malovana et al. (2018).

It is also customary to include OLS and FE estimations (as in Trabelsi (2016)) to gauge the consistency of GMM results. The efficiency of using the Arellano and Bond (1991), Blundell and Bond (1998) and BC-LSDV estimator, respectively, are summarized in table 2.1. Important to note is that the GMM estimators are inefficient in case there is second order serial correlation while the BC-LSDV is inefficient in case there is endogeneity problem. Nonetheless, Trabelsi (2016) shows that in the small sample context and when there is both endogeneity and Nickel bias, the BC-LSDV performs better than other estimators.

Table 2.1: The efficiency of different estimators according to different situations

Estimator	**Unobserved heterogeneity**	**Dynamic panel bias**	**Second order serial correlation**	**Unbalanced panel data**	**Endogeneity**
AB	Yes	Yes	No	Yes	Yes
BB	Yes	Yes	No	Yes	Yes
BC-LSDV	Yes	Yes	Yes	Yes	No

Source: Trabelsi (2016); Flannery and Hankins (2013)

[8]We denote this estimator as BC-LSDV.

[9]This was developed in Bruno (2005a), who extends the results by Bun and Kiviet (2003), Kiviet (1995) to unbalanced panels.

[10]We denote this estimator as BC-FE.

[11]This is documented in Nickell (1981) and Everaert and Pozzi (2007).

The variable names, labels and data sources are given in Appendix 2.1. In summary, the main data sources are: International Country Risk Guide (ICRG), the Economic Freedom of the Word Report /Fraser Institute, PWT 9.1[12], OECD[13], IMF[14], WGI[15], Barro-Lee[16], the Global Financial Development Database (GFDD)[17] and World Development Indicators (WDI) of the World Bank. Note that the World Bank's estimate of the rule of law (rl_est) reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Each of the new IMF financial development indicator (i.e. FD, FI, FM, FID, FIA, FIE, FMD, FMA, and FME) is normalized between 0 and 1. Thus, the highest (lowest) value of each one of these indicators across time and countries is equal to one (zero) and all other values are measured relative to these maximum (minimum) values. The level of aggregation of these new financial development indicators is given in figure 2.2:

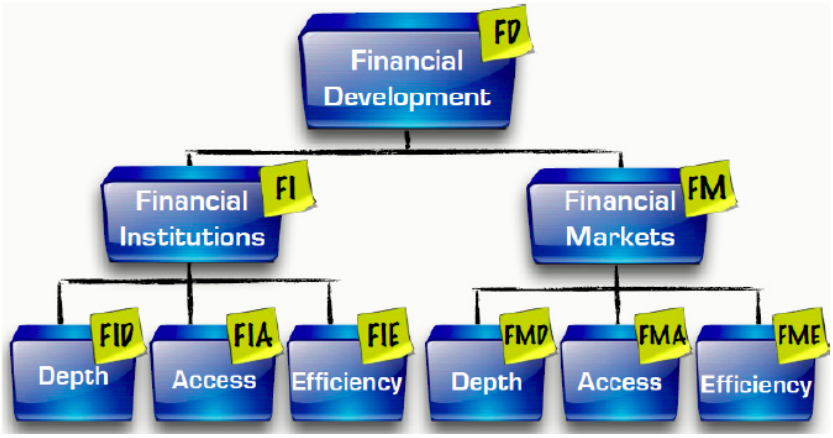

Figure 2.2: Aggregation of new IMF financial development indicators
Source: Sahay et al. (2015).

According to Sahay et al. (2015), financial development is a combination of depth (i.e. the size and liquidity of markets), access (i.e. ability of individuals to access financial services), and efficiency (i.e. the ability of institutions to provide financial services at low cost and with sustainable revenues, and the level of activity of capital markets).

[12] from https://www.rug.nl/ggdc/productivity/pwt/
[13] from https://stats.oecd.org/Index.aspx?DataSetCode=TABLE2A
[14] from https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B
[15] from http://info.worldbank.org/governance/wgi/index.aspx
[16] from http://www.barrolee.com/main.htm
[17] from https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database

2.4 Data Analysis and Empirical Results

In this section, we present summary statistics and empirical results, obtained by estimating equation 2.11. The averages of traditional indicators by income group[18] show that low income countries are less monetized (as shown by Broad Money (M3) as a percentage of GDP: $M3\_GDP$) and less financed by the banking system (as shown by the Credit to the Private Sector (CPS) as a percentage of GDP: CPS_GDP). Generally, monetization and financing increase as we move up the income ladder (figure 2.3).

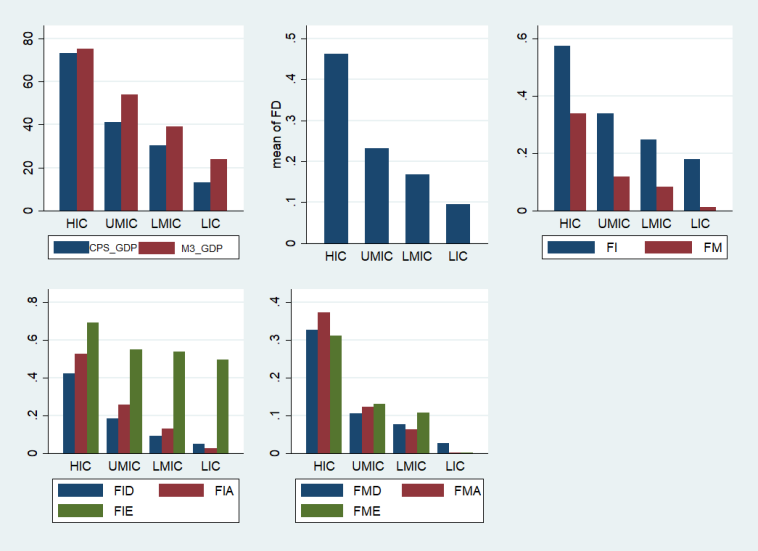

Figure 2.3: Financial Development Indicators averaged over income groups
Source: Own computations.

The new measures of financial development (see figure 2.2) also present a similar picture that financial development generally increases with income. One key fact is that less developed countries, perform relatively well with respect to financial institutions compared to financial markets (figure 2.3), whereby the latter are almost non-existent. The fact that financial development varies with income groups implies that there is heterogeneity among these income groups, which calls for the use of panel data methods.

If the disaggregation is done over regional groupings[19], it is clear that financial development (measured by both new and traditional indicators) is lower in Sub-Saharan Africa, South Asia as well as in Latin America and Caribbean as clearly shown in figure 2.4.

Nonetheless, the regional groupings may mask some important information given the fact that a particular grouping may include countries from different income groups and thus lumping them together

[18]**The income groups** are defined by the World Bank according to the Gross National Income (GNI) per capita as of 2020: (1) High Income Countries (HIC): $12,696 or more, (2) Upper Middle Income Countries (UMIC): $4,096 to $12,695, (3) Low Middle Income Countries (LMIC): $1,046 to $4,095 and, (4) Low Income Countries (LIC): $1,045 or less.

[19]**The regional groupings are:** (1) East Asia and Pacific (EAP); (2) Europe and Central Asia (ECA); (3) Latin America and Caribbean (LAC); (4) Middle East and North Africa (MENA); (5) North America (NA); (6) South Asia (SA); and, (7) Sub-Saharan Africa (SSA).

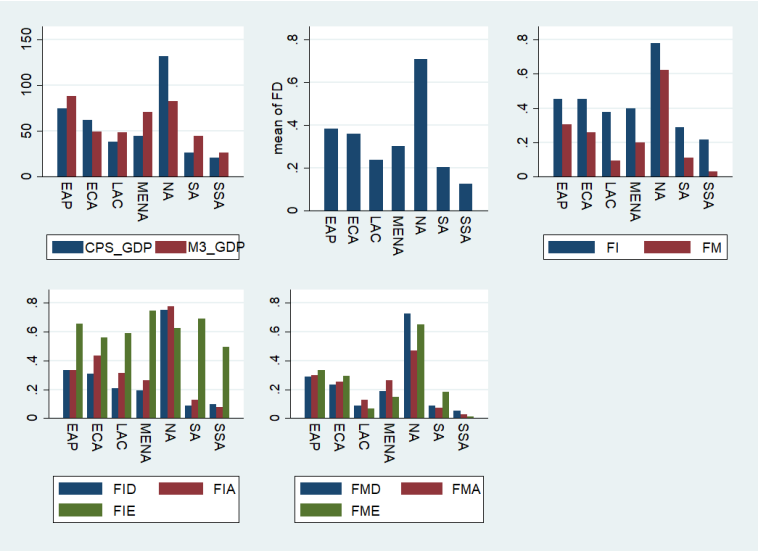

Figure 2.4: Financial Development Indicators averaged over geographical groups
Source: Own computations.

may not be very useful. Thus, figure 2.5 gives summary statistics for the financial development indicators for both developing and developed countries. As expected, financial development is higher in advanced economies. Compared to the level of other financial development indicators, it is important to note that Financial Institutions Efficiency (FIE) is relatively high in developing countries. Note that the category of developed countries is defined to only include HICs while the developing countries' category includes UMICs, LMICs and LICs.

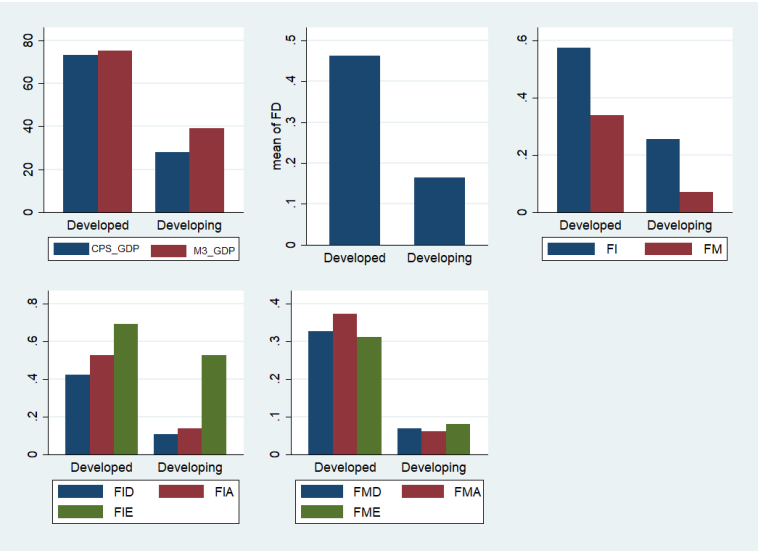

Figure 2.5: Financial Development Indicators: Developed Vs Developing Countries
Source: Own computations.

Turning to per capita income as a measure of welfare status, figure 2.6 shows that welfare is lowest in Sub-Saharan Africa and South Asia. With respect to income grouping, Welfare is higher for countries in the higher income bracket. From the foregoing analysis, the empirical question is thus to determine whether there is any causal relationship between financial development and welfare across regions and income groups. We will however keep our focus on Sub-Saharan Africa and use other estimations for comparison and robustness checks.

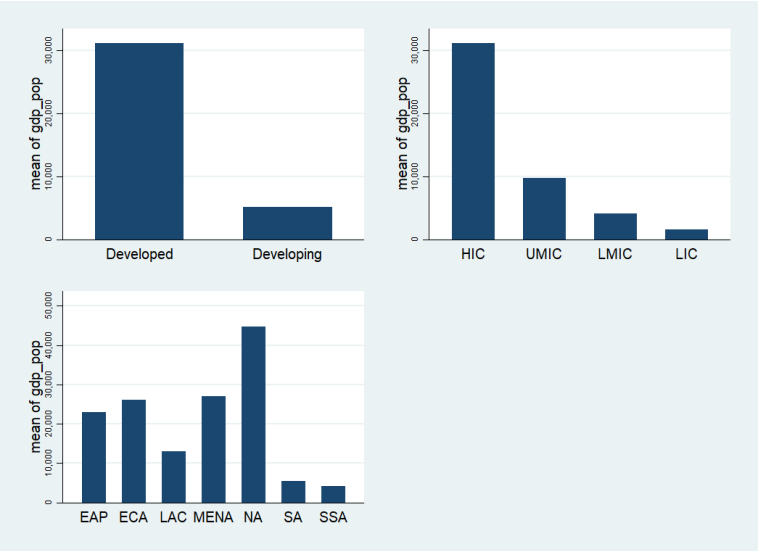

Figure 2.6: Average per capita real GDP by groupings
Source: Own computations.

In this study, we run estimations using a "3-year" non-overlapping period average dataset for each of the variables included in equation 2.11 using data spanning the period 1980-2017. We adopt a general to specific approach whereby we run regressions for the global sample and then narrow down to the sub-samples of interest. The estimations on the sub-samples is aimed at assessing whether the nexus between financial development and per capita GDP is sensitive to both income groupings (i.e. level of development) and geographical groupings. We start with the world sample and estimate the OLS, FE, GMM and the "Bias Corrected Least Squares Dummy Variables" (BC-LSDV) models. As mentioned earlier, the OLS estimator is biased upwards while the FE estimator is biased downwards. A good estimator is therefore expected to be the one that lies between the OLS estimator and the FE estimator. This is one of the criteria used to judge the efficiency of the system GMM and the BC-LSDV estimators.

In table 2.2, the last two columns show BC-LSDV estimation results: BC-LSDV(1) includes education[20] as one of the control variables, while BC-LSDV(2) does not include education. Also, OLS, FE and GMM include education. Other control variables are: the first lag of the log of real GDP ($L.lrgdpna$), the log of population ($lpop$), the shares of investment (csh_i), trade (csh_xm) and government consumption (csh_g) in GDP, as well as the interpolated/extrapolated rule of law (rl_est2)[21]. As noted above, we also include time dummies (μ_t) to capture the effect of macroeconomic shocks. Note that the variables of

[20]We include $l1\_yr\_sch2$, which is the first lag of interpolated and extrapolated yr_sch. Since the Barro-Lee data set on education attainment is given at 5-year time intervals, we interpolate to obtain annual data and fill the data gaps. Also since the data set ends in 2010, we extrapolate observations until 2017.

[21]We interpolate the rule of law estimate so as to fill the many missing observations in the sample period and thus increase the degrees of freedom. Also since the data set begins in 1996, we extrapolated data before 1996 until 1980. In addition, this

interest are financial development indicators, in this case: FID, FIA, FIE, FMD, FMA and FME. Since these indicators are quite many, we checked for correlation and collinearity among them. Appendix 2.2 shows that these variables are indeed positively and significantly correlated. However, appendix 2.3 shows that these indicators of financial development are not collinear since the "Variance Inflation Factor" (VIF) for each of them is less than ten and the tolerance value is greater than 0.1[22]. Thus, we can conveniently include all of them in the same regression model.

In terms of expected signs, $L.lrgdpna$ is anticipated to positively affect per capita income due to the cumulative causation argument and to conditional income convergence among countries. The empirical literature on $lpop$ is mixed: a positive effect is possible if economies can reap from the demographic dividend whereby improved reproductive health and a rapid decline in fertility lead to a shift in the age structure such that a big portion of the population belongs to the labor force. Conversely, if a big chunk of population is in the non-productive age group (e.g. dependents) which simply consumes and does not produce anything, then $lpop$ can constrain welfare enhancement. Under the neo-classical model (i.e. Solow model), a rapid population growth reduces the available capital per person, which reduces the productivity of its labor force, and thus income and saving fall. Likewise, the Malthusian theory argues that a rapid growth in population puts pressure on the available factors of production and thus constrains economic growth and welfare.

Most empirical studies have reported a positive effect of trade openness (csh_xm) because it enables technological transfers, encourages competition, facilitates specialization and international trade and enables countries to reap from economies of scale. However, some empirical studies have reported that trade restrictions are more beneficial for the case of developing countries that cannot favorably compete in international markets. The share of investment in GDP (csh_i) is expected to have a positive effect given that more investment leads to more capital accumulation and hence to more production and output. The effect of foreign aid can be positive or negative: it is negative when aid is used to finance non-productive investment (i.e. white elephants) or when aid is swindled. Also, some studies (Mah & Yoon, 2020) have reported that aid grants can have a negative effect because governments tend to use them irresponsibly. Conversely, aid can have a positive effect if it is used to finance productive investments or not embezzled (Moyo, 2009). Aid loans have been reported to be more beneficial because governments tend to use them responsibly so as to be able to pay back when time comes (Islam, 1992; Clist & Morrissey, 2011).

The share of government consumption in GDP (csh_g) can have a negative or positive effect on per capita income. Keynesians argue that more government spending (i.e. expansionary fiscal policy) stimulates aggregate demand and economic activity hence helping to raise output. Classical and neoclassical economists argue that government spending on non-productive goods, such as purchase of fire arms, can have detrimental effects on welfare. Also, government spending is detrimental if it crowds out the private sector. Regarding institutional quality, good institutions provide a good environment (e.g. protection of property rights and efficient mitigation of business related conflicts) for investors and hence promote

gave better results than when other measures of institutional quality were used. These other measures of institutional quality are: (1) interpolated data on the legal system and property rights (Area2), and, (2) interpolated/extrapolated data on law and order (law_ord_icrg). Note that $Area2$ has 5-year data from 1970 to 2000, so we interpolate to get annual data. From 2000 onwards, the data is annual but we do interpolate due to having many missing values over the sample period especially for developing countries. The data for law_ord_icrg start in 1984, so we extrapolate observations before 1984 until 1980. Due to missing observations for many countries over the sample period, we also do interpolation.

[22] https://stats.idre.ucla.edu/stata/webbooks/reg/chapter2/stata-webbooksregressionwith-statachapter-2-regression-diagnostics/, section 2.4.

growth. Bad institutions create a bad environment and impede growth. For example bad institutions induce corruption, wars and civil conflicts as well as lack of trust in society. Education attainment (yr_sch), which is a proxy of human capital, is expected to positively affect economic growth since a more skilled labor force can lead to increased production.

Finally, financial development is expected to positively affect economic growth if the improvement in access, depth and efficiency brings forth the benefits summarized in figure 2.1. However, the size and liquidity of markets (i.e. depth) has been reported to have negative effects on economic growth in high-income countries due to the fact these economies have reached a point at which financial depth no longer contributes to increasing the efficiency of investment (De Gregorio & Guidotti, 1995). Cecchetti and Kharroubi (2015) argue that a rapid expansion of the financial sector can have negative effects on allocative efficiency and can induce the crowding out of human capital away from the real sector to the financial sector. Also when resources are diverted away from more productive sectors to the financial sector, financial depth can negatively affect economic growth (Dabla-Norris et al., 2015). An expanded financial sector may lead to the emergence of too large and complicated financial systems, which could end up in a catastrophic meltdown (Rajan, 2005). Also, too large financial markets may negatively affect economic growth given the risks (e.g. high volatility in stock prices) associated with financial markets.

As noted in table 2.1 above, the system GMM is more efficient in dealing with the endogeneity issue while the BC-LSDV is more efficient in correcting for the Nickel bias and not the other way around. According to the results in table 2.2, once education is included in the models, the GMM results show that FIA, FIE and FMA have a significant (at 5%) effect on per capita GDP while FMD has a negative significant (at 5%) effect. In the BC-LSDV(1) column of table 2.2, FIE has a positive significant effect (at 1%) while FMD has a negative significant effect (at 10%). Thus, in both cases the effect of FIE and FMD is generally the same.

Comparing the last two columns oftable 2.2, it is clear that exclusion of education not only helps to increase the degrees of freedom but also helps to improve estimation results[23]. The results of the BC-LSDV(2) model show that the lag of per capita real GDP, trade openness (i.e. the share of trade in GDP), the share of investment in GDP and rule of law have a significant (at 1%) positive effect on per capita real GDP; population and the share of government consumption in GDP have a significant negative (at 1%) effect. Turning to the variables of interest, financial institutions efficiency (FIE) has a significant (at 1%) positive effect on per capita income while financial market development has a significant (at 5%) negative effect. As noted by Trabelsi (2016), the BC-LSDV estimator performs better in the small sample context and when there is both endogeneity and Nickel bias. In appendix 2.4, we present relevant robustness using 5-years averaged data to check if the effect of financial development indicators is roughly the same, particularly in developing countries, LMICs, UMICs, LICs, developing Africa, developing SSA and the developed world.

[23]Going forward, we exclude education from the estimations since there is no data for many countries. For example, 14 African countries have no data. Additionally, education is not statistically significant in the BC-LSDV(1) model.

Table 2.2: Estimation Results - Global Sample

	OLS	FE	GMM	BC-LSDV(1)	BC-LSDV(2)
L.lrgdpna	0.961***	0.787***	0.906***	0.855***	0.846***
	(0.01)	(0.03)	(0.02)	(0.01)	(0.02)
lpop	0.003	-0.121***	-0.008	-0.090***	-0.091***
	(0.00)	(0.04)	(0.02)	(0.03)	(0.03)
csh_xm	0.018***	0.019	0.019	0.020	0.037***
	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)
csh_i	0.214***	0.333***	0.481***	0.274***	0.165***
	(0.05)	(0.09)	(0.13)	(0.05)	(0.05)
csh_g	-0.258***	-0.340***	-0.207	-0.327***	-0.377***
	(0.07)	(0.12)	(0.19)	(0.06)	(0.05)
FID	-0.046**	-0.060	-0.151*	-0.072	-0.044
	(0.02)	(0.06)	(0.09)	(0.05)	(0.06)
FIA	0.014	0.001	0.151**	0.013	0.009
	(0.01)	(0.05)	(0.08)	(0.04)	(0.04)
FIE	0.120***	0.110***	0.145**	0.100***	0.120***
	(0.02)	(0.04)	(0.07)	(0.03)	(0.02)
FMD	-0.096***	-0.068	-0.146**	-0.071*	-0.082**
	(0.03)	(0.05)	(0.07)	(0.04)	(0.04)
FMA	-0.003	-0.037	0.140**	-0.041	-0.023
	(0.01)	(0.04)	(0.06)	(0.04)	(0.05)
FME	0.026**	-0.004	-0.002	-0.002	0.007
	(0.01)	(0.02)	(0.05)	(0.02)	(0.02)
rl_est2	0.028***	0.034***	0.052***	0.031***	0.030***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
l1_yr_sch2	0.009***	0.003	0.014**	0.003	
	(0.00)	(0.01)	(0.01)	(0.01)	
_cons	0.255***	2.258***	0.646***		
	(0.05)	(0.35)	(0.18)		
N	1578	1578	1578	1578	1971
AIC	-2.4e+03	-2.9e+03	.	.	.
Log-lklhd	1246.404	1467.378			

R-squared	0.993	0.889			
F-stat.	1.2e+04	395.032			
RMSE	0.111	0.096			
T		11.689	11.689		
Groups		135.000	135.000	135.000	170.000
hansenp			0.124		
j			131.000		
ar1p			0.002		
ar2p			0.352		

Standard errors in parentheses

Source: own estimations.

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

However, the global sample may not be appropriate since it combines more advanced and less advanced economies, in addition to encompassing all geographical groupings. Most of the studies treat geographical and/or income sub-regions as dummy variables, explaining each sub-region's growth by the differences between its dummy variable from that of a chosen baseline sub-region (Anyanwu, 2014). In this study, the interest is to check if the interaction between a given financial development indicator and a dummy variable for a given sub-group (i.e. developing countries or Sub-Saharan Africa), is significant and either positive or negative. In table 2.3, BC-LSDV is the same as BC-LSDV(2) in table 2.2 above, while Int_dev and int_SSA are BC-LSDV models with interaction terms between financial development and the developing countries' dummy and between financial development and the Sub-Saharan African (SSA) countries' dummy, respectively. In the Int_dev column, results are much similar to those in the BC-LSDV column, except the fact that in the former, FIE is significant at 5% while FMD is significant at 10%. Also none of the interaction terms between the new IMF indicators of financial development and the developing countries' dummy variable is significant. The exception in the int_SSA column compared to the BC-LSDV column is that, in the former, FMD is not significant while the interaction between the SSA dummy and FIE is negative and significant at 1%. The other interaction terms between the remaining new IMF financial development indicators and the SSA dummy are individually insignificant.

Doing the same exercise for models with traditional indicators of financial development, the first (i.e. column findev_trad) of the last three columns presents the BC-LSDV model without interaction terms; the second last column (i.e. Int_dev_trad) includes interaction terms between financial development indicators and the developing countries' dummy; the last column (i.e. int_SSA_trad) includes interactions between financial development indicators and the SSA dummy variable. In the last and second last columns, CPS_GDP has a significant negative effect, though the magnitude is very negligible. In all the last three columns, $M3\_GDP$ has a negative significant effect on per capita income. Once again, the magnitude of the coefficients is very small and thus the effect is negligible. Among the interaction terms, it is only CPS_dev, in the second last column that is positive and significant. Though the coefficient is very small, this means that credit to private sector (% of GDP) has a positive, albeit very small, significant effect on per capita income in developing countries. Though positive, the interaction terms for the case of SSA have very small coefficients and are also not significant. The main take away here is that, depending on interaction terms to assess the effect of financial development on economic growth may be quite misleading, as highlighted by Anyanwu (2014). Thus, this study contributes to the literature by addressing this shortfall, which we do by running regressions on appropriate sub-samples.

Table 2.3: Global Panel Data Regressions - interactions

	BC-LSDV	Int_dev	int_SSA	findev_trad	Int_dev_trad	int_SSA_trad
L.lrgdpna	0.846***	0.840***	0.846***	0.880***	0.872***	0.880***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
lpop	-0.091***	-0.098***	-0.095***	-0.086***	-0.082***	-0.088***
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
csh_xm	0.037***	0.045***	0.038***	0.067***	0.073***	0.068***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
csh_i	0.165***	0.144***	0.165***	0.131***	0.113**	0.135***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
csh_g	-0.377***	-0.371***	-0.385***	-0.369***	-0.360***	-0.384***
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
FID	-0.044	-0.133	-0.083			
	(0.06)	(0.09)	(0.07)			
FIA	0.009	-0.068	-0.024			
	(0.04)	(0.08)	(0.04)			
FIE	0.120***	0.134**	0.171***			
	(0.02)	(0.07)	(0.03)			
FMD	-0.082**	-0.100*	-0.063			
	(0.04)	(0.05)	(0.04)			
FMA	-0.023	0.002	-0.020			
	(0.05)	(0.06)	(0.05)			
FME	0.007	0.026	0.004			
	(0.02)	(0.03)	(0.02)			
rl_est2	0.030***	0.033***	0.031***	0.022**	0.026***	0.022**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FID_dvnt		0.191				
		(0.12)				
FIA_dvnt		0.082				
		(0.10)				
FIE_dvnt		-0.023				

		(0.07)				
FMD_dvnt		0.138				
		(0.09)				
FMA_dvnt		-0.031				
		(0.12)				
FME_dvnt		-0.039				
		(0.05)				
FID_SSA			0.195			
			(0.13)			
FIA_SSA			0.182			
			(0.13)			
FIE_SSA			-0.174***			
			(0.06)			
FMD_SSA			-0.035			
			(0.19)			
FMA_SSA			-0.062			
			(0.20)			
FME_SSA			0.029			
			(0.16)			
CPS_GDP				-0.000	-0.001***	-0.001***
				(0.00)	(0.00)	(0.00)
M3_GDP				-0.001***	-0.001**	-0.001***
				(0.00)	(0.00)	(0.00)
CPS_dev					0.001***	
					(0.00)	
M3_dev					-0.000	
					(0.00)	
CPS_SSA						0.001
						(0.00)
M3_SSA						0.000
						(0.00)
N	1971	1971	1971	1648	1648	1648
Standard errors in parentheses						

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

To check whether the effect of financial development on per capita income depends on the income level of countries, we run regressions on different income groupings (table 2.4). First, we compare estimation results for developing and developed countries and for countries classified under LIC, LMIC and UMIC. In developing countries, the lag of the log of per capita real GDP ($L.lrgdpna$), csh_xm and rule of law (rl_est) have a positive significant (at 1%) effect. The effect of csh_i is also positive but significant at 5%. Conversely, $lpop$ and csh_g have a negative significant (at 1%) effect on per capita income. Among the variables of interest, FIE has a positive significant effect (at 1%), while other indicators are not significant. While interactions terms between financial development indicators and the dummy variable for developing countries are not significant (table 2.3), it is clear from table 2.4 that once we narrow down to the developing countries sub-sample, FIE positively and significantly affects per capita income. Thus, the criticism raised by Anyanwu (2014), among others, concerning the use of interaction terms to assess the sensitivity of results to sub-groups seems to be founded.

In the developed countries' group (which is simply the High Income Countries' group), the lag of the log of per capita real GDP ($L.lrgdpna$) and rule of law (rl_est2) have a significant (at 1%) positive effect while $lpop$ and csh_g have a significant (at 1%) negative effect. Among the financial development indicators, FIE has a positive significant (5%) effect, while FID has a significant (at 10%) negative effect on per capita income. The last three columns of table 2.4 present dis-aggregated results for the developing countries' sub-group. In the LIC category, ($L.lrgdpna$), $lpop$, csh_xm and csh_i have a significant (at 1%) positive effect. Though rl_est2 has a positive effect, it is only significant at 5% whereas csh_g has a significant (at 1%) negative effect. Only FIA, among the indicators of financial development, has a significant (at 5%) positive effect on welfare in LICs. In the LMIC category, the effect of ($L.lrgdpna$) is significant (at 1%) and positive. Also, csh_xm and rl_est2 have a positive effect, but only significant at 5% and 10%, respectively. The only important indicator of financial development is FIE, with a positive and significant (at 1%) effect on per capita income.

In the last column, results of the BC-LSDV model for the UMICs are presented and these show that $L.lrgdpna$ and csh_xm have a significant (at 1%) positive effect on welfare whereas $lpop$ and csh_g have a negative significant (at 1%) effect. Among the indicators of financial development, only FIE has a significant (at 5%) positive effect, while other financial development indicators are not significant. In summary, FIE is important for developing countries and particularly for LMICs and UMICs while FIA is important for only LICs. The fact that FIE is important for both developed countries as well as in relatively rich countries among the developing countries sub-group implies that the effect of FIE is greater for higher income groups.

Table 2.4: Panel Data Regressions per income grouping

	Developing	Developed/HIC	LIC	LMIC	UMIC
L.lrgdpna	0.855***	0.701***	0.807***	0.771***	0.842***
	(0.02)	(0.03)	(0.04)	(0.03)	(0.04)
lpop	-0.107***	-0.160***	0.337***	-0.421***	-0.158***
	(0.04)	(0.03)	(0.12)	(0.05)	(0.06)
csh_xm	0.111***	0.010	0.246***	0.061**	0.157***
	(0.02)	(0.01)	(0.08)	(0.03)	(0.04)
csh_i	0.163**	-0.016	0.514***	0.032	0.054
	(0.07)	(0.07)	(0.14)	(0.08)	(0.11)
csh_g	-0.313***	-0.691***	-0.361***	-0.183**	-0.427***
	(0.06)	(0.09)	(0.10)	(0.08)	(0.11)
FID	0.054	-0.129*	0.697**	-0.120	0.026
	(0.08)	(0.07)	(0.35)	(0.13)	(0.11)
FIA	-0.013	0.038	2.641**	-0.097	-0.102
	(0.07)	(0.06)	(1.03)	(0.08)	(0.09)
FIE	0.098***	0.126**	0.033	0.139***	0.144**
	(0.03)	(0.05)	(0.06)	(0.04)	(0.06)
FMD	0.033	-0.051	-0.251	0.045	0.128
	(0.09)	(0.06)	(0.29)	(0.11)	(0.11)
FMA	-0.031	0.020	-0.539	-0.195	0.081
	(0.11)	(0.05)	(6.45)	(0.13)	(0.13)
FME	-0.012	-0.001	1.806	0.013	-0.030
	(0.04)	(0.03)	(1.55)	(0.04)	(0.07)
rl_est2	0.032***	0.051***	0.050**	0.027*	0.015
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
N	1308	663	330	453	525

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Regarding the geographical groupings, the main focus of this study is to assess the effect of financial development on per capita GDP in Sub-Saharan Africa. In table 2.5, we compare results for both developing Africa and developing Sub-Saharan Africa. Important to note is the fact that results are much

better for the African sub-sample if we use interpolated rule of law (rl_est2) as a measure of institutional quality, while for Sub-Sahara Africa, better results are obtained if we use interpolated Area2 ($Area22$). The first three columns (i.e. Africa-dev1, Africa-dev2 and Africa-dev3) present BC-LSDV estimation results for the developing African countries. In column one (i.e. Africa-dev1), we use an aggregate indicator of financial development (i.e. FD); in column two (i.e. Africa-dev2), we use the two sub-components of FD, that is an indicator for Financial Institutions (FI) development and an indicator for Financial Markets (FM) development; in column three (i.e. Africa-dev3), we use all the six indicators of financial development. In column one, $L.lrgdpna$ and csh_xm have a positive and significant (at 1%) effect. Though it has a positive effect, csh_i is only significant at 10%. Conversely, csh_g has a significant (at 1%) negative effect. Interestingly, FD has a positive and significant (at 5%) effect on per capita GDP in the developing African countries' sub-sample.

In column two, $L.lrgdpna$, csh_xm, csh_i and csh_g have similar effects as in column one. In column two, it is clear that only bank-based measures of financial development are important determinants of per capita income in developing Africa since only FI is positive and significant (at 5%). Results in column 3 are much similar to those in the first two columns, except that csh_i is now significant at 5%, rather than 10%. Also, csh_g is now significant at 5%, instead of 1%. The interesting finding in column three is that it is FIA, a component of FI, that has a significant (at 1%) positive effect on per capita income in developing African countries. Estimations for the developing Sub-Saharan African countries' sample are not fundamentally different, except that csh_g is not significant. In addition, none of the indicators of financial development is significant whereas population has a positive and significant effect. The measure of institutional quality ($Area22$) also has a significant positive effect in the developing Sub-Saharan African sub-sample.

Table 2.5: Estimations per geographical grouping

	Africa-dev1	Africa-dev2	Africa-dev3	SSA-dev1	SSA-dev2	SSA-dev3
L.lrgdpna	0.881***	0.882***	0.883***	0.894***	0.894***	0.898***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
lpop	0.051	0.051	0.065	0.146**	0.142**	0.158**
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.08)
csh_xm	0.130***	0.129***	0.125***	0.106**	0.105**	0.109**
	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)
csh_i	0.167*	0.164*	0.186**	0.212**	0.208**	0.183**
	(0.09)	(0.09)	(0.09)	(0.08)	(0.09)	(0.09)
csh_g	-0.174***	-0.175***	-0.160**	-0.025	-0.030	-0.045
	(0.07)	(0.07)	(0.07)	(0.10)	(0.11)	(0.11)
FD	0.262**			-0.080		
	(0.11)			(0.17)		
rl_est2	0.021	0.022	0.025			

	(0.02)	(0.02)	(0.02)			
FI		0.167**			-0.047	
		(0.08)			(0.10)	
FM		0.068			0.001	
		(0.11)			(0.22)	
FIA			0.251***			-0.060
			(0.09)			(0.23)
FID			-0.009			0.107
			(0.11)			(0.13)
FIE			0.018			-0.049
			(0.04)			(0.04)
FMA			0.031			0.046
			(0.14)			(0.29)
FMD			-0.042			-0.028
			(0.12)			(0.18)
FME			0.052			-0.025
			(0.05)			(0.18)
Area22				0.014**	0.014**	0.014*
				(0.01)	(0.01)	(0.01)
N	837	837	837	469	469	469

Standard errors in parentheses. Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

However, our estimations so far have not taken into account the specific context of Sub-Saharan African countries, notably the fact that a big chunk of government spending is financed by foreign aid (i.e. loans and grants). Therefore, we can use total foreign aid as a percentage of GDP (aid_tot) instead of csh_g. While Foreign Direct Investment (FDI) is also an important source of finance in Sub-Saharan Africa, it is reasonable to assume that csh_i is much broader since it captures other forms of financing, such as remittances. In table 2.6, we present results of the BC-LSDV models for developing Sub-Saharan African countries, after replacing csh_g with aid_tot.

In column (1), we only include FD as a measure of financial development; in column (2), we include both FI and FM; in column (3), we include only bank-based measures (i.e. FID, FIA and FIE); in column (4), we include only indicators for financial markets development (i.e. FMD, FME and FMA) and lastly, in column (5), we include all the six indicators of financial development. In all models, $L.lrgdpna$ has a significant (at 1%) effect on per capita income, $lpop$ has a significant positive effect at 5% in column (1) and column (3) and at 10% in column (2), column (4) and column (5). Indeed, csh_xm has a

positive significant effect, at 5% (columns (1), (3) and (5)) and at 10% (column (2)). The newly introduced variable, aid_tot, has a positive significant effect (at 1%) on per capita income in developing Sub-Saharan countries. Also, csh_i has a significant (at 5%) positive effect in column (1), column (2) and column (4). The effect of institutional quality ($Area22$) is positive and significant in column (1) and column (3) but only at 10%. Turning to the variables of interest, it is only FID that is positive and significant in column (3) and column (5). Since the results in table 2.5 above stress the importance of bank-based measures of financial development for the case of developing African countries, we can go by the results of column (3) in table 2.6 for the case of developing Sub-Saharan African countries. Thus, while FIA is important for developing Africa (table 2.5), FID is important for developing SSA (table 2.6).

Table 2.6: Modified estimations for SSA

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna
L.lrgdpna	0.938***	0.942***	0.935***	0.948***	0.944***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
lpop	0.185**	0.180*	0.194**	0.181*	0.182*
	(0.09)	(0.10)	(0.10)	(0.10)	(0.11)
csh_xm	0.111**	0.107*	0.135**	0.106*	0.125**
	(0.06)	(0.05)	(0.05)	(0.06)	(0.05)
csh_i	0.159**	0.155**	0.105	0.151**	0.092
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
aid_tot	0.031***	0.031***	0.030***	0.031***	0.031***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FD	0.180				
	(0.22)				
Area22	0.012*	0.012	0.014*	0.013	0.013
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FI		0.103			
		(0.15)			
FM		0.048			
		(0.30)			
FID			0.327**		0.349*
			(0.17)		(0.20)
FIA			-0.223		-0.212
			(0.32)		(0.33)
FIE			0.003		0.004

			(0.06)		(0.06)
FMD				0.054	-0.063
				(0.19)	(0.22)
FMA				0.082	0.009
				(0.25)	(0.26)
FME				-0.169	-0.165
				(0.41)	(0.43)
N	397	397	397	397	397

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Until now, we have assessed the effect of the new IMF financial development indicators on per capita income in different samples: World, Developing, Developed, Developing Africa and Developing SSA. It is worth checking if the findings remain the same if we use the traditional indicators of financial development, notably: Credit to Private Sector (CPS) as a percentage of GDP, CPS_GDP, and Broad Money (M3) as a percentage of GDP, $M3\_GDP$. Table 2.7 replicates table 2.4, whereby in the former, the traditional indicators of financial development are used instead.

In table 2.7, we present the results of BC-LSDV models on different sub-samples. In both table 2.4 and table 2.7, the following variables are significant and with the same effect on per capita GDP in the developing countries' sub-sample: $L.lrgdpna$, $lpop$, csh_xm, csh_i, csh_g and rl_est. In table 2.4, it was FIE that had a significant positive effect on GDP per capita. In table 2.7, $M3\_GDP$ has a negative significant (at 5%) effect on per capita GDP (column 1). However, its coefficient is very small and therefore its effect quite negligible. The other indicator of financial development in table 2.7 (i.e. CPS_GDP) is not only insignificant but also its coefficient is zero. Generally, the results in table 2.7 indicate that none of the traditional indicators of financial development is important in explaining GDP per capita in LICs, LMICs and UMICs. Comparing the results in table 2.4 and table 2.7 points to the fact that the traditional indicators are not good proxies of financial development since they are not capable of capturing all the facets of financial development, notably, efficiency, depth and access. Thus, the contribution of this study is to extend the empirical literature on Africa, in general, and on Sub-Saharan Africa, in particular, by using the new IMF financial development indicators to examine the finance-growth nexus. The new IMF indicators of financial development capture access, depth and efficiency of both financial markets and financial institutions (figure 2.2).

Table 2.7: Income groups with traditional indicators

	Developing	Developed	LIC	LMIC	UMIC
L.lrgdpna	0.885***	0.720***	0.887***	0.896***	0.810***
	(0.02)	(0.03)	(0.04)	(0.03)	(0.02)
lpop	-0.071**	-0.145***	0.230	-0.143**	-0.103**
	(0.03)	(0.03)	(0.14)	(0.06)	(0.04)
csh_xm	0.111***	0.024	0.182*	0.069***	0.207***
	(0.02)	(0.02)	(0.10)	(0.03)	(0.04)
csh_i	0.188***	-0.127	0.291**	0.158**	0.037
	(0.04)	(0.08)	(0.13)	(0.06)	(0.11)
csh_g	-0.336***	-0.570***	-0.251*	-0.105	-0.725***
	(0.05)	(0.10)	(0.14)	(0.08)	(0.11)
CPS_GDP	0.000	-0.001***	0.003	0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
M3_GDP	-0.001**	-0.000	0.001	-0.001	-0.001*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
rl_est2	0.021*	0.029*	0.028	0.008	0.039**
	(0.01)	(0.02)	(0.03)	(0.01)	(0.02)
N	1221	427	309	414	498

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2.8 replicates table 2.5, whereby in the former, we use traditional indicators of financial development. In addition, we use aid_tot in lieu of csh_g and $Area22$ instead of rl_est2[24]. In all the BC-LSDV model estimation results presented in table 2.8, none of the traditional financial development indicators is significant for both developing Africa and developing SSA. Focusing on Africa-dev3 and SSA-dev3 columns in table 2.8, it is clear that $L.lrgdpna$, csh_xm, aid_tot and $Area22$ have a positive and significant effect on GDP per capita in both developing Africa and developing SSA while $lpop$ has a positive and significant effect only in the developing African countries' sub-sample. Once again, the results in table 2.8 point to the fact that the traditional indicators of financial development do not capture all the facets of financial development.

[24]Unlike in table 2.5, the use of $Area22$ in table 2.8 as a proxy of institutional quality for the developing Africa sub-sample gives better results. For the developing SSA sub-sample, table 2.8 replicates table 2.6, with the former using traditional indicators of financial development.

Table 2.8: Geographical groups with traditional indicators

	Africa-dev1	Africa-dev2	Africa-dev3	SSA-dev1	SSA-dev2	SSA-dev3
L.lrgdpna	0.872***	0.905***	0.906***	0.851***	0.887***	0.885***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
lpop	0.025	0.038	0.038	0.048	-0.073	-0.065
	(0.06)	(0.04)	(0.04)	(0.10)	(0.07)	(0.08)
csh_xm	0.129***	0.114***	0.113***	0.295***	0.246***	0.249***
	(0.03)	(0.02)	(0.02)	(0.07)	(0.05)	(0.05)
csh_i	0.169**	0.160***	0.160***	0.227*	0.139*	0.140*
	(0.07)	(0.06)	(0.06)	(0.13)	(0.08)	(0.08)
csh_g	-0.166**	-0.167***	-0.167***	-0.133	-0.248**	-0.252**
	(0.07)	(0.06)	(0.06)	(0.13)	(0.11)	(0.12)
CPS_GDP	0.000		-0.000	0.000		0.000
	(0.00)		(0.00)	(0.00)		(0.00)
rl_est2	0.019	0.017	0.017	0.008	0.008	0.006
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
M3_GDP		-0.000	-0.000		-0.001	-0.001
		(0.00)	(0.00)		(0.00)	(0.00)
N	799	790	788	420	415	414

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

2.5 Concluding Remarks

The aim of chapter two was to examine the effect of financial development on per capita GDP in Sub-Saharan Africa, using a set of new IMF indicators of financial development, covering access, depth and efficiency of both financial institutions and financial markets. In addition, we repeated the estimations after interchanging the new indicators with the traditional indicators (i.e. credit to private sector and broad money, all expressed as % of GDP) of financial development. In the global sample (table 2.2), results in column BC-LSDV (2) show that FIE has a positive significant effect on per capita income while FMD has a negative significant effect. The same findings remain valid even when we introduce pairwise interaction terms between new IMF financial development indicators and the dummy variable for developing countries (table 2.3, column Int_dev). When each of the new IMF financial development indicators is interacted with a dummy variable for Sub-Saharan Africa, only FIE has a positive significant effect on per capita GDP

(table 2.3, column int_SSA).

However, the interaction terms between financial development indicators and the developing countries' dummy variable are individually insignificant (table 2.3, column Int_dev) while the interaction term between FIE and the SSA dummy variable is negative and significant at 1% (table 2.3, column int_SSA). This simply means that the efficiency of financial institutions is lower in SSA compared to other geographical sub-regions and is still an impediment to the performance of real GDP per capita. However, the use of interaction dummies to assess the differential effects of financial development on per capita income or economic growth across sub-groups has been criticized as adequately addressed. Thus, this study goes a step further by presenting estimation results per income groups and per geographical groupings of interest.

In table 2.4, BC-LSDV results for developing countries show that FIE has a positive and significant effect on per capita income. For developed countries, FIE has a positive and significant effect while FID has a negative significant effect. For the LICs, both FIA and FID have a significant positive effect while in both LMICs and UMICs, FIE has a positive and significant effect. Regarding geographical sub-regions, we focus on Africa and Sub-Saharan Africa, but only retaining developing countries. In table 2.5, the results show that the aggregate indicator of financial development (i.e. FD), the indicator for financial institutions development (FI) and the indicator for financial institutions access (FIA) have a positive and significant effect on GDP per capita. This means that only bank-based measures of financial development, particularly FIA, positively affect per capita income in developing Africa.

In table 2.6, we present modified BC-LSDV results for SSA. The modifications done are: using aid_tot instead of csh_g and $Area22$ in place of rl_est2. These modifications are based on the fact that SSA is the biggest recipient of foreign aid and that most of this is used to finance government consumption/spending. Also, Area2, which covers "Legal systems and property rights" seems to be a better proxy for institutional quality in Sub-Saharan Africa: what matters for people is economic freedom and protection of property rights. Focusing on the model with only bank-based measures of financial development (i.e. column (3)), It is clear that FID has a positive significant effect on per capita income in SSA. The same results are valid even in the model with all the indicators of financial development (i.e. column (5)).

So far, the empirical studies we have seen that focus on Africa, in general and on Sub-Saharan Africa, in particular, used the traditional indicators of financial development. In tables 2.7 and 8, we present findings of BC-LSDV models in which traditional indicators are used in lieu of the new IMF indicators of financial development. Though $M3\_GDP$ is negative and significant for the case of developing countries and UMICs, its coefficient is practically zero (table 2.7). Thus, none of the traditional indicators has a significant effect on per capita income for all the income groups. Similar findings are obtained for the case of developing Africa and developing Sub-Saharan Africa (table 2.8). As noted earlier, this could be due to the fact that the traditional measures of financial development do not capture all the aspects of financial development, notably access, depth and efficiency (Ang, 2008; Sahay et al., 2015).

The results for developing countries, developed countries, LICs, LMICs, UMICs, developing Africa and developing SSA are broadly consistent with the robustness checks presented in appendix 2.4, whereby a 5-years averaged data set is used instead. The only exceptions are: (1) for developed countries, FID is not significant in the robustness checks); (2) for LMICs, FID is only significant (at 10%) and negative in the robustness checks; (3) for developing SSA, FIE is only significant (at 10%) and negative in the robustness checks. All the other results (i.e. in terms of the effect of new indicators of financial development on per

capita income) are broadly the same, confirming the fact that the BC-LSDV model performs well in small samples.

In view of the above, this study contributes to empirical literature by using the BC-LSDV model and focusing on the samples covering countries in the sub-groups of interest. We also show that the new set of IMF indicators is more useful in empirical studies on the finance-growth nexus, than the traditional indicators. Also, this study has shown that the effect of financial development on per capita income varies across the income groups since different indicators of financial development are important in different income sub-groups. While FIA has a significant positive effect in developing Africa, FID is significant and positive for the case of developing SSA. Thus, the effect of financial development also depends on the geographical region's specific realities.

CHAPTER 3

FOREIGN AID AND ECONOMIC GROWTH

3.1 Introduction

To address the long-standing economic development challenges, developing countries have, especially after the Second World War, called for more favorable arrangements in international trade and for increased transfer of resources from developed countries to developing countries. The quest for fair development cooperation between developing and developed countries gained prominence especially, during the 1960s and 1970s, following the increased decolonization of many developing countries. Economic growth can be financed by domestic savings, domestic borrowing, or foreign capital inflows such as portfolio investments, foreign direct investment (FDI) and, foreign aid (both grants and loans). For the case of developing countries, economic growth and development have continued to highly depend on external resources, especially foreign aid, and this was echoed by the United Nations, which has considered foreign aid to be "one of the most powerful weapons in the war against poverty" since at least 2005 (United Nations, 2005, p. 16).

In this regard, foreign aid was emphasized in the Millennium Development Goals (MDGs) as an important source of development finance, and since 1970, each of the developed countries was requested to progressively raise its net Official Development Assistance (ODA) to the 148 developing countries to a target of 0.7% of its Gross National Income by 2015 as noted in the United Nations (2005, p. 1) that "Developing countries have been asked to devise national strategies to meet the MDGs targets and to facilitate transparent and accountable governance, while developed countries are being urged to increase aid...others have promised to make substantial increases in ODA over the next ten years." Despite this call, many developed countries failed to reach the 0.7% net ODA (as a % of GDNI) target (see figure 3.1) by the initially planned 2015 timeline (Yiew & Lau, 2018). In addition to the fact that the Development Assistance Committee (DAC) member countries have failed to meet the target of 0.7% of net ODA (as % of GNI), there has been a gradual shift from foreign aid to other forms of foreign capital inflows, especially foreign direct investments (Arvin & Lew, 2015, p. 1). Nonetheless, foreign aid remains an important source of development finance for developing countries, as was emphasized in 2016 when the UN introduced the Sustainable Development Goals (SDGs) with 17 global objectives to be achieved by 2030. It was made

clear that for these 17 goals to be achieved, an annual budget amounting to USD[1] 4 trillion a year was needed, and for the case of developing countries, a big chunk of this financing was expected to come from foreign aid (Yiew & Lau, 2018).

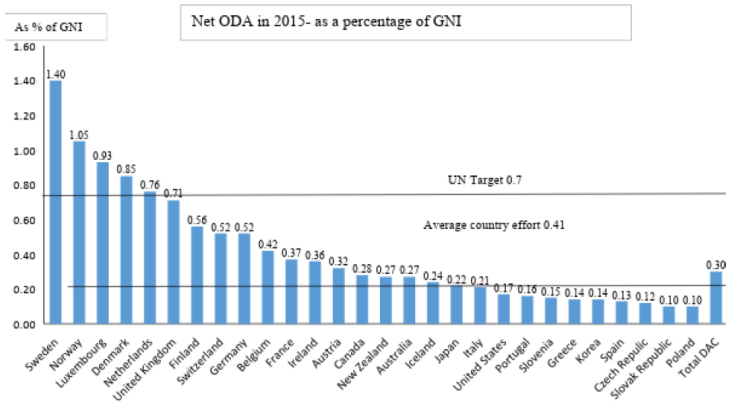

Figure 3.1: Net ODA (% of GNI) in 2015
Source: Yiew and Lau (2018).

Over the past, a consensus has been established that economic growth is a necessary requirement for any country to attain sustained economic development and poverty reduction (Dollar & Kraay, 2002). While the importance of economic growth is quite obvious, the idea that foreign aid is needed to promote growth, especially in historically aid-dependent but still poor countries, remains highly controversial (Snowdon, 2009). Compared to other parts of the world, Sub-Saharan Africa has enjoyed a high share of net ODA flows, averaging at around 39% between 1980 and 2017 (figure 3.2), the highest figure compared to other sub-regions.

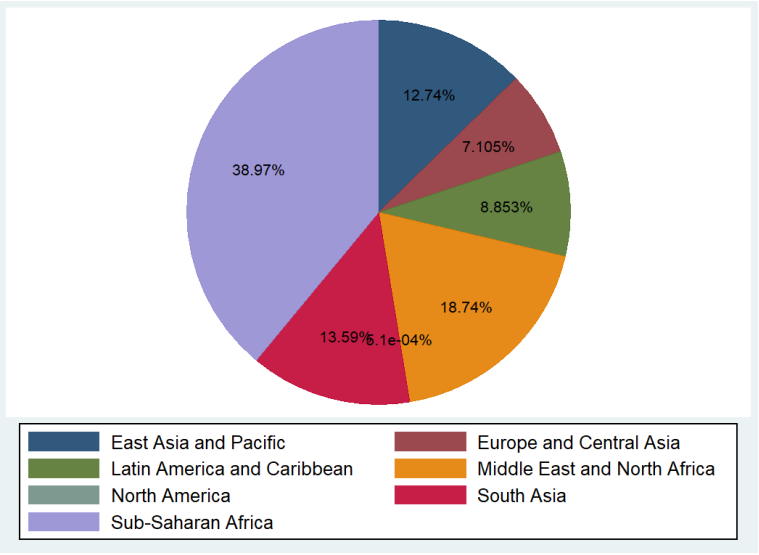

Figure 3.2: Net ODA by region (% of World total, 1980-2017)
Source: Own computations.

[1]United States Dollar.

Despite attracting huge sums of aid, Sub-Saharan Africa remains the poorest sub-region, with 41.2% (2017 data) of its population living under the international poverty line[2] ($1.9 a day) and a per capita income[3] of $3775.28 (2017 data). It is followed by South Asia, with 17.1% (2013 data) of its population living under the poverty line and with a per capita income of $5769.18 as of 2017 (table 3.1). In 2017, the proportion of the global population living under the poverty line was 9.3%, while the global per capita income stood at $16253.39.

	Year	PHR $1.90 a day (2011 PPP)	$ GDPPC (2017 PPP)
East Asia & Pacific	2017	1.4	16348.30
Europe & Central Asia	2017	1.3	34084.07
Latin America & Caribbean	2017	3.8	16290.90
Middle East & North Africa	2017	6.3	16561.23
South Asia	2013	17.1	5769.18
North America	2017	NA	58896.27
Sub-Saharan Africa	2017	41.2	3775.28
World	2017	9.3	16253.39

Table 3.1: Welfare status by region.

The impact of foreign aid on economic growth remains a highly contested issue all over the world (Acemoglu & Robinson, 2010b; Papanek, 1973; Mosley, 1980; Dalgaard, Hansen, & Tarp, 2004). Results show that aid is either more ineffective (Easterly, 2003, 2005) or less effective (Burnside & Dollar, 2000, 1998) in Sub-Saharan Africa compared to other regions. Other authors like Riddell (1999) and Collier (2006) argue that Sub-Saharan Africa has the potential to reap the benefits of foreign aid and other forms of foreign capital inflows.

Generally, the effect of aid on growth in Sub-Saharan Africa remains a highly unsettled debate (Kanbur, 2000). This, coupled with the fact that Sub-Saharan African countries share similar intrinsic characteristics (with negligible differences) such as geographical location, economic policies, governance, and political systems, economic structure, technology, and resource endowments, motivates the reason why chapter three if this thesis focuses on Sub-Saharan Africa. After the introduction presented in section 1, the rest of the chapter is organized as follows: section 2 gives a brief overview of both theoretical and empirical literature, section 3 covers the methodology and data description, section 4 presents and discusses results, and finally, section 5 gives the concluding remarks.

3.2 Literature Review

This section starts by giving the definitions, historical origins, scope, advantages, and disadvantages of foreign aid. Specifically, it unpacks the various types/forms of foreign aid and the channels through which foreign aid can affect economic growth. It then proceeds to the review of some of the common theoretical literature-mainly, the ones based on growth models and the Albert O. Hirschman's Exit-Voice-Loyalty (EVL)

[2]PHR $1.90 a day (2011 PPP) stands for "Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)."
[3]GDPPC (2017 PPP) stands for "GDP per capita, PPP (constant 2017 international $)."

model. It also discusses the available empirical literature, especially concerning aid effectiveness. The main takeaway is that, the results on aid effectiveness are quite mixed, and approaches to the analysis of aid effectiveness have evolved over time.

3.2.1 Definition, Scope, (dis) advantages and transmission channels of foreign aid

3.2.1.1 Definition and composition of foreign aid

Broadly, foreign aid is defined as the transfer of resources such as financial grants (i.e. gifts), concessional loans, physical goods, skills, and technical know-how from more developed donor countries to less-developed recipient countries (Ridell, 2017). In the modern world, the main purpose of foreign aid is to help poor countries to attain sustainable economic growth and development and therefore be able to reduce poverty (Burnside & Dollar, 2000; Collier & Dollar, 2002; Asongu & Nwachukwu, 2018; Kaufmann, McGuirk, & Vicente, 2019).

The Development Assistance Committee (DAC) considers foreign aid to be official development assistance (ODA), which is defined as "government aid designed to promote the economic development and welfare of developing countries" (OECD, 2018, p. 1). The DAC definition implies that for foreign aid to be considered as ODA, it has to fulfill certain conditions, notably: (1) it has to be undertaken by official agencies, including state and local governments, or by their executive agencies; (2) It must have a grant element of at least 25%; and, (3) its main objective should be the promotion of the welfare and economic development of the recipient country. Aid can be given directly by one government to another government (i.e., bilateral aid) or indirectly by one government to another government through the donor country's state agency or international agency (i.e., multilateral aid). In terms of scope, foreign aid has various components, which include project aid, program aid, technical assistance, humanitarian or emergence aid, as well as food aid, as summarized in figure 3.3.

In brief, project aid covers aid to specific sectors of the economy, such as health, rural development, education, agriculture, water, housing, and electricity, among others. Conversely, program aid is not linked to a specific activity but rather covers the balance of payments support and budget support[4]. Technical assistance (TA) is the type of aid from developed countries to developing countries that comes in the form of capacity building and policy advice aimed at building skills and sharing technical knowledge with technocrats and officials in recipient countries. Humanitarian aid is given in emergency situations, such as wars and natural disasters, with the objective of saving lives and safeguarding human dignity. Humanitarian aid involves providing food to the hungry, availing the necessary medical and health care services and materials as well ensuring the supply of good quality shelter, sanitation materials, and water. Finally, food aid comprises both program food aid and humanitarian food aid. "program food aid may relieve the foreign exchange constraint to the import of the necessary intermediate inputs or by providing

[4]This covers: (1) General Budget Support (GBS), which covers funds given to recipient country's ministry of finance; and, (2) Sector Budget Support (SBS), which covers funds channeled to certain socio-economic sectors of interest. Both the GBS and SBS are aimed at boosting aggregate revenue and overall spending in the economy.

fiscal resources through counterpart funds generated by the local sale of program food aid" (Barrett, 1998, p. 567).

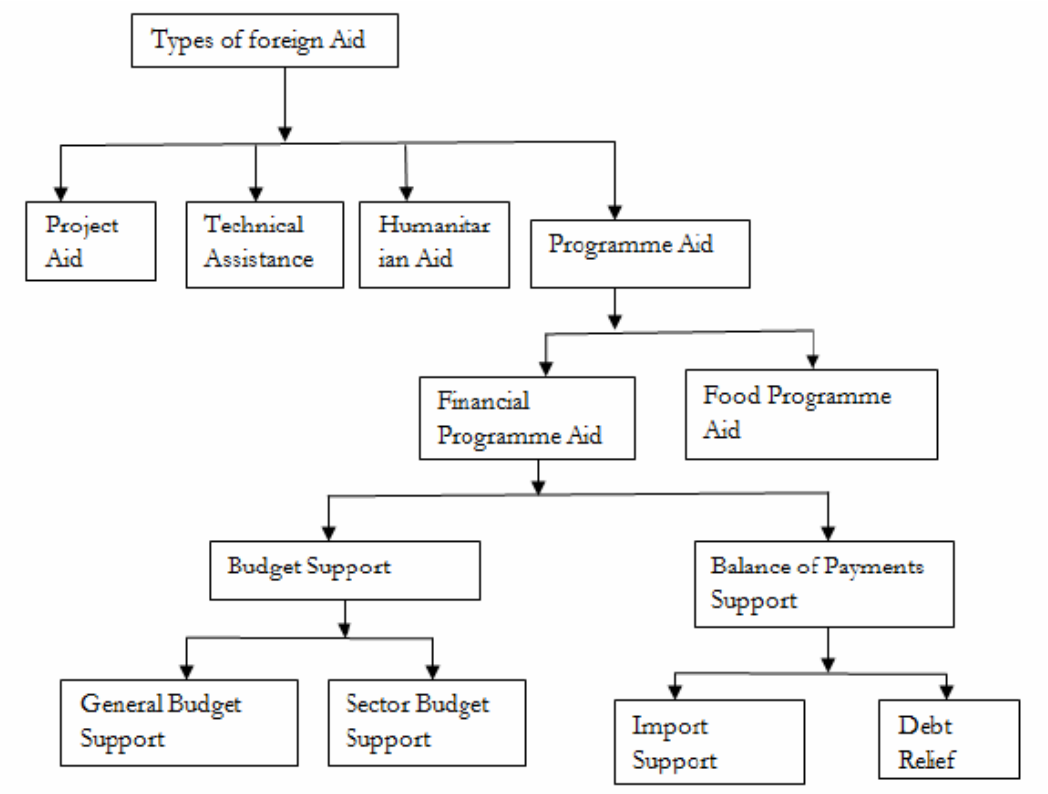

Figure 3.3: Forms of foreign aid
Source: Own formulation based on White (1998).

3.2.1.2 Historical origins of foreign aid

Military aid was perhaps the earliest form of foreign aid since it existed even during the pre-state era. While the modern view of foreign aid started in the 18^{th} century when Prussia subsidized some of its allies, foreign aid became more popular since the late 1870s and early 1920s following the discussions on how the United Kingdom (UK) could finance the development of its poor colonial territories (Hjertholm & White, 1998). Indeed, the provision of development aid as it is known today started after the Second World War (World Bank, 1998), especially following the establishment of the Marshall Plan in 1947 by the USA aimed at providing financial assistance to help in rebuilding the war-torn European countries, as well as the creation of international organizations, especially the United Nations, World Bank, and IMF, that helped in the allocation of development finance (McGillivray, Feeny, Hermes, & Lensink, 2006). As emphasized in the 2000-2015 Millennium Development Goals (MDGs) program and later, the 2015-2030 Sustainable Development Goals (SDGs) program, the modern times objective of foreign aid is to help developing countries attain the desired levels of socio-economic development and thus be able to improve the general welfare of the people (Sachs, 2005; Mahembe & Odhiambo, 2019, 2021).

3.2.1.3 Advantages and Disadvantages of foreign aid

Different types of foreign aid come along with both merits and demerits. Regarding the advantages of aid, early theories linking foreign aid and economic growth and development generally emphasized the fact that foreign aid helps developing countries to fill the saving-investment gap. According to this argument, a country that cannot finance all its investment needs should solicit foreign aid as an alternative source of development finance. Related to this, another argument suggested that once a country imports more than it exports, it faces a trade deficit and the risks associated with foreign exchange shortfalls. To cover this trade gap, a country may use foreign aid to beef up its foreign reserves and prevent unneccessary depreciation of its currency.

Foreign aid in the form of technical support helps to transfer skills and technical know-how to recipient countries, thus leading to improved quality of labor and helping to fill the skills gap, which in turn helps to improve productivity and contribute to economic growth and development. Whenever planned government expenditures exceed planned government revenues, foreign aid can help to fill this gap and enable the government to make investments in key sectors of the economy such as education, infrastructure, and health and thus be able to impact long-term growth. Aid in the form of import support helps to positively impact production capacity in the recipient country and thus resulting in higher output and increased availability of goods and services.

Humanitarian aid, which comes as emergence relief during wars and natural disasters, helps to save lives and preserve the dignity of those affected by providing food for the hungry, medical care as well as shelter, among others. Aid in the form of debt relief, such as the debt forgiveness under the Highly Indebted Poor Countries (HIPC) initiative, helps to relax foreign exchange constraints. In addition, debt relief also helps to reduce debt overhang while additional resources from such debt cancellation can help the recipient country to scale up their investments and imports, especially of intermediate and capital goods that can have a long-term effect on a country's productivity.

One of the most cited disadvantages of foreign aid is that it leads to the "Dutch Disease", which occurs when a country's revenues increase as a result of a growing sector, discovery of a natural resource, or huge aid inflows. This leads to the appreciation of the country's currency compared to the currencies of other nations. The other exports of the country become more expensive for other countries while imports become cheaper, resulting in a loss of competitiveness for the country. As a country gets more foreign aid, the result is real exchange rate appreciation and an increase in domestic inflation, which depresses the export sector.

While micro-level studies have often supported the view that project aid has positive effects on economic growth and development, there are certain negative effects that cannot be overlooked. For example, project aid comes with certain conditions, including obliging recipient countries to hire project managers and technical staff and procuring materials from donor countries. Also, recipient countries are often obliged to meet recurrent expenditures of these projects, which constitutes a burden, especially when there is a proliferation of such projects. Aid in the form of loans also has its own challenges, especially related to high-interest rates that make debt-servicing quite cumbersome.

Finally, the effectiveness of aid has been under scrutiny in cases where there is aid fungibility (Pack & Pack, 1993; Feyzioglu, Swaroop, & Zhu, 1998). Fungibility not only means the diversion of aid to

finance unintended activities but also the funding of certain activities that could have happened without aid. When aid is used for unintended purposes, such as the purchase of military equipment, financing of luxurious consumption, and/or of white elephant projects, then it is not likely to positively affect economic growth and development and may, in fact, perpetuate political oppression and economic exploitation of the masses by propping up dictatorships, leading to the creation of extractive institutions and state capture. When aid is used to finance projects that could have been done without aid, more resources are freed up to be used elsewhere, mostly to finance counter-productive projects and thus constraining economic growth. Indeed, in most developing countries, such resources have helped to fuel corruption, foster dependence, and create economic malaise (Moyo, 2009). While most developing countries have enjoyed huge aid inflows for several decades, there is no consensus on whether aid has been effective in spurring economic growth and development or reducing poverty (Addison, Morrissey, & Tarp, 2017; Bayale, 2020).

3.2.1.4 Transmission channels of foreign aid

Foreign aid can have both direct and indirect effects on the economy of the recipient country. The direct channel, for example, implies that high aid inflows increase aggregate income in the recipient country, which helps to stimulate domestic demand. The indirect channel is twofold: first, aid inflows affect the private sector by altering prices that private economic agents face. For example, when the government gets more aid, it increases spending on goods and services, both domestically produced and imported, which leads to high demand and ultimately into price pressures. Second, with more aid inflows, there are enough financial resources that can be used to finance the budget of the public sector. Due to this, the government can afford to cut taxes, reduce both domestic and foreign borrowing while at the same time scaling up development and non-development expenditure. Figure 3.4 summarizes the aforementioned transmission channels via which foreign aid can benefit the recipient country.

In many developing countries, domestic savings often fall short of investment needs. Thus, governments resort to foreign aid as a vital source of development finance. For example, aid can be used to scale up investments in human capital development via increased spending on health and education, and this will, in turn, lead to increased productivity in the economy. Due to aid, the government can invest in economic infrastructure projects (such as roads, power, and communication) as well as in social infrastructure (such as education, health, and water) that may not attract private investors. This can stimulate aggregate demand and stimulate private sector investments (that is, have a crowding-in effect). Aid money can also be chanelled directly to the private sector through development banks or via agricultural finance corporations. Such funds are usually aimed at de-risking less attractive sectors to attract private investors.

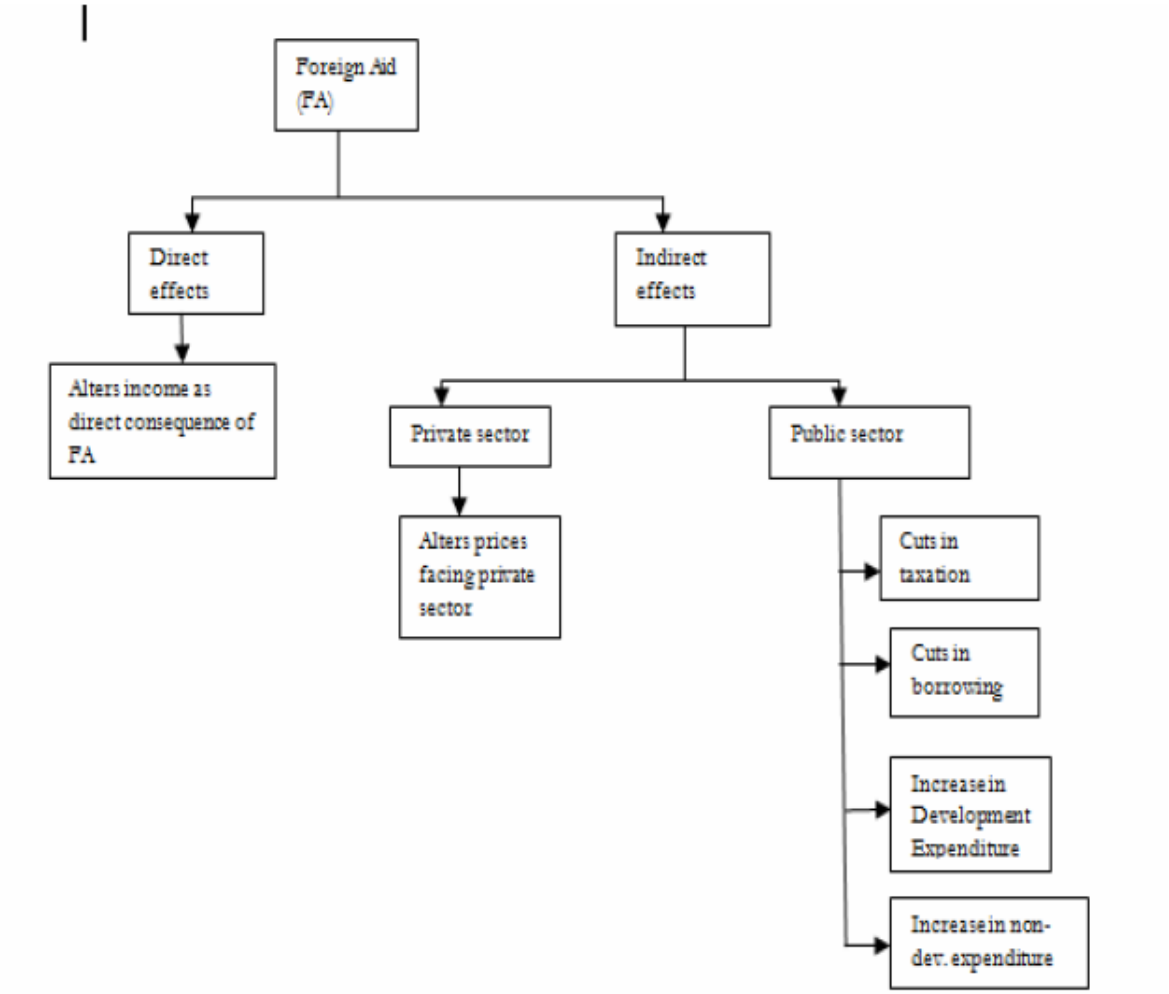

Figure 3.4: Transmission channels via which foreign aid can benefit the recipient country
Source: Mosley (1987, p. 120).

Nonetheless, investment has been found to be the main channel through which foreign aid affects economic growth (Papanek, 1973), given that foreign savings from developed countries complement savings in less developed countries so as to finance growth and thus speed up capital accumulation (Hansen & Tarp, 2000). Other major channels via which aid affects growth include government spending, institutions, and human capital (Mallaye & Yogo, 2015), as well as taxation (Morrissey, 2015). Depending on data availability, we empirically investigate these channels by including relevant variables in the growth regression (see equation 3.12 in the methodology section). Empirical evidence about Sub-Saharan Africa indeed points to the fact that aid has been effective in those countries with better institutions (Mallaye & Yogo, 2015; Ouedraogo, Sourouema, & Sawadogo, 2021).

3.2.2 Theoretical Literature

As noted above, foreign aid can lead to an increase in aggregate demand, which according to the Keynesian theory, stimulates economic growth. Aside from this, supply-side models have been developed to explain sources of long-run economic growth, and within them, the role of aid can be clearly seen. The starting point is the Harrod-Domar model, which is built using a Leontief production technology. It assumes exogenous growth of the labor force (n), constant labor-to-labor ratio, constant output-to capital ratio, constant returns to scale, and constant returns to capital. Given a two-sector economy (i.e., composed of households and firms), the national income identity can be written as in equation 3.1:

$$Y_t = C_t + S_t \tag{3.1}$$

It is assumed that:

- Capital is the only input driving economic growth: $Y_t = f(K_t)$
- All saving are invested: $S_t = I_t$
- Capital to output ratio is fixed: $\frac{K_t}{Y_t} = \nu$ and therefore $K_t = \nu Y_t$
- Saving is a proportion of GDP_t (Y_t) such that $S_t = sY_t$
- Capital depreciates at a constant rate: δ

Since there are two inputs (capital and labor) and growth in the labor force is assumed fixed, then long-run economic growth depends on capital accumulation. In view of the above assumptions, the equation of motion for capital is specified and expanded as follows:

$$K_{t+1} = I_t + (1 - \delta)K_t \tag{3.2}$$

$$\nu Y_{t+1} = sY_t + (1 - \delta)\nu Y_t \tag{3.3}$$

Dividing equation 3.3 through by ν yields:

$$Y_{t+1} = \Big(\frac{s}{\nu}\Big)Y_t + (1 - \delta)Y_t \tag{3.4}$$

Subtracting Y_t on both sides of equation 3.4 gives:

$$Y_{t+1} - Y_t = \Big(\frac{s}{\nu}\Big)Y_t + (1 - \delta)Y_t - Y_t \tag{3.5}$$

$$Y_{t+1} - Y_t = \left(\frac{s}{\nu}\right)Y_t + Y_t - \delta Y_t - Y_t \tag{3.6}$$

$$Y_{t+1} - Y_t = \left(\frac{s}{\nu}\right)Y_t - \delta Y_t \tag{3.7}$$

$$Y_{t+1} - Y_t = \left(\frac{s}{\nu} - \delta\right)Y_t \tag{3.8}$$

Dividing both sides of equation 3.8 by Y_t and denoting the growth rate in GDP as $\left(G = \frac{Y_{t+1}-Y_t}{Y_t}\right)$, we get:

$$G = \left(\frac{s}{\nu} - \delta\right) \tag{3.9}$$

In view of the Harrod-Domar model (equation 3.9), an economy can grow faster if the saving rate increases and both the capital to output ratio and depreciation rate of capital decline. However, the Harrod-Domar model has been criticized on several grounds. First, the assumptions of the Leontief production technology (i.e., imperfect substitutability between capital and labor as well as fixed capital to output ratio) were deemed unrealistic. In economies where labor is abundant and cheaper, labor can be substituted for capital. The assumption of fixed capital to output ratio has also been criticized on the ground that it is only possible if both capital and labor grow at the same rate in the steady-state $\left(n = G = (\frac{s}{\nu} - \delta)\right)$. Thus, when $n > G$ unemployment rises while when $G > n$ some capital will be superfluous and this will force the economy back to the steady-state where $G = n$. Second, the model also assumes that slower growth in output is a result of lower investment, which implicitly means a scarcity of capital. However, lower economic growth could result from lower productivity of capital. Third, the model assumes one to one relationship between investment and foreign aid and rules out the possibility of aid fungibility. This means that aid is considered as a supplement to domestic saving and not as a component of Gross National Income (GNI), and therefore, aid affects both consumption and investment.

Despite the above-mentioned weaknesses, the Harrod-Domar model was an important tool used to predict the **level of capital investments and foreign aid needed to attain the desired level of economic growth**. Note that Easterly (2003, p. 31) incorporates foreign aid in the Harrod-Domar model by modifying the assumption that $I_t = S_t$ and rewriting this as:

$$\frac{I_t}{Y_t} = \frac{A_t}{Y_t} + \frac{S_t}{Y_t} \iff I_t - S_t = A_t > 0 \tag{3.10}$$

Thus, equation 3.9 is also rewritten as:

$$G = \frac{\left(\frac{I_t}{Y_t}\right)}{\nu} - \delta = \left(\frac{\frac{A_t}{Y_t} + \frac{S_t}{Y_t}}{\nu} - \delta\right) \tag{3.11}$$

In view of equation 3.10 and equation 3.11, I_t is required investments, Y_t is output, G is the targeted GDP growth rate, A_t is foreign Aid, S_t is domestic saving and ν is the incremental capital-output ratio. The role of Aid is to fill the saving-investment gap and the trade gap, as explained by Chenery and Strout (1966). However, Aid effectiveness in terms of filling these gaps depends on the productivity of investments undertaken, which for developing countries could be constrained by political turbulences, limited technology, low human capital development, poor economic and social infrastructure, rapid population growth, and high-interest payments on concessional loans (White, 1992a). Indeed, some authors such as Griffin (1970) argue that foreign aid actually displaces domestic savings though empirical evidence refutes this claim (White, 1992b).

Thus, the Harrod-Domar was the basis for the development of the gap models. According to the first gap model, countries whose domestic savings fall short of their investment needs are forced to find alternative sources of financing (such as foreign aid) to permeate the acceleration of capital accumulation and hence enable economic growth and development. If aid is used to fill the saving-investment gap, it should be such that aid is used for investment rather than consumption, and there should be shortage of domestic capital such that the return on investment is positive. However, foreign aid may not yield the desired benefits if the cause of low investment is lack of incentives to invest (Easterly, 2003). The initial gap model considered the saving-invesment gap but was later extended into a dual gap model by Chenery and Strout (1966) by adding the trade gap (i.e., import-export gap), arguing that low levels of exports limit the amount of foreign exchange that can be used to import capital goods. In simple terms, the import-export gap implies that economic growth may be constrained by limited capacity to import intermediate and capital goods in addition to consumption goods (Hansen & Tarp, 2000).

In the three gap model, the government revenues gap is added to the dual gap model, which shows that tax revenue collections always fall short of government expenditure needs, necessitating the search for foreign resources to bridge this gap and enable the government to invest in various development-oriented projects. The saving-investment gap, trade gap, and government revenues gap may therefore justify the need for foreign aid. The fiscal gap may be further exarcebated by the debt service burden as this puts pressure on the available foreign exchange as well as on government revenue, which may reduce a country's import capacity and result into lower investment in capital and intermediate goods. As noted by Hjertholm, Laursen, and White (2000), in a discussion of various growth models, an inflow of aid in the form of a loan may help to fill the trade gap in the short-run, but for it to be sustainably useful, it should be followed by future growth in export revenues.

Due to the weaknesses of the Harrod-Domar model, economists developed the neoclassical (e.g., the Solow model (1956)) and endogenous growth theories (e.g., the AK model and the Romer model (1990)), each having its own assumptions as well as its own pros and cons (see Thompson (2008) for a discussion on various growth models). The key message from these models is that persistent economic growth is only possible if there is increased investment in both physical and human capital. The models generally show that domestic savings can be used to finance investment but can always be complemented by other

sources of development finance such as foreign aid (i.e., both aid loans and aid grants), foreign direct investments, and remittances. In short, aid can be used to close the saving-invesment gap, trade gap and fiscal gap, just like in the Harrod-Dommar model.

The endogenous growth models, unlike the Solow model, view sources of growth (such as financing, including domestic savings and foreign aid) as endogenous. Specifically, the assumption of a constant saving rate has been found to contradict reality. If saving was constant, then a pre-announced huge future increment in income taxes, for example, would have no impact on households' savings decisions. The rise of endogenous growth models was also driven by the failure of the predictions of the Solow model. For example, empirical evidence shows that poor countries were on average not converging but rather becoming worse-off. Once sources of growth are endogenized, theory can provide analytical explanations for the differences in economic growth across countries and the rationale behind choices in these factors (Arrow, 1962; Oniki & Uzawa, 1965; Romer, 1986; Rebelo, 1991).

In addition, the poverty trap models (e.g., Solow-Swan model) assert that countries can be tied up in the vicious cycle of poverty due to low agricultural productivity, heavy disease burdens, and a state of relative isolation. Collier (2008) notes that the world's poorest societies are caught up in poverty traps due to internal conflict traps, natural resources traps, land locked by bad neighbor traps, and bad governance traps. To escape from the poverty trap, such countries need the "big-push" in investment that will move the countries to a certain threshold of capital, economic growth and welfare status. Such big-push can be in the form of a large enough infusion of aid that can help developing economies to 'jump' to a higher income per capita equilibrium level. The Solow-Swan model views the main drivers of growth, such as savings and technology, as exogenous.

Finally, another strand of theoretical literature is the Albert O. Hirschman's ExitVoice-Loyalty (EVL) model (Hirschman, 1970), which is basically a game-theoretic political economy model of foreign aid and economic growth. Under the EVL model, when a government passes a policy, with potential negative effects on the welfare of the citizens, the latter can respond in one of the three ways: (1) they can "Exit" the country or rearrange their capital and goods so they are not taxed by the government; (2) they can "voice" their concerns to the government through violent or non-violent means, thereby creating high costs for policy implementation and perhaps bring them to a negotiating table with the government; and, (3) the citizens may also choose to remain "loyal" and avoid disrupting the government's policy implementation.

Under the Albert O. Hirschman's Exit-Voice-Loyalty (EVL) model, foreign aid in weak states may affect the citizens' power of "voice" and "exit" by weakening the states' dependence on their citizens. Once aid replaces tax revenue in importance, governments may be tempted to be less responsive to the needs of their citizens. Indeed, economists like Moyo (2009) argued that aid, especially government to government aid, has done more harm than good especially in Africa by propping-up corrupt dictatorships that either embezzle the funds or invest in "white elephant projects", incapable of increasing the productive capacity of countries, which results into economic stagnation. Other studies examine whether or not foreign aid crowds out domestic tax revenue collections (Benedek et al., 2012; Gupta et al., 2004; Clist & Morrissey, 2011).

3.2.3 Empirical Literature

There has been renewed interest in the investigation of the effectiveness of foreign aid, especially during the 21^{st} century. World leaders acknowledged that for the Millennium development goals (MDGs) & later sustainable development goals (SDGs) to be achieved, developing countries needed sufficient and reliable development finance. One avenue for developing countries to get development finance was the transfer of resources (via foreign aid, foreign direct investment and remittances) from rich countries to poor countries. However, this alone has, according to some authors, not helped poor countries to attain the desired growth and development. In this regard, world leaders not only called for increased resource transfers to poor countries but also for improved aid effectiveness via donor coordination. The call for increased aid inflows to poor countries was well articulated in the Monterrey Consensus (United Nations, 2002) and the United Nations' MDGs assessment report (Sachs, 2005) whereas the multilateral debt relief initiative (MDRI) was also introduced to reduce the debt burden of developing countries.

The empirical literature on the effect of aid on economic growth falls under three categories: macro-level studies, meso-level studies and micro-level studies. Generally, results on the effect of aid are quite mixed, with some claiming that aid positively affects economic growth (Hudson & Mosley, 2001; Roodman, 2007; Selaya & Thiele, 2010) while others argue that the effect of aid is null or even negative (Easterly, 2007). Other scholars have reported the tendency for some empirical studies to fall under the trap of 'reluctance bias' (Gorg & Strobl, 2001; Stanley & Jarrell, 2005), which is the unwillingness to produce negative results even when data shows so and this could be because most of these studies are funded by donors/development partners. Other studies have also reported the micro-macro paradox whereby micro-level studies tend to report positive effects while macro-level studies report negative or insignificant effects of aid on economic growth (Mosley, 1987). The differences in empirical findings have been attributed to the heterogeneity of aid recipients, different aid motives/strategies on the part of donors and differences in analytical approaches (Selaya & Thiele, 2010).

The first category covers "macro-level" studies (Mosley, 1986; Tarp, 2006; Hansen & Tarp, 2000; X. X. Sala-i-Martin, 1997; Burnside & Dollar, 2000; Easterly, Levine, & Roodman, 2004; Roodman, 2007), which focus on the relationship between aid and an aggregate measure of the standard of living across countries. Macro-level studies are especially important because they stress the fact that for poor countries to attain higher living standards, they must initiate and sustain long run processes of building physical and human capital, acquiring technology, and building institutions to economic growth and development. Therefore convergence under these macro-level studies imply that poor countries should be able to record high growth rates in per capita income in order to be able to attain higher living standards. Apart from complementing micro-level studies, macro-level studies also take into account the possible spillovers from individual aid-financed interventions.

Tarp (2006) highlights different classifications of macro-level studies of aid effectiveness in enhancing living standards. Broadly, these look at either the direct effect of aid on economic growth or the indirect effect of aid on growth via its effect on saving and investment. The first generation of these studies is based on the growth theories and looks at the indirect link between aid and growth via its effect on savings. Though part of aid can be consumed, these studies generally conclude that aid tends to positively affect savings, and this helps to finance capital accumulation which results into economic growth (Hansen & Tarp, 2000). The second generation, common in the 1980s and 1990s, looks at the causal link between economic growth and investment. These studies confirm that aid positively affects investment whereas

the effect of investment on growth was not found to be consistently robust, raising suspicion over the cross-country determinants of growth (X. X. Sala-i-Martin, 1997). The first and second generation studies employed different methodologies, mainly, static cross-sectional OLS, IV estimators, static and dynamic panel data methods and country level time series analysis. Each of these methods has its strengths and weaknesses, leading to fragile results (Roodman, 2007).

Empirical studies on the direct link between aid and economic growth also reached different conclusions attributed to the heterogeneity of recipients, aid motives/strategies and even the methodologies used to assess the effect (Selaya & Thiele, 2010). These studies also conclude that the effect of aid is either non-existent or even negative (Easterly, 2007; Moyo, 2009; Rajan & Subramanian, 2008) or positive (Hudson & Mosley, 2001; Roodman, 2007; Selaya & Thiele, 2010).

Most of these studies look at the conditional effect of aid on economic growth; with results conditional on: corruption in the recipient country and binding policy environment (Djankov, Montalvo, & Reynal-Querol, 2008; Svensson, 2000; Tezanos, Quiñones, & Guijarro, 2013), weak institutional framework (Shirley, 2005), the fungibility of aid (Burnside & Dollar, 2000; Chatterjee, Giuliano, & Kaya, 2012; Hudson & Mosley, 2001) and, geographical challenges (Dalgaard et al., 2004; Rajan, 2005; Selaya & Thiele, 2010). Burnside and Dollar (2000) also reported that bilateral aid in particular increased government consumption, confirming the fungible nature of aid. Other studies investigated the quadratic relationship between aid and economic growth, with aid having a negative effect and aid squared having a positive effect (Yiew & Lau, 2018).

Micro-level studies look at the performance of individual donor-financed projects. These aim at formal evaluations of donor activities at the project, sector, country and regional levels. Most impact evaluations point to strong welfare gains in some, but not all, instances. For example, the project to deworm children in one Kenyan district helped to improve health but also had negative peer effects (Miguel & Kremer, 2004). In rural Georgia, rehabilitation of school infrastructure yielded large gains for the poorest households relative to other infrastructure projects (Lokshin & Yemtsov, 2005). Jalan and Ravallion (2003) found that interventions providing piped water reduce the prevalence and duration of diarrhoea among young children, although this effect is weaker for children from poor families. van de Walle and Mu (2007) report positive economic effects from support to rural road infrastructure for the kilometers of roads rehabilitated in Vietnam.

Finally, meso-level studies focus on investigating the impact of foreign aid on sectorial growth and acknowledge that the effect of aid might be emanating from different sectors (Herdt, 2010). Succinctly put, Gomanee, Girma, and Morrissey (2005, p. 65) assert that "...aid might not have a direct impact on welfare...however if aid affects the amount of public expenditure directed at areas that enhance welfare (health, education, water and sanitation), then aid can indirectly contribute to levels of welfare." Results of the effect of aid on sectorial growth are mixed (Rajan & Subramanian, 2011; Selaya & Thiele, 2010; Ram, 1987; Gomanee et al., 2005; Williamson, 2008; Herdt, 2010; Kaya, Kaya, & Gunter, 2012; Gupta, Pattillo, & Wagh, 2006). For example, while Gomanee et al. (2005)found positive effect of aid on human development especially via lowering the infant mortality rate, Williamson (2008) argued that foreign aid does not significantly lead to the improvement of the health sector in developing aid recipient countries.

Empirical evidence about aid effectiveness in developing countries is quite mixed, with some studies claiming that aid affects economic growth positively (Adebayo & Beton Kalmaz, 2020; Ndikumana & Pickbourn, 2017) while other studies found negative or no effect (Yiew & Lau, 2018; Moyo, 2009). In fact,

Moyo (2009) recommended for the withdrawal of African countries from the foreign aid program not later than 2019, though this never materialised. Some other studies have found that aid is more effective in developing countries that have implemented sound economic policies and with good institutions (Ouedraogo et al., 2021; Babalola & Shittu, 2020). For example, aid in developing countries has helped to prop-up dictatorships and to create extractive institutions that perpetuate economic interests of a small oligarchy at the expense of the population. This has been the case in countries like Somalia and Haiti (Mosley, 1987). For the case of Sub-Saharan Africa, aid has been been found to be more effective in countries with more effective governments, good regulatory quality and low corruption (Ouedraogo et al., 2021). Also, project aid has been more effective in countries with sound coordination between the government and implementing Non-Government Organizations (Azam & Laffont, 2003).

The often cited economic policies are fiscal, monetary and trade policies (Burnside & Dollar, 2000) while institutions can be political, social and economic (North, 1990; Bräutigam & Knack, 2004; Acemoglu & Robinson, 2010b). Some scholars claim that aid has been ineffective in developing countries that received a small portion of aid and where aid flows have been quite volatile and unpredictable (Yiew & Lau, 2018; Chauvet & Guillaumont, 2009; Markandya, Ponczek, & Yi, 2011; Hudson & Mosley, 2008). Donors' motivation and practices have also been cited as factors that determine aid effectiveness. For example, some scholars claim that donors give aid to entrench their political and economic control over the developing world (Selaya & Thiele, 2010; Kilby & Dreher, 2010; Maizels & Nissanke, 1984). The effectiveness of aid also depends on aid composition and aid use. For example, food aid is counter-productive while aid used to finance infrastructure projects has medium-term and long-term positive effects on economic growth and development (Yiew & Lau, 2018). Empirical studies have also reported that aid loans and aid grants have opposite effects on economic growth, either indirectly via their impact on domestic tax revenue mobilization (Benedek et al., 2012; Clist & Morrissey, 2011) or directly (Mah & Yoon, 2020). Aid effectiveness has been reported to be low in countries with a high degree of rent seeking and in the tropics (Hodler, 2007).

Generally, empirical evidence from cross-sectional, time-series and panel data studies give mixed and conflicting results. This has prompted some researchers to carry out meta-analyses on the empirical works carried out so far on the relationship betwen foreign aid and economic growth. Meta-analyses point to the fact that most of the previous empirical studies found that foreign aid positively affects economic growth (Stanley & Jarrell, 2005; Addison et al., 2017; Mahembe & Odhiambo, 2019). These results have however been questioned on the ground that most studies were commisioned by international financial institutions, such as the IMF and World Bank, and therefore tend to dance on their tunes (Doucouliagos & Paldam, 2006). The issue of reluctance/publication bias has been widely debated in recent times and no agreement has been reached on whether empirical findings on the effect of aid on growth are dictated or not by the donors (Doucouliagos & Paldam, 2013; Mekasha & Tarp, 2013).

3.3 Methodology and Data

Most of the studies that investigate the link between foreign aid and economic growth do so by considering a single country or a sample of heterogenous countries. Studies about Sub-Saharan Africa do not take into account the heterogeneity of countries across the continent and in fact most of them actually use regional dummy variables to compare geographical regions (Anyanwu, 2014). In this study, we deal with the heterogeneity issue by selecting a sample of developing countries in Sub-Saharan Africa. The study also explores the potential opposite (positive Vs negative) effects of aid loans and aid grants on GDP per capita (Mah & Yoon, 2020). Since most studies claim that the effect of aid on economic growth can be non-linear, this study investigates this hpothesis by employing a new methodology, capable of estimating a dynamic threshold panel data model with endogeneous regressors (Seo, Kim, & Kim, 2019; Amadou, 2020). Finally, the study examines if there is any complimentarity between foreign aid and institutional quality in influencing GDP per capita in Sub-Saharan Africa.

To examine the effect of a given aid component on GDP per capita, we estimate the following dynamic panel data model:

$$y_{i,t} = \alpha_i + \psi' y_{i,t-1} + \delta' AidComp_{i,t} + \beta' x_{i,t} + \varphi' Interaction_{i,t} + \mu_t + \lambda_i + u_{i,t} \qquad (3.12)$$

Where variables are defined as follows: $y_{i,t}$ is the log of real GDP per capita and $y_{i,t-1}$ is its lag, $AidComp_{i,t}$ is either foreign aid as % of GDP (ODA_GDP) or its component (% of GDP). The latter can either be grants as % of GDP ($grants\_gdp$) or loans as % of GDP ($loans\_gdp$), $x_{i,t}$ is a vector of explanatory variables, potentially correlated with $u_{i,t}$. These variables are: Average share of gross capital formation in GDP (csh_i), Average share of government consumption in GDP (csh_g), population growth ($growth\_pop$), Average share of trade in GDP (csh_xm), which is a measure of trade openness, as well as selected measures of institutional quality (see table 3.2). We also include $Interaction_{i,t}$ as the interaction between foreign aid (or each of the abovementioned components of foreign aid) and a selected institutional quality variable so as to investigate the complementary effect of aid and institutional quality on GDP per capita. Note also that μ_t are time dummies to account for macroeconomic shocks common to all included countries, while λ_i are individual (i.e., country-specific) effects[5]. The parameters to be estimated are $(\alpha_i, \psi', \delta', \beta', \varphi')$ whereas $u_{i,t}$ is the error term. Also, $i = 1, ...N \ \forall i$ is applicable to the individual/country index and $t = 1, ..., T \ \forall t$ is applicable to the time-index. To estimate equation 3.12, we use a three-year averaged data set spanning the period 1980-2017.

As noted by Faghih and Samadi (2021, p. 143-171), researchers are often faced with the challenge of identifying the right measures of institutional quality since there are several of these measures, from different sources and often highly correlated. In this study, we use a simple correlation analysis to select the institutional quality measures to include in equation 3.12.

The institutional variables included in the model are selected based on the correlation matrices pre-

[5]We include fixed effects because countries are not randomly selected from a large sample but rather selected following the income criterion (i.e., based on income status).

sented in appendix 3.1. A correlation coefficient that is less or equal to 0.3, in absolute terms, is considered to be weak[6]. First, the correlation matrices show that law_ord_icrg2 is highly[7] correlated with the other ICRG variables (i.e., gov_stab_icrg2, $socio\_cond\_icrg2$, inv_prof_icrg2, int_conf_icrg2 ext_conf_icrg2, $corrup\_icrg2$, $military\_icrg2$, $religion\_icrg2$, dem_acc_icrg2 & $bureau\_qua\_icrg2$) except eth_tens_icrg2. In this regard, we select both law_ord_icrg2 and eth_tens_icrg2. Second, law_ord_icrg2 is weakly correlated with variables in the CNTS data base (i.e., assassi, gstrikes, guerrilla, govcrise, purges, riots and demonst), except revol. Third, gstrikes, demonst and riots are highly correlated. Fourth, assassi and revol are highly correlated with variables in the V-DEM data set (i.e., $v2x\_polyarchy$, $v2x\_libdem$, $v2x\_partipdem$, $v2x\_delibdem$ and, $v2x\_egaldem$). Thus, we expand our selected variables to include: law_ord_icrg2, eth_tens_icrg2, riots, guerrilla, govcrise and, purges. In order to allow the use of at least one variable from each data set, we opt to replace law_ord_icrg2 with $v2x\_egaldem$ since the two are highly correlated. Also, $v2x\_egaldem$ is highly correlated with other variables in the V-DEM data set and is by definition much more comprehensive. Thus, the final list of institutional variables to include in the model is: $v2x\_egaldem$, eth_tens_icrg2, riots, guerrilla, govcrise and purges. Note that the ICRG data set starts in 1984, so we extrapolate eth_tens_icrg to get observations for the 1980-1983 period. The extrapolated version of this variable is eth_tens_icrg2. However, we exclude eth_tens_icrg2 in the final estimations since this gives better results. While education is an important determinant of economic performance, we dropped it because many developing countries do not have data in the consulted data sets[8].

Due to the potential reverse causality between GDP per capita and other variables, notably between GDP per capita and aid variables, the use of OLS and standard static panel data models gives biased results. Reverse causality leads to the endogeneity problem, which is even compounded by the inclusion of the lagged dependent variable as one of the regressors (Wooldridge, 2012; Roodman, 2009c, 2009b). Due to endogeneity, OLS yields biased estimates, unless the right set of instrumental variables is used. However, earlier studies that employed two or three-stage least squares methods suffered from the difficulty of finding the right instruments as most of them relied on external instruments. Following the correlation between $u_{i,t}$ and the other explanatory variables, the random effects model results are also biased. The biasedness of the fixed effects model is mainly due to the Nickel bias(Nickell, 1981) as well as the inability of the fixed effects model to completely eliminate the endogeneity problem in a dynamic panel data model context (Roodman, 2009b). The problem of endogenity is partially dealt with by estimation of the differenced GMM developed by Arellano and Bond in 1991 (Arellano & Bond, 1991) and the system GMM developed by Blundell and Bond in 1998 (Blundell & Bond, 1998), which are both enhancements of the Anderson-Hsiao estimator (Anderson & Hsiao, 1981). However, in the presence of a highly persistent dependent variable, the Blundell and Bond's estimator (1998) is more appropriate than the one proposed by Arellano and Bond (1991). Also, the Blundell and Bond's estimator (1998) allows for inclusion of more moment conditions and thus expands the pool of available internal (i.e., lags of included variables) instruments that can be used, though this may itself be a problem when it comes to deciding the right set of instruments.

However, the system GMM was designed for samples with larger N and small T and thus suffers from

[6]This criterion is adapted from http://www.dmstat1.com/res/TheCorrelationCoefficientDefined.html.

[7]This is used to mean moderate to strong correlation.

[8]We checked the following data sets: Barro-Lee, World Development Indicators (WDI) and Cross National Time Series (CNTS).

weak sample properties if for example N is small, which is the case for this study. In such a case, system GMM estimators may be inconsistent. To be able to deal with small sample bias in dynamic panel data, either the Bias-Corrected Least Squares Dummy Variable[9] (BC-LSDV) model or the Bias-Corrected Fixed Effect[10] (BC-FE) model is used. However, none of these deals with the endogeneity problem. Despite this, monte-carlo simulations by Trabelsi (2016) show that the BC-LSDV estimator outperforms the system GMM estimator and other estimators in the context of finite samples (i.e., when N is small) even in the presence of endogeneity and Nickel bias. The BC-LSDV is also more preferred to the BC-FE in cases when there is an unbalanced panel data set and when there are missing values in the data. Empirical literature shows that the BC-LSDV is a widely used methodology for short dynamic panels, devoted to many applications (Flannery & Hankins, 2013; Bogliacino, Piva, & Vivarelli, 2012; Bruno et al., 2017). While we will use the BC-LSDV model, we will compare results with those from the Fixed effects (FE) model, which is downward biased, and the OLS model, which is upward biased, as in (Trabelsi, 2016) since a good estimator must lie between the two estimators.

To test for the non-linear effect of foreign aid or of a given component of foreign aid on GDP per capita, we use the threshold regression for dynamic panel data with endogenous regressors. So far, this issue has been handled by Seo et al. (2019) and Amadou (2020). The former gives results for both the lower regime and the upper regime of the threshold, which gives insights on the sign, magnitude and statistical significance of all the drivers (including the threshold variable) of GDP per capita in both regimes. It also allows the testing of linearity as well as the estimation of the threshold value, a kink and the static model. However, it does not provide a way of setting the desired number of instruments, which leads to a proliferation of moment conditions and also does not give a confidence interval for the threshold value. Additionally, the Seo et al. (2019) model is less appropriate in the context of this study since it does not allow inclusion of institutional variables and interactions between institutional variables and foreign aid variables, which makes it hard to compare results. Conversely, the Amadou (2020) model enables the setting of the desired number of instruments; shows how only the threshold variable affects real GDP per capita in the lower and upper regime and gives room for addition of extra endogeneous variables and instrumental variables and enables the construction of the confidence interval for the threshold value and the associated graph. additionally, it allows inclusion of institutional variables and interaction terms. However, it does not separate coefficients for other variables, other than the threshold variable, in both regimes. Generally, both models enable the correction of the endogeneity problem in dynamic panel data. In view of the above pros and cons for each model, we estimate the following generic threshold dynamic panel data model, based on Amadou (2020)[11]:

$$y_{i,t} = \psi y_{i,t-1} + \beta_1 \pi_{i,t} I(q_{i,t} \leq \gamma) + \beta_2 \pi_{i,t} I(q_{i,t} > \gamma) + \phi_1' x_{1,it} + \phi_2' x_{2,it} + \mu_i + \epsilon_{i,t} \quad (3.13)$$

Where we define $z_{it} = (y_{it-1} x_{2it})'$ as a vector of endogeneous variables, $y_{i,t}$ is the dependent variable, $y_{i,t-1}$ is the lagged dependent variable, $\pi_{i,t}$ is the variable that depends on the threshold variable

[9] see Bruno (2005b)

[10] see Kiviet (1995); Bun and Carree (2005); Bun and Kiviet (2003)

[11] First install the "xtendothresdpd" Stata package (type "ssc install xtendothresdpd" in the Stata command window), thereafter type "help xtendothresdpd" in the Stata command window to see the cited model.

(i.e., the regime dependent variable)[12], $q_{i,t}$ is the threshold variable (which in our case is per capita foreign aid or one of its components: i.e., either per capita grants or per capita loans), γ is the threshold parameter to be estimated, $I(.)$ is the indicator function, $x_{1,it}$ is the vector of exogenous variables uncorrelated with ϵ_{it} (i.e., the first set of regime independent variables), $x_{2,it}$ is the vector of endogeneous variables correlated with ϵ_{it} (i.e., the second set of regime independent variables), p_{it} is the vector of all endogenous variables, μ_i are the fixed effects whereas $\psi, \beta_1, \beta_2, \phi_1', \phi_2'$ are parameters to be estimated, with $i = 1, ..., N$ and $t = 1, ..., T$. To construct the confidence interval (used to produce a graph after running the estimation) for the threshold model, the following additional equations are needed:

$$LR(\gamma) = \frac{(S(\gamma) - S(\hat{\gamma}))}{\hat{\sigma}^2} \tag{3.14}$$

$$C(\alpha) = -2ln\left(1 - \sqrt{1-\alpha}\right) \tag{3.15}$$

$$\Gamma = \{\gamma : LR(\gamma) \leq C(\alpha)\} \tag{3.16}$$

To test for threshold effects in equation 3.13, we test the null hypothesis that there is no threshold effect. This implies testng the following hypothesis (equation 3.17):

$$\beta_1 = \beta_2 \tag{3.17}$$

In stata, the above model is estimated using either the "xtendothresdpd" command/package developed by (Amadou, 2020) or the "xthenreg" command/package developed by Seo et al. (2019). As noted earlier, the "xtendothresdpd" command/package developed by (Amadou, 2020) is more appropriate in the context of this study and hence our estimation results are based on this approach. The main data sources are: the International Country Risk Guide (ICRG)[13], the Cross National Time Series (CNTS)[14],the Varieties of Democracy (V-DEM)[15], the Penn World Tables version 10 (PWT 10)[16], and, the OECD data base on foreign aid[17]. As already mentioned above, institutional variables are sourced from three data sets, namely ICRG, V-DEM and CNTS. Variable definitions and sources are presented in table 3.2. For more elaborate definitions of institutional variables, see appendix 3.2.

[12] Note that the regime dependent variable can be the same as the threshold variable.
[13] $https://guides.tricolib.brynmawr.edu/icrg\#s-lg-box-5809748$
[14] https://www.cntsdata.com/
[15] https://www.v-dem.net/
[16] https://www.rug.nl/ggdc/productivity/pwt/
[17] https://stats.oecd.org/Index.aspx?DataSetCode=TABLE2A

Table 3.2: Definition of variables and data sources

Variable	**Source**
The log of per capita GDP ($lrgdpna$)	Computed using data from PWT10
Lag of the log of per capita GDP ($L.lrgdpna$)	Computed using data from PWT10
aid loans, % of GDP ($loans\_gdp$)	Computed using data from OECD and PWT10
aid grants, % of GDP ($grants\_gdp$)	Computed using data from OECD and PWT10
Share of investment in GDP (csh_i)	PWT10
Share of government consumption in GDP (csh_g)	PWT10
Trade openness (csh_xm)	PWT10
Population growth ($growth\_pop$)	Computed using data from PWT10
Egalitarian democracy ($v2x\_egaldem$)	V-DEM
Total ODA as % of GDP (ODA_GDP)	Computed using data from OECD and PWT10
Extrapolated ethnic tensions (eth_tens_icrg2)	ICRG
Riots (riots)	CNTS
Guerrillas (guerrilla)	CNTS
Government crises (govcrise)	CNTS
Purges (purges)	CNTS
Interaction terms	institutional variable(s)*aid variable(s)

In view of the aid components and selected institutional variables, the following interaction terms are included in equation 3.12:

1. $v2x\_egaldem$*aid components: $egaldem\_odagdp$, $egaldem\_grantsgdp$ and, $egaldem\_loansgdp$;
2. $riots$*aid components: $riots\_odagdp$, $riots\_grantsgdp$ and, $riots\_loansgdp$;
3. $guerrilla$*aid component: $guerrilla\_odagdp$, $guerrilla\_grantsgdp$ and, $guerrilla\_loansgdp$;
4. $govcrise$*aid component: $govcrise\_odagdp$, $govcrise\_grantsgdp$ and, $govcrise\_loansgdp$;
5. $purges$*aid component: $purges\_odagdp$, $purges\_grantsgdp$ and, $purges\_loansgdp$.

3.4 Data Analysis and Empirical Results

The importance of foreign aid as a source of development finance has been emphasized at the international level and this is the main reason why the United Nations requested developed countries to pledge at least 0.7% of their GNI as funds available to support economic development in developing countries (figure 3.1). Compared to other sub-regions, Sub-Saharan Africa has been the main aid recipient, getting 39% of the world's total aid in the period 1980-2017 (figure 3.2). However, Sub-Saharan Africa remains poor, with 41.2% of the population living under 1.9 USD per day and average per capita income standing at 3775.28 USD (table 3.1 and figure 3.5) as of 2017.

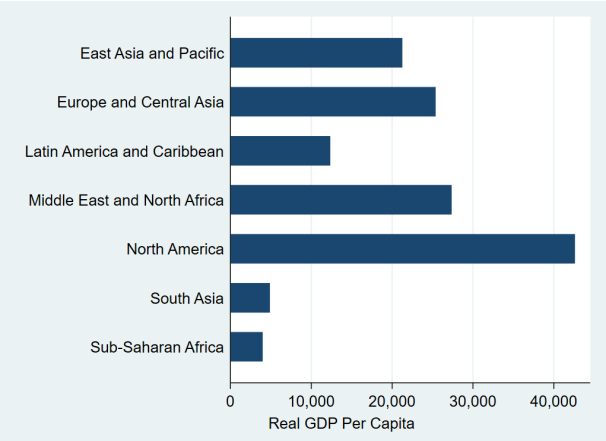

Figure 3.5: Per capita real GDP by region, USD (1980-2017 average)
Source: Own computations.

Historically, the main sources of development finance for Africa in general and Sub-Saharan Africa in particular have been FDI, remittances and official development assistance Heshmati (2018). Despite the recent increase in remittances and FDI, the main source of development finance for Sub-Saharan Africa remains official development assistance (figure 3.6). The fact that Sub-Saharan Africa has been the main aid recipient and yet remains underdeveloped is a conundrum that has not been been adequately addressed.

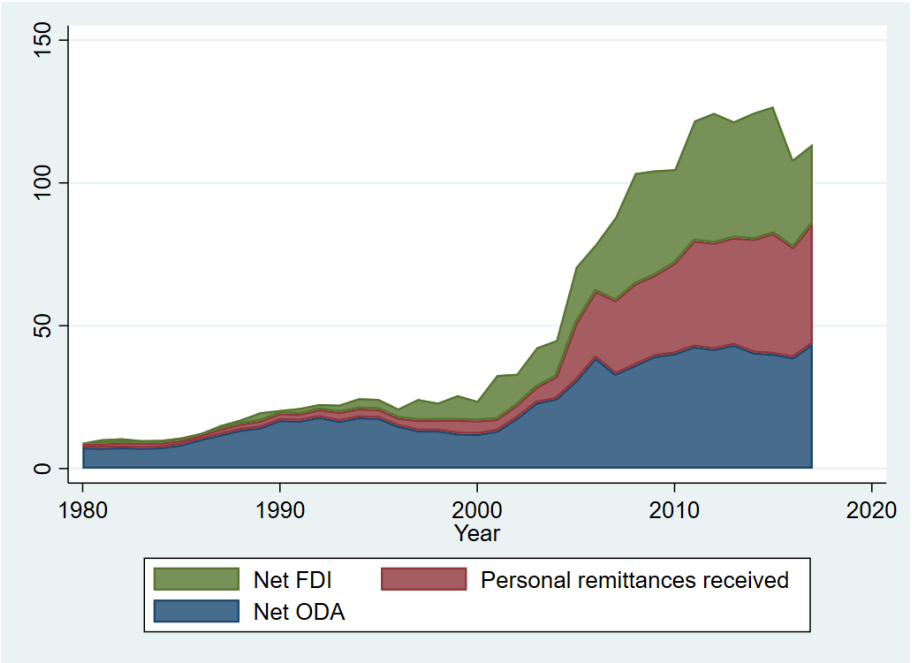

Figure 3.6: Capital flows to SSA in Billion USD
Source: Own computations.

Figure 3.7 below shows that the relationship between foreign aid as a percentage of GDP (or its components) and real GDP per capita in Sub-Saharan Africa is potentially negative. As noted in the literature, however, this relationship remains an unsettled debate. Differences in empirical findings have been due to the fact that: most of the studies on Africa treat geographical and/or income sub-regions as dummy variables, explaining each sub-region's growth by the differences between its dummy variable from that of a chosen baseline sub-region Anyanwu (2014); there has been publication bias (Gorg & Strobl, 2001; Stanley & Jarrell, 2005); empirical studies have used different methodologies in terms of sample and estimation techniques. In addition, few studies on the Sub-Saharan sub-region have examined the potential opposite effect of aid grants and aid loans. While the issue of the non-linear effect of aid on economic growth has been investigated, the methodologies previously used do not account for endogeneity. In this study, we address these issues and also tackle the issue of heterogeneity by focusing on developing countries in our estimations.

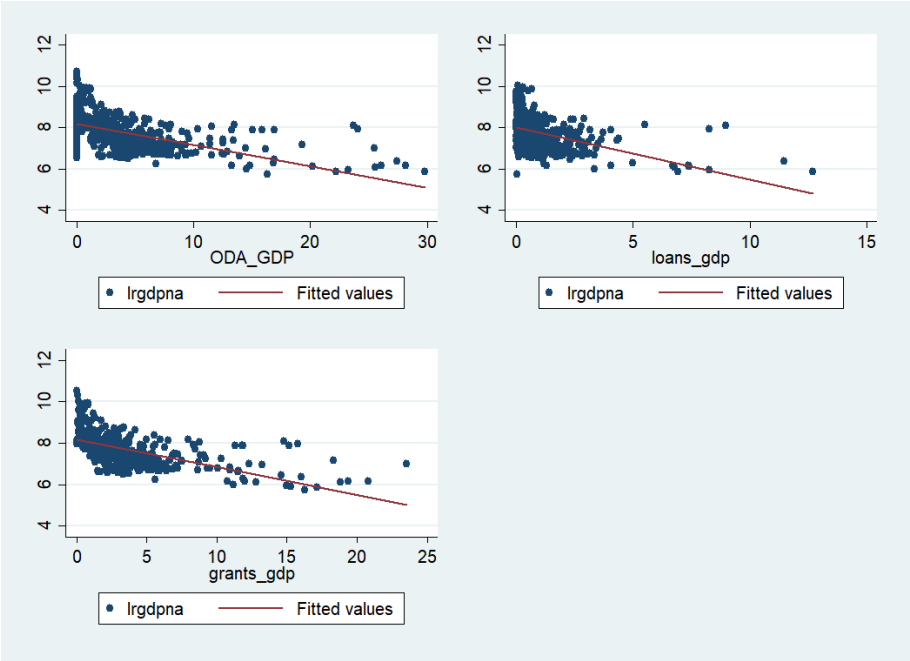

Figure 3.7: Relationship between aid (% of GDP) and per capita real GDP in SSA
Source: Own computations.

While the focus of this study is on Sub-Saharan Africa, we adopt a general to specific approach by estimating models for the whole world, developing countries, disaggregated developing countries (LICs, LMICs, UMICs) and developing Africa, not only to contextualize this study but also to do cross-sample comparisons. Table 3.3 presents results for the global sample. As expected, the BC-LSDV addresses the Nickel bias better than the GMM as the coefficient of the lagged dependent variable is within the prescribed interval, that is between the OLS and FE estimators. Also, the BC-LSDV results are closer to those of FE than the GMM results, and this is expected in macroeconomic data with short-panels. We present results for two BC-LSDV models: one with disaggregated aid variables (i.e., BC-LSDV column) and the other with aggregated ODA (i.e., BC-LSDV-ODAGDP column).

Results in the BC-LSDV-ODAGDP column show that the lag of the log of per capita real GDP ($L.lrgdpna$), the share of investment in GDP (csh_i) and the share of trade in GDP (csh_xm) have a positive significant (at 1%) effect on the log of per capita real GDP. Regarding the variables of our interest, ODA_GDP

has a negative significant effect (at 1%). The negative coefficient for ODA_GDP could be due to the fact that many of the best performing countries in terms of GDP growth are not ODA recipients, or receive little ODA as a percentage of GDP. Counter-intuitively, guerrilla is (marginally) statistically significant and with a positive effect. However, the positive effect of guerrilla is not robust, as it is only significant at 10% in column "BC-LSDV-ODAGDP", but not significant in any of the other columns.

While $egaldem$ is not significant, the interaction term between egalitarian democracy and foreign aid has a positive and significant (at 1%) effect, implying that egalitarian democracy promotes aid effectiveness. The interaction between aid-to-GDP and government crises has a negative and significant effect (at 1%), implying that government crises impede effective use of foreign aid. Similarly, the interaction between guerrilla and aid has a negative and significant (at 1%) effect. Thus, guerrilla warfares also reduce aid effectiveness.

Just like in the BC-LSDV case (i.e. with aggregated ODA), the BC-LSDV estimation results with disaggregated aid-to-GDP components show that the lag of the log of per capita real GDP ($L.lrgdpna$), the share of investment in GDP (csh_i) and the share of trade in GDP (csh_xm) have a positive significant (at 1%) effect on the log of per capita real GDP. The hypothesis that aid grants and aid loans have opposite effects is rejected given that the coefficients on $grants\_gdp$ and $loans\_gdp$ are negative. However, only $grants\_gdp$ is significant at 10%. This could happen in case aid is dominated by grants and when these grants are viewed as free resources used to substitute for domestic revenues. Since grants tend to be more volatile than both loans and tax revenues, the reliance on the former may impede governments to implement their development programs in case of declines or sudden stoppages in the inflow of grants. Indeed, aid dependent countries usually have less incentives to adopt good policies and to create inclusive institutions. In fact, most of such governments are characterized by state capture, where powerful interest groups are given large tax exemptions. Due to state capture, the private sector is usually owned by elites with political connections, which hinders tax compliance. Thus, fiscal consolidation is likely to be low in economies that depend much on aid grants and grants can actually have detrimental effects on per capita income. The effect of loans can also be detrimental if excessive borrowing leads to debt distress (Clements et al., 2004).

As expected, the interaction term between egalitarian democracy and grants to GDP ratio is positive and significant at 10%. Since the sum of the coefficients for $grants\_gdp$ and for $egaldem\_grantsgdp$ is positive, it can be argued that grants have a positive effect on per capita real GDP in egalitarian democracies, but a negative effect in the other cases. Also, the interaction term between grants to GDP ratio and guerrilla warfares has a significant (at 5%) negative effect. Similarly, the interaction between government crises and grants also has a negative significant (at 1%) effect. Thus, both government crises and guerrilla warfares reinforce the negative effect of grants on per capita real GDP. Counter-intuitively, the effect of the interaction terms, $govcrise\_loans$ and $purges\_grants$ is positive and significant at 5% and 10%, respectively.

Table 3.3: Estimations for the global sample

	OLS	FE	GMM	BC-LSDV	BC-LSDV-ODAGDP
L.lrgdpna	0.9582***	0.7599***	0.8782***	0.8390***	0.8398***
	(0.0061)	(0.0186)	(0.0460)	(0.0196)	(0.0199)
growth_pop	-0.0013	-0.0002	-0.0031	0.0005	0.0007
	(0.0019)	(0.0015)	(0.0062)	(0.0016)	(0.0016)
csh_i	0.2016***	0.1922***	0.2433	0.1656***	0.1690***
	(0.0524)	(0.0618)	(0.2241)	(0.0629)	(0.0625)
csh_g	0.0190	-0.0180	0.0044	-0.0238	-0.0279
	(0.0784)	(0.0673)	(0.2032)	(0.0784)	(0.0758)
csh_xm	0.0564***	0.1756***	0.0031	0.1691***	0.1690***
	(0.0146)	(0.0285)	(0.1379)	(0.0275)	(0.0273)
grants_gdp	-0.0043	-0.0165**	-0.0259	-0.0133*	
	(0.0097)	(0.0072)	(0.0354)	(0.0078)	
loans_gdp	-0.0260	-0.0023	-0.0453	-0.0041	
	(0.0210)	(0.0161)	(0.0728)	(0.0165)	
v2x_egaldem	0.0738**	-0.0303	0.0546	-0.0456	-0.0390
	(0.0295)	(0.0615)	(0.1843)	(0.0542)	(0.0539)
riots	0.0021	-0.0008	0.0075	-0.0013	-0.0016
	(0.0015)	(0.0026)	(0.0092)	(0.0028)	(0.0024)
guerrilla	0.0002	0.0008	-0.0046	0.0011	0.0015*
	(0.0009)	(0.0011)	(0.0077)	(0.0011)	(0.0008)
govcrise	-0.0123	-0.0289*	-0.0359	-0.0278	-0.0083
	(0.0231)	(0.0172)	(0.0701)	(0.0182)	(0.0173)
purges	0.0349	-0.0020	0.1957	-0.0019	-0.0198
	(0.0306)	(0.0294)	(0.2119)	(0.0287)	(0.0261)
egaldem_grantsgdp	0.0025	0.0402**	0.0582	0.0388*	
	(0.0239)	(0.0197)	(0.1032)	(0.0220)	
egaldem_loansgdp	0.0540	0.0164	0.1002	0.0330	
	(0.0496)	(0.0526)	(0.2007)	(0.0572)	
riots_grantsgdp	-0.0017	-0.0028	0.0104	-0.0016	

	(0.0029)	(0.0027)	(0.0155)	(0.0030)	
riots_loansgdp	-0.0111	-0.0078	-0.0659	-0.0073	
	(0.0108)	(0.0127)	(0.0553)	(0.0114)	
guerrilla_grantsgdp	-0.0035***	-0.0030**	-0.0089	-0.0029**	
	(0.0012)	(0.0012)	(0.0083)	(0.0012)	
guerrilla_loansgdp	0.0085	0.0015	0.0510	0.0005	
	(0.0078)	(0.0089)	(0.0641)	(0.0087)	
govcrise_grantsgdp	-0.0471***	-0.0412***	-0.0644	-0.0431***	
	(0.0165)	(0.0072)	(0.0405)	(0.0079)	
govcrise_loansgdp	0.0593	0.0928**	0.2139	0.0940**	
	(0.0768)	(0.0445)	(0.2159)	(0.0457)	
purges_grantsgdp	0.0194	0.0218*	-0.0004	0.0222*	
	(0.0277)	(0.0131)	(0.0940)	(0.0134)	
purges_loansgdp	-0.1282	-0.0854	-0.5252	-0.0899	
	(0.0997)	(0.0672)	(0.4980)	(0.0810)	
ODA_GDP					-0.0112***
					(0.0040)
egaldem_odagdp					0.0362***
					(0.0118)
riots_odagdp					-0.0019
					(0.0023)
guerrilla_odagdp					-0.0026***
					(0.0006)
govcrise_odagdp					-0.0363***
					(0.0072)
purges_odagdp					0.0104
					(0.0096)
_cons	0.3299***	2.0673***			
	(0.0501)	(0.1653)			
N	979	979	979	979	979
AIC	-1380.1122	-1751.8969	.	.	.
Log-lklhd	724.0561	909.9485			
R-squared	0.9878	0.8813			
F-stat.	3200.9909	191.6128	.		

RMSE	0.1176	0.1024			
T		10.4149	10.4149		
Groups		94.0000	94.0000	94.0000	94.0000
hansenp			0.1455		
j			84.0000		
ar1p			0.0002		
ar2p			0.6120		

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Going by the numbers, aid grants is the biggest component of foreign aid to SSA (figure 3.8). Thus, its effect is expected to be stronger for the SSA case, at least when conditioned on institutional quality.

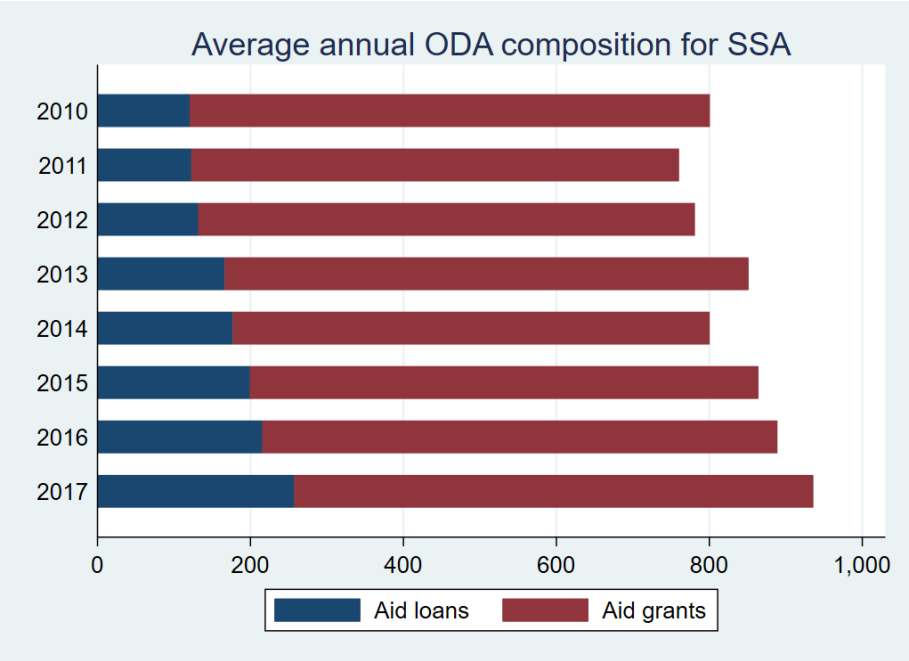

Figure 3.8: Aid composition in SSA (Million USD): 2010-2017
Source: Own computations.

For the case of developing countries (table 3.4), the BC-LSDV does well in terms of addressing the Nickel bias and its results look much better compared to GMM results. In the BC-LSDV model with aggregated aid, results show that the lag of the log of per capita real GDP ($L.lrgdpna$) and the share of trade in GDP (csh_xm) have a positive significant (at 1%) effect on the log of per capita real GDP. The share of investment in real GDP (csh_i) also has a positive significant effect (at 5%) while population growth ($growth\_pop$) has a positive significant effect at 10% and this could be due to the benefits related to the demographic dividend (Misra, 2015). ODA_GDP has a negative effect, just like in the global sample, but is now significant at 5%. The negative coefficient on ODA_GDP may be due to the fact that the developing countries with the highest per capita real GDP are not the ones with the highest ODA (% of GDP). Similar to results obtained using the global sample, $egaldem\_odagdp$ has a

positive effect, though significant at 5%. Also, for reasons already mentioned above, $guerrilla\_odagdp$ and $govcrise\_odagdp$ have a negative significant (at 1%) effect on per capita real GDP in developing countries.

In the model with disaggregated aid, $L.lrgdpna$ and csh_xm have a positive and significant (at 1%) effect on per capita real GDP while csh_i has a positive and significant effect at 5%. Regarding the variables of interest, each of the aid components (i.e. grants and loans) has a negative but insignificant effect. Though none of the institutional variables is significant, some interaction terms are significant. As expected, $guerrilla\_grantsgdp$ and $govcrise\_grantsgdp$ have a negative and significant effect, at 5% and 1%, respectively. Thus, guerrilla warfares and government crises impede the effectiveness of aid grants in developing countries. Just like in the global sample, $govcrise\_loansgdp$ has a counter-intuitive positive effect on per capita income, though it is significant only at 10%.

Table 3.4: Estimations for the developing countries

	OLS	FE	GMM	BC-LSDV	BC-LSDV-ODA
L.lrgdpna	0.9604***	0.7705***	0.8788***	0.8538***	0.8543***
	(0.0068)	(0.0195)	(0.0691)	(0.0189)	(0.0185)
growth_pop	-0.0007	0.0018	-0.0049	0.0026	0.0029*
	(0.0022)	(0.0017)	(0.0050)	(0.0017)	(0.0017)
csh_i	0.2504***	0.1976***	0.2460	0.1737**	0.1750**
	(0.0585)	(0.0688)	(0.2239)	(0.0783)	(0.0757)
csh_g	0.0695	-0.0020	0.0924	-0.0125	-0.0186
	(0.0748)	(0.0723)	(0.2824)	(0.0796)	(0.0767)
csh_xm	0.0562**	0.2033***	0.2056*	0.1988***	0.1990***
	(0.0220)	(0.0332)	(0.1065)	(0.0361)	(0.0358)
grants_gdp	-0.0032	-0.0166**	-0.0556	-0.0119	
	(0.0103)	(0.0074)	(0.0591)	(0.0090)	
loans_gdp	-0.0326	-0.0037	-0.0941	-0.0058	
	(0.0224)	(0.0166)	(0.1235)	(0.0178)	
v2x_egaldem	0.0219	-0.0877	-0.1087	-0.0811	-0.0702
	(0.0339)	(0.0728)	(0.3775)	(0.0809)	(0.0745)
riots	0.0019	-0.0004	0.0032	-0.0012	-0.0015
	(0.0016)	(0.0027)	(0.0133)	(0.0029)	(0.0023)
guerrilla	0.0001	0.0006	0.0019	0.0010	0.0015
	(0.0009)	(0.0011)	(0.0047)	(0.0014)	(0.0009)
govcrise	-0.0077	-0.0277	0.0876	-0.0275	-0.0033

	(0.0269)	(0.0198)	(0.0976)	(0.0173)	(0.0148)
purges	0.0321	-0.0020	-0.0933	-0.0033	-0.0237
	(0.0297)	(0.0300)	(0.2563)	(0.0326)	(0.0299)
egaldem_grantsgdp	-0.0002	0.0423**	0.0937	0.0374	
	(0.0255)	(0.0204)	(0.1599)	(0.0262)	
egaldem_loansgdp	0.0866	0.0320	0.1903	0.0506	
	(0.0546)	(0.0544)	(0.3699)	(0.0657)	
riots_grantsgdp	-0.0029	-0.0028	0.0179	-0.0016	
	(0.0032)	(0.0028)	(0.0272)	(0.0033)	
riots_loansgdp	-0.0085	-0.0088	-0.0408	-0.0086	
	(0.0113)	(0.0131)	(0.0983)	(0.0136)	
guerrilla_grantsgdp	-0.0037***	-0.0031**	0.0023	-0.0029**	
	(0.0011)	(0.0012)	(0.0095)	(0.0014)	
guerrilla_loansgdp	0.0092	0.0029	-0.0177	0.0009	
	(0.0078)	(0.0090)	(0.0495)	(0.0113)	
govcrise_grantsgdp	-0.0475***	-0.0390***	-0.0588	-0.0416***	
	(0.0164)	(0.0074)	(0.0436)	(0.0088)	
govcrise_loansgdp	0.0639	0.0988**	0.1429	0.1007*	
	(0.0785)	(0.0461)	(0.3373)	(0.0536)	
purges_grantsgdp	0.0214	0.0223*	0.1029	0.0227	
	(0.0272)	(0.0133)	(0.1239)	(0.0150)	
purges_loansgdp	-0.1353	-0.0950	-0.1980	-0.0992	
	(0.0970)	(0.0683)	(0.5397)	(0.0850)	
ODA_GDP					-0.0104**
					(0.0047)
egaldem_odagdp					0.0378**
					(0.0165)
riots_odagdp					-0.0020
					(0.0023)
guerrilla_odagdp					-0.0026***
					(0.0006)
govcrise_odagdp					-0.0349***

					(0.0062)
purges_odagdp					0.0104
					(0.0098)
_cons	0.3199***	1.9325***			
	(0.0558)	(0.1714)			
N	858	858	858	858	858
AIC	-1197.6229	-1503.3182	.	.	.
Log-lklhd	632.8115	785.6591			
R-squared	0.9848	0.8824			
F-stat.	2571.2662	169.8140	.		
RMSE	0.1181	0.1038			
T		11.0000	11.0000		
Groups		78.0000	78.0000	78.0000	78.0000
hansenp			0.6699		
j			67.0000		
ar1p			0.0120		
ar2p			0.1044		

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Since the BC-LSDV model is more robust for developing countries, we estimate BC-LSDV models for Low Income Countries (LICs), Low and Middle Income Countries (LMICs), as well as Upper Middle Income Countries (UMICs) and results are presented in table 3.5. Again, we present results for both cases: the model with aggregated aid and disaggregated aid data, respectively.

The BC-LSDV estimation results with aggregated aid data show that for the case of Low Income Countries (LICs), $L.lrgdpna$ and $growth\_pop$ have a positive significant (at 1%) effect on per capita income while csh_i and csh_xm have a positive significant effect at 5%. Total official development assistance as a % of GDP (ODA_GDP) has a positive but insignificant effect in LICs. As expected, guerrilla warfare has a negative significant effect at 10%. The $govcrise\_odagdp$ interaction term between govcrise and oda_gdp has a negative significant (at 1%) effect, implying that government crises hinder aid effectiveness in LICs.

The results from the BC-LSDV model with disaggregated aid shows that for the case of LICs, the effect of $L.lrgdpna$ and $growth\_pop$ on real per capita GDP is positive and significant at 1%. Though positive, the effect of csh_i and csh_xm is significant at 5%. Aid variables have opposite effects, with grants having a positive but insignificant effect and loans having a negative significant (at 10%) effect. Among the institutional variables, only guerrilla is significant (at 5%) and it has a negative effect. Among the interaction terms, $govcrise\_grantsgdp$ has a negative significant effect (at 1%), implying that government crises have hindered the effective use of aid grants to promote economic growth in LICS. As in the case for the global sample, $govcrise\_loansgdp$ has a counter-intuitive positive significant (at 5%) effect for the case of LICs.

Using aggregated data, the BC-LSDV estimation results for the Low Middle Income Countries (LMICs) show that $L.lrgdpna$ and csh_xm have a positive and significant (at 1%) effect on per capita income. Unlike in the case of LICs, the effect of ODA_GDP is negative but insignificant for LMICs. Contrary to expectations and unlike for the case of LICs, guerrilla has a positive significant effect at 5%. As expected, government crises have a negative significant effect at 5%. Among the interaction terms, only $guerrilla\_odagdp$ is significant (at 5%) and its effect is negative, implying that guerrilla warfares reduce aid effectiveness among the LMICs.

With disaggregated aid data, the BC-LSDV estimation results for LMICs show that $L.lrgdpna$ and csh_xm have a positive and significant effect (at 1%) on per capita income. The aid variables (i.e. grant and loans) have a negative but insignificant effect. However, guerrilla warfares have a counter-intuitive positive and significant effect at 5%. Conversely, the effect of government crises is negative and significant at 5%. None of the interaction terms between institutional variables and aid variables is significant. The BC-LSDV model results with aggregated aid for the case of UMICs show that $L.lrgdpna$ has a positive significant effect at 1%. Population growth ($growth\_pop$) has a negative and significant effect at 5% and this could be due to the fact that high population growth can exert pressures on available resources, leading to the shortfall in both public and private capital formation. High population growth may also imply diverting resources from capital accumulation to capital maintenance (Easterlin, 1967). In addition, csh_xm has a positive and significant effect, also at 5%. The effect of ODA_GDP is negative and significant at 5%, implying that foreign aid is harmful for growth in UMICs. While none of the institutional variables is significant, the only interaction term that is significant (at 5%) is $egaldem\_odagdp$ and it has a positive effect on per capita income, implying that egalitarian democracy is welfare enhancing by making aid more effective.

Using disaggregated data, BC-LSDV estimation results point to the fact that $L.lrgdpna$ and csh_xm have a positive and significant effect (at 1%) on per capita income in UMICs. Just like in the case for aggregated data, the effect of population growth is negative and significant at 5%. The aid variables have opposite effects: $grants\_gdp$ has a negative and significant effect (at 5%) while $loans\_gdp$ have a positive but insignificant effect. While none of the institutional variables is significant, the only interaction term that is significant is $egaldem\_grantsgdp$, with a positive and significant (at 10%) effect on per capita income.

Interestingly, the results for grants, in table 3.5, vary with income groups. The coefficient on $grants\_gdp$ is positive and insignificant for LICs, negative and insignificant for LMICs and negative and significant for the case of UMICs. This could be related to the fact that the best performing countries in terms of GDP may be the ones receiving small grants (% of GDP).

Table 3.5: Estimations per selected income group

	LICs	LMICs	UMICs	LICs-ODA	LMICs-ODA	UMICs-ODA
L.lrgdpna	0.893***	0.868***	0.875***	0.896***	0.868***	0.885***
	(0.043)	(0.030)	(0.051)	(0.045)	(0.030)	(0.050)
growth_pop	0.011***	-0.005	-0.010**	0.011***	-0.005	-0.011**
	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)
csh_i	0.409**	0.059	0.034	0.368**	0.060	0.087
	(0.173)	(0.068)	(0.243)	(0.183)	(0.067)	(0.234)
csh_g	-0.157	0.066	-0.122	-0.140	0.063	-0.173
	(0.184)	(0.101)	(0.201)	(0.194)	(0.099)	(0.204)
csh_xm	0.261**	0.124***	0.210***	0.279**	0.122***	0.196**
	(0.116)	(0.032)	(0.078)	(0.120)	(0.031)	(0.078)
grants_gdp	0.016	-0.007	-0.160**			
	(0.012)	(0.009)	(0.069)			
loans_gdp	-0.047*	-0.007	0.045			
	(0.028)	(0.022)	(0.159)			
v2x_egaldem	-0.055	-0.093	-0.106	-0.019	-0.076	-0.100
	(0.204)	(0.077)	(0.185)	(0.196)	(0.071)	(0.187)
riots	-0.004	-0.003	0.003	-0.004	-0.003	0.006
	(0.017)	(0.003)	(0.013)	(0.017)	(0.002)	(0.009)
guerrilla	-0.015**	0.004**	-0.001	-0.010*	0.003**	0.001
	(0.006)	(0.002)	(0.007)	(0.006)	(0.001)	(0.006)
govcrise	-0.031	-0.065**	-0.054	0.042	-0.049**	-0.070
	(0.060)	(0.027)	(0.044)	(0.047)	(0.023)	(0.044)
purges	0.063	-0.000	-0.033	0.027	-0.006	-0.052
	(0.129)	(0.028)	(0.081)	(0.107)	(0.028)	(0.075)
egaldem_grantsgdp	-0.027	0.015	0.353*			
	(0.046)	(0.024)	(0.209)			
egaldem_loansgdp	0.159	0.017	0.066			
	(0.165)	(0.055)	(0.572)			
riots_grantsgdp	-0.004	0.002	-0.029			

	(0.004)	(0.009)	(0.043)			
riots_loansgdp	-0.004	-0.005	-0.006			
	(0.020)	(0.017)	(0.122)			
guerrilla_grantsgdp	-0.002	-0.006	-0.006			
	(0.002)	(0.008)	(0.045)			
guerrilla_loansgdp	0.016	-0.017	0.028			
	(0.015)	(0.012)	(0.073)			
govcrise_grantsgdp	-0.059***	-0.022	0.100			
	(0.011)	(0.034)	(0.153)			
govcrise_loansgdp	0.172**	0.152	-0.139			
	(0.074)	(0.110)	(0.364)			
purges_grantsgdp	-0.009	-0.019	0.141			
	(0.022)	(0.039)	(0.208)			
purges_loansgdp	-0.109	0.015	-0.131			
	(0.149)	(0.083)	(0.448)			
ODA_GDP				0.002	-0.007	-0.087**
				(0.008)	(0.005)	(0.035)
egaldem_odagdp				0.012	0.014	0.239**
				(0.034)	(0.013)	(0.118)
riots_odagdp				-0.002	-0.000	-0.030
				(0.004)	(0.004)	(0.022)
guerrilla_odagdp				-0.001	-0.009**	0.000
				(0.001)	(0.005)	(0.030)
govcrise_odagdp				-0.046***	0.015	0.068
				(0.009)	(0.013)	(0.090)
purges_odagdp				-0.015	-0.001	0.118
				(0.022)	(0.018)	(0.147)
N	267	298	293	267	298	293
Groups	24.000	26.000	28.000	24.000	26.000	28.000

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In developing Africa (table 3.6) the BC-LSDV beats the GMM in terms of correcting for the Nickel bias but also yields better results. The BC-LSDV estimation results with aggregated aid show that $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive and significant (at 1%) effect on per capita income in the sample of developing African countries. ODA_GDP has a negative but insignificant effect. Among the institutional variables, only guerrilla has a significant effect, but with a counter-intuitive positive coefficient. The interaction term (govcrise_oda) between govcrise and ODA has a negative significant (at 1%) effect, implying that government crises reduce aid effectiveness in developing Africa.

Regarding the BC-LSDV model with disaggregated aid, $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive and significant (at 1%) effect. Aid variables have opposite but statistically insignificant effects, with $grants\_gdp$ having a positive effect and $loans\_gdp$ having a negative effect. In addition, government crisis (govcrise) has a negative significant effect (at 1%) and the interaction term, $govcrise\_grants$, is also negative and significant at 1%. Thus, government crises clearly hamper the effectiveness of grants in developing countries. As in previous estimations, $govcrise\_loans$ has a positive significant (at 1%), which is an unexpected and counter-intuitive result.

Table 3.6: Estimations for the developing African countries

	OLS	FE	GMM	BC-LSDV	BC-LSDV-ODA
L.lrgdpna	0.965***	0.812***	0.992***	0.897***	0.890***
	(0.010)	(0.026)	(0.347)	(0.030)	(0.029)
growth_pop	0.006*	0.008***	0.015	0.009***	0.010***
	(0.003)	(0.002)	(0.022)	(0.003)	(0.003)
csh_i	0.127	0.157*	0.210	0.126	0.152
	(0.082)	(0.087)	(3.284)	(0.106)	(0.105)
csh_g	0.059	-0.122	1.240	-0.083	-0.074
	(0.085)	(0.092)	(2.223)	(0.093)	(0.097)
csh_xm	0.148***	0.328***	0.090	0.326***	0.321***
	(0.048)	(0.054)	(0.669)	(0.058)	(0.058)
grants_gdp	0.012	-0.000	0.161	0.006	
	(0.011)	(0.009)	(0.174)	(0.010)	
loans_gdp	-0.043	-0.020	-0.482	-0.026	
	(0.029)	(0.021)	(0.516)	(0.023)	
v2x_egaldem	0.068	-0.013	-0.838	-0.019	0.011
	(0.063)	(0.116)	(1.791)	(0.124)	(0.110)
riots	0.002	-0.007	-0.038	-0.008	-0.007
	(0.003)	(0.007)	(0.062)	(0.009)	(0.007)
guerrilla	0.000	0.002	-0.005	0.002	0.002*

	(0.001)	(0.002)	(0.018)	(0.002)	(0.001)
govcrise	-0.109*	-0.096**	0.000	-0.094*	0.015
	(0.058)	(0.046)	(0.857)	(0.057)	(0.045)
purges	0.074*	0.079	0.752	0.082	0.052
	(0.039)	(0.056)	(0.678)	(0.053)	(0.051)
egaldem_grantsgdp	-0.037	0.004	-0.382	-0.009	
	(0.030)	(0.025)	(0.482)	(0.031)	
egaldem_loansgdp	0.115	0.060	1.913	0.098	
	(0.099)	(0.089)	(2.064)	(0.093)	
riots_grantsgdp	-0.009**	-0.007	0.153	-0.006	
	(0.004)	(0.004)	(0.144)	(0.005)	
riots_loansgdp	0.013	0.010	-0.300	0.011	
	(0.015)	(0.019)	(0.361)	(0.021)	
guerrilla_grantsgdp	-0.000	0.000	0.008	0.000	
	(0.002)	(0.002)	(0.038)	(0.002)	
guerrilla_loansgdp	0.004	-0.003	0.080	-0.005	
	(0.008)	(0.011)	(0.176)	(0.011)	
govcrise_grantsgdp	-0.060***	-0.053***	-0.247	-0.056***	
	(0.007)	(0.009)	(0.197)	(0.009)	
govcrise_loansgdp	0.217***	0.210***	-0.462	0.216***	
	(0.069)	(0.056)	(1.221)	(0.058)	
purges_grantsgdp	-0.023	-0.024	-0.524	-0.026	
	(0.021)	(0.016)	(0.387)	(0.018)	
purges_loansgdp	-0.059	-0.060	-0.122	-0.061	
	(0.064)	(0.079)	(1.278)	(0.087)	
ODA_GDP					-0.004
					(0.005)
egaldem_odagdp					0.019
					(0.015)
riots_odagdp					-0.001
					(0.003)
guerrilla_odagdp					-0.001

					(0.001)
govcrise_odagdp					-0.040***
					(0.009)
purges_odagdp					-0.018
					(0.015)
_cons	0.225***	1.414***			
	(0.080)	(0.223)			
N	446	446	446	446	446
AIC	-638.186	-819.556	.	.	.
Log-lklhd	353.093	443.778			
R-squared	0.985	0.897			
F-stat.	1293.829	97.823	.		
RMSE	0.114	0.098			
T		10.878	10.878		
Groups		41.000	41.000	41.000	41.000
hansenp			0.870		
j			38.000		
ar1p			0.099		
ar2p			0.969		

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Just like for the African case, the Nickel bias is better addressed by the BC-LSDV model for the Sub-Saharan case (table 3.7). Once again, we focus on the BC-LSDV estimation results with aggregated and disaggregated aid, respectively. Estimation results from the BC-LSDV model with aggregated aid show that $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive and significant (at 1%) effect on per capita real GDP in the developing Sub-Saharan African countries' sample. Though positive, the effect of csh_i is significant at 10%. The variable of interest, ODA_GDP has a negative but insignificant effect. Since $govcrise\_odagdp$ has a negative significant (at 1%) effect, government crises hinder aid effectiveness in SSA.

The findings from the model with disaggregated aid are that $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive and significant (at 1%) effect. Aid variables have opposite albeit statistically insignificant effect on per capita income in SSA, with $grants\_gdp$ and $loans\_gdp$ having a positive and negative effect, respectively. The interaction term, $govcrise\_grantsgdp$, has a negative significant (at 1%) effect, implying that the effect of grants is negative in situations characterized by government crises. Conversely, the effect of $govcrise\_loansgdp$ is unexpectedly positive and significant at 1%.

Table 3.7: Estimations for SSA Countries

	OLS	FE	GMM	BC-LSDV	BC-LSDV-ODA
L.lrgdpna	0.950***	0.822***	0.926*	0.912***	0.901***
	(0.011)	(0.028)	(0.461)	(0.031)	(0.032)
growth_pop	0.009**	0.008***	0.004	0.010***	0.010***
	(0.004)	(0.002)	(0.023)	(0.002)	(0.002)
csh_i	0.113	0.156	0.298	0.134	0.170*
	(0.093)	(0.095)	(0.780)	(0.087)	(0.090)
csh_g	0.019	-0.145	-0.101	-0.112	-0.099
	(0.091)	(0.099)	(0.683)	(0.102)	(0.099)
csh_xm	0.194***	0.327***	-0.116	0.324***	0.314***
	(0.051)	(0.057)	(0.713)	(0.060)	(0.062)
grants_gdp	0.017	0.002	0.216	0.010	
	(0.012)	(0.010)	(0.342)	(0.011)	
loans_gdp	-0.041	-0.023	-0.540	-0.030	
	(0.030)	(0.023)	(0.790)	(0.025)	
v2x_egaldem	0.175**	0.002	-0.193	-0.001	0.009
	(0.075)	(0.138)	(1.431)	(0.138)	(0.130)
riots	0.008*	0.003	-0.007	0.001	0.004
	(0.005)	(0.017)	(0.054)	(0.015)	(0.014)
guerrilla	0.000	0.002	-0.006	0.002	0.003
	(0.001)	(0.002)	(0.015)	(0.002)	(0.002)
govcrise	-0.112	-0.113*	0.196	-0.098	0.044
	(0.091)	(0.062)	(0.612)	(0.063)	(0.058)
purges	0.110**	0.073	0.712	0.076	0.044
	(0.043)	(0.062)	(0.963)	(0.057)	(0.058)
egaldem_grantsgdp	-0.051	-0.001	-0.582	-0.017	
	(0.032)	(0.027)	(0.914)	(0.032)	
egaldem_loansgdp	0.098	0.072	1.869	0.118	
	(0.105)	(0.095)	(3.143)	(0.102)	
riots_grantsgdp	-0.010**	-0.008	0.035	-0.008	
	(0.004)	(0.005)	(0.161)	(0.006)	

riots_loansgdp	0.012	0.010	-0.162	0.013	
	(0.018)	(0.023)	(0.591)	(0.024)	
guerrilla_grantsgdp	0.001	-0.000	-0.047	-0.000	
	(0.002)	(0.002)	(0.061)	(0.002)	
guerrilla_loansgdp	-0.002	-0.001	0.172	-0.002	
	(0.010)	(0.012)	(0.198)	(0.008)	
govcrise_grantsgdp	-0.062***	-0.052***	-0.237	-0.056***	
	(0.009)	(0.010)	(0.203)	(0.012)	
govcrise_loansgdp	0.245***	0.225***	-0.308	0.227***	
	(0.082)	(0.062)	(1.814)	(0.066)	
purges_grantsgdp	-0.035	-0.023	0.039	-0.024	
	(0.023)	(0.018)	(0.557)	(0.021)	
purges_loansgdp	-0.057	-0.065	-0.733	-0.069	
	(0.068)	(0.084)	(1.864)	(0.082)	
ODA_GDP					-0.003
					(0.006)
egaldem_odagdp					0.018
					(0.020)
riots_odagdp					-0.003
					(0.004)
guerrilla_odagdp					-0.001
					(0.001)
govcrise_odagdp					-0.043***
					(0.009)
purges_odagdp					-0.018
					(0.018)
_cons	0.272***	1.299***			
	(0.085)	(0.237)			
N	399	399	399	399	399
AIC	-559.476	-695.688	.	.	.
Log-lklhd	313.738	381.844			
R-squared	0.983	0.892			
F-stat.	877.911	82.077	.		
RMSE	0.115	0.102			

T	10.784	10.784		
Groups	37.000	37.000	37.000	37.000
hansenp		0.915		
j		36.000		
ar1p		0.105		
ar2p		0.092		

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

To investigate whether the effect of foreign aid (and each of its components) has a non-linear effect on per capita income in developing Sub-Saharan African countries, we estimate a dynamic panel threshold model with endogeneous regressors, based on Amadou (2020). We present results in table 3.8 for the three cases depending on which threshold variable (ODA_GDP, $grants\_gdp$ and $loans\_gdp$) is used. We select the models based on the criterion that the number of instruments (j) should be less or equal to the number of groups (Barajas, Chami, & Yousefi, 2013). The threshold value (gammahat) is a cut-off point that separates the lower regime from the upper regime, with the latter corresponding to higher values (i.e. above the estimated threshold) of the threshold variable.

When ODA is used as a threshold variable, the lag of per capita GDP positively and significantly (at 1%) affects per capita GDP. Egalitarian democracy ($v2x\_egaldem$) has a positive significant (at 10%) effect. Important to note is the fact that the threshold for Official Development Assistance (ODA) is around 0.47% of GDP, with a lower limit of 0.46% and an upper limit of 8.15%. Estimation results show that foreign aid (ODA_GDP) has a positive but insignificant effect, below (i.e. $below\_thres\_enr$) and above (i.e. $above\_thres\_enr$) the threshold. However, the effect of ODA_GDP is stronger when it is below the threshold. Thus, the linearity test statistic (**SupWstar =6.623**) is significant at 1%, which leads to the rejection of the null hypothesis of no threshold effects. Therefore, ODA_GDP has a non-linear effect on real GDP per capita in Sub-Saharan Africa. In addition, the interaction term ($govcrise\_odagdp$) between government crisis and ODA_GDP has a negative and statistically significant (at 5%) effect, implying that government crises have detrimental effects on aid effectiveness in SSA.

Table 3.8: Threshold models for Sub-Saharan Africa

	threshold_ODA	threshold_grants	threshold_loans
L.lrgdpna	0.866***	0.914***	0.920***
	(0.14)	(0.07)	(0.07)
below_thres_enr	0.071	-0.645	-0.039
	(0.71)	(1.04)	(3.46)
above_thres_enr	0.055	0.102	0.115
	(0.04)	(0.08)	(0.20)
growth_pop	0.013	0.020	0.023*

	(0.01)	(0.01)	(0.01)
csh_i	0.413	-0.272	0.555
	(0.92)	(0.80)	(0.68)
csh_g	-0.322	-1.194	-0.711
	(0.64)	(0.81)	(0.60)
csh_xm	0.331	0.378	0.159
	(0.33)	(0.36)	(0.32)
v2x_egaldem	0.918*	1.055	0.403
	(0.52)	(1.07)	(0.76)
riots	0.028	-0.035	0.042
	(0.10)	(0.12)	(0.13)
guerrilla	0.009	0.032	-0.003
	(0.03)	(0.07)	(0.06)
govcrise	0.044	-0.069	-0.897**
	(0.45)	(0.40)	(0.42)
purges	0.372	1.008	0.044
	(1.03)	(1.12)	(1.21)
egaldem_odagdp	-0.158		
	(0.12)		
riots_odagdp	-0.051		
	(0.06)		
guerrilla_odagdp	-0.000		
	(0.01)		
govcrise_odagdp	-0.086**		
	(0.03)		
purges_odagdp	0.050		
	(0.24)		
egaldem_grantsgdp		-0.249	
		(0.22)	
riots_grantsgdp		-0.084**	
		(0.04)	
guerrilla_grantsgdp		-0.000	

		(0.02)	
govcrise_grantsgdp		-0.119***	
		(0.03)	
purges_grantsgdp		-0.158	
		(0.35)	
egaldem_loansgdp			-0.294
			(0.84)
riots_loansgdp			-0.101
			(0.15)
guerrilla_loansgdp			0.020
			(0.07)
govcrise_loansgdp			0.201
			(0.60)
purges_loansgdp			0.413
			(1.47)
_cons	0.588	0.356	0.339
	(1.15)	(0.54)	(0.40)
SupWstar	6.623***	7.624***	5.566***
	(1.770)	(2.524)	(1.754)
P>|z|	0.000	0.003	0.002
N	399	405	399
T	10.784	10.946	10.784
Groups	37	37	37
j	33	33	33
gammahat	0.467	0.343	0.143
lowbgamma	0.460	0.327	0.082
uppbgamma	8.150	6.440	1.807

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

When $grants\_gdp$ is used as a threshold variable, the lag of per capita GDP has a positive and significant (at 1%) effect. The threshold for aid grants is estimated at 0.34% of GDP, ranging between 0.33% and 6.44%. Though statistically insignificant, the threshold variable has a negative and positive effect below and above the threshold, respectively. These findings could be an indication that there is need to upscale the disbursement of aid grants to Sub-Saharan African countries. Regarding the linearity test, the test statistic is 7.624 and it is significant at 1%, which leads to the rejection of the null hypothesis of no threshold effects. Thus, grants have a non-linear effect on real GDP per capita in Sub-Saharan

Africa. The interaction terms ($riots\_grantsgdp$ and $govcrise\_grantsgdp$) indicate that riots and government crises hinder the effectiveness of aid grants in SSA, respectively.

Using $loans\_gdp$ as the threshold, the estimated threshold of aid loans is 0.143% of GDP, with a lower value of 0.082% and an upper value of 1.81%. The test of linearity shows that we reject the null hypothesis of no threshold effect at 1%. Thus, loans (as % of GDP) have a non-linear effect on real GDP per capita. Though statistically insignificant, aid loans (as % of GDP) have a negative effect when below the threshold and a positive effect when above the threshold, perhaps pointing to the need to increase loan disbursements to SSA. Estimation results also show that $L.lrgdpna$ has a significant (at 1%) positive effect on per capita real GDP. While $growth\_pop$ also has a positive effect, it is only significant at 10%. As expected, the direct effect of government crises is negative and significant at 5%.

To estimate the threshold value of institutional quality below and above which the effect of foreign aid (and other variables) on per capita income may vary, we follow the approach by Abate (2022) where a dynamic panel threshold model developed by Seo et al. (2019) with endogenous regressors is estimated. This model enables, among other things, the estimation of the threshold value for each of the institutional variables and also separates regression results between the upper and lower regimes. Since we have five institutional variables, we will estimate five models for each of the three aid variables. As in Abate (2022), we estimate simple models in which the main drivers[18] of per capita income are included and then threshold variables and their corresponding interaction terms are added in alternating order. In this model, the estimated threshold is given by r while the p-value related with the linearity test is given by "$boots\_p$". Also, variables with the suffix "$\_b$" pertain to the lower regime while those with the "$\_d$" suffix correspond to the upper regime. For $v2x\_egaldem$, the lower (upper) regime corresponds to low (high) institutional quality. For riots, purges, guerrilla and govcrise[19], the upper regime corresponds to poor institutional quality and vice-versa.

Table 3.9 presents estimation results for the models with aggregated ODA (% of GDP). When the variable "purges" is used as the threshold, the threshold value (r) is estimated at 0.33 and is significant at 1%. Since $boots\_p = 0.000$, we reject (at 1%) the null hypothesis of no threshold effect. Thus, the effect of purges on per capita income is non-linear. Despite being negative in both the upper and lower thresholds, the effect of purges is only significant (at 1%) in the upper regime. Thus, poor institutional quality as reflected in the increased number of purges has a negative significant effect on per capita income. One implication of this is that the effect of ODA_GDP may vary across the two regimes. Indeed, ODA_GDP has a negative but insignificant effect in the lower regime while it has a negative and significant (at 1%) effect in the upper regime. In absolute terms, the effect of ODA_GDP is also stronger in the upper regime. In the lower regime, $L.lrgdpna$ has a positive significant (at 10%) on per capita income while the effect of $purges\_odagdp$ is positive and statistically insignificant. In the upper regime, $purges\_odagdp$ has a positive and significant effect, though it is not high enough to cancel out the negative individual effects of purges and ODA_GDP. Additionally, csh_xm has a significant (at 1%) positive effect. In short, in addition to having a negative effect on per capita income, bad institutions also make the individual effect of ODA_GDP negative.

Using $V2x\_egaldem$ as the threshold variable, the threshold value is estimated at 0.465 and is significant at 1%. The non-linearity test shows that $V2x\_egaldem$ has a non-linear effect on per capita

[18]For our case, these are: $L.lrgdpna$, $lpop$, csh_i, csh_g, csh_xm, and a given aid variable (which is one of: ODA_GDP, $grants\_gdp$ and $loans\_gdp$).

[19]This is because, these are defined as number of riots, purges, guerrilla warfares and government crises, respectively.

income. As mentioned above, the upper regime corresponds to good institutional quality with more egalitarian democracy and vice-versa. In the lower regime, $V2x\_egaldem\_b$ has a significant (at 5%) strong negative effect. In the upper regime, the effect of $V2x\_egaldem\_d$ is also negative but statistically insignificant. In the lower regime, $L.lrgdpna$ has a positive significant (at 10%) effect while $lpop$ has a positive effect, significant at 1%. Though insignificant, the effect of ODA_GDP varies across the two regimes, with ODA_GDP_b having a negative effect and ODA_GDP_d having a positive effect.

Results from the panel threshold model using riots as the threshold variable show that when institutional quality is good (i.e. in the lower regime with low incidence of riots), $riots$ have a positive but insignificant effect. The effect of ODA_GDP is negative but statistically insignificant. Also, the interaction between riots and foreign aid (i.e. $riots\_odagdp$) has a negative significant (at 10%) effect, pointing to the fact that riots impede aid effectiveness even when they are at lower levels. The lag of per capita income (L.lrgdpna) also has a positive and statistically significant (at 1%) effect. With bad institutional quality (i.e. in the upper regime), the effect of riots is negative and statistically significant (at 5%) while that of ODA_GDP is negative but insignificant. The interaction term ($riots\_odagdp$) has a counter-intuitive positive significant (at 10%) effect. Nevertheless, the positive effect of $riots\_odagdp$ does not cancel out the overall negative effect of riots on GDP. The threshold value is estimated at 0.34 but is not statistically significant. However, the linearity test shows that riots have a non-linear effect on per capita income in SSA, since $boots\_p = 0.000$.

When the variable "guerrilla" is used as a threshold variable, the upper regime once again corresponds to poor institutional quality and vice-versa. The estimated threshold is 1 and the linearity test shows that guerrilla warfare has a non-linear effect on per capita income in SSA. Though insignificant, the effect of guerrilla is indeed positive in the lower regime and negative in the upper regime. Despite being insignificant, the effect of ODA_GDP is also positive in the lower regime and negative in the upper regime. The effect of the interaction term ($guerrilla\_odagdp$) turns from negative in the lower regime to positive in the upper regime, though insignificant in both cases. In the poor institutions/upper regime, the effect of $L.lrgdpna$ is negative and significant at 1%, implying that frequent guerrilla warfares are quite detrimental since they can progressively lead to the destruction of the economy.

Once $govcrise$ is used to define the threshold, the lower regime corresponds to the regime with good institutions (or fewer government crises) and vice-versa. The estimated threshold is 0.33 and is significant at 1%. Since $bots\_p = 0.000$, we reject the null hypothesis of no threshold effects. Thus, government crises have a non-linear effect on per capita income in SSA. Indeed, the effect of govcrise turns from positive in the lower regime to negative in the upper. However, it is not significant in both regimes. Though insignificant, the effect of ODA_GDP turns from positive in the lower regime to negative in the upper regime. The interaction term $govcrise\_odagdp$ has a negative and statistically significant (at 1%) effect in the lower regime, pointing to the fact that even when at lower levels, government crises hinder aid effectiveness in SSA. In the regime with good institutional quality, $L.lrgdpna$ has a positive significant (at 1%) effect.

Table 3.9: Institutional thresholds for the ODA models

	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna_b	0.798*	0.492*	0.923***	0.702	0.867***
	(0.433)	(0.298)	(0.251)	(0.433)	(0.191)
purges_b	-1.361				
	(6.301)				
purges_odagdp_b	0.217				
	(1.862)				
ODA_GDP_b	-0.00577	-0.0565	-0.00271	0.00135	0.00351
	(0.157)	(0.0361)	(0.0295)	(0.0189)	(0.00731)
lpop_b	0.0340	0.893***	0.188	0.214	0.138
	(0.191)	(0.338)	(0.153)	(0.228)	(0.125)
csh_i_b	1.079	0.151	-0.0940	0.638	0.158
	(1.444)	(0.986)	(1.163)	(1.498)	(0.471)
csh_g_b	0.481	0.794	-0.0863	0.595	0.156
	(0.751)	(0.607)	(0.531)	(4.174)	(0.507)
csh_xm_b	0.248	-0.671	0.0703	0.0987	0.00608
	(1.149)	(0.434)	(0.498)	(0.434)	(0.254)
cons_d	228.0	10.43	0.688	5.093***	614.9
	(207.1)	(7.550)	(3.545)	(1.922)	(435.3)
L.lrgdpna_d	-22.34	-0.483	-0.0223	-0.699***	-55.96
	(15.70)	(0.680)	(0.389)	(0.257)	(38.81)
purges_d	-60.81***				
	(23.09)				
purges_odagdp_d	25.39***				
	(7.938)				
ODA_GDP_d	-50.24***	0.214	-0.0759	-0.0293	-39.35
	(15.44)	(2.087)	(0.129)	(0.134)	(28.69)
lpop_d	-0.927	0.556	-0.0924	0.363	-49.81
	(10.59)	(0.722)	(0.172)	(0.493)	(39.86)
csh_i_d	16.94	3.139	1.966	1.727	1835
	(76.19)	(2.362)	(1.878)	(3.003)	(1411)
csh_g_d	-59.84	9.872	0.713	-6.068	656.3
	(164.0)	(10.25)	(1.151)	(5.296)	(498.1)
csh_xm_d	365.4***	-0.981	-0.415	-0.178	-703.6
	(103.6)	(2.342)	(0.468)	(1.198)	(533.7)
v2x_egaldem_b		-2.518**			
		(1.255)			
egaldem_odagdp_b		0.194			
		(0.149)			
v2x_egaldem_d		-18.13			
		(15.94)			
egaldem_odagdp_d		-0.421			
		(4.223)			

riots_b			0.545		
			(0.397)		
riots_odagdp_b			-0.184*		
			(0.107)		
riots_d			-0.906**		
			(0.434)		
riots_odagdp_d			0.215*		
			(0.128)		
guerrilla_b				0.224	
				(0.188)	
guerrilla_odagdp_b				-0.0180	
				(0.0165)	
guerrilla_d				-0.221	
				(0.190)	
guerrilla_odagdp_d				0.0119	
				(0.0162)	
govcrise_b					0.563
					(0.511)
govcrise_odagdp_b					-0.245***
					(0.0848)
govcrise_d					-190.9
					(135.8)
govcrise_odagdp_d					34.48
					(24.57)
r	0.333***	0.465***	0.340	1	0.333***
	(0.00844)	(0.0498)	(0.615)	(7.122)	(0.000294)
N	28	29	28	28	28
T	13	13	13	13	13
Moments	429	429	429	429	429
boots_p	0.000	0.000	0.000	0.000	0.000

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

We replace ODA_GDP with oda_grants and re-estimate the models. The estimation results are presented in table 3.10. Using the variable "purges" as the threshold variable, the threshold value is estimated at 0.34 and is significant at 1%. The linearity test shows that purges have a non-linear effect on per capita income in SSA. The effect of purges turns from negative in the lower regime (i.e. a regime with good institutional quality) to positive in the upper regime (i.e. a regime with bad institutional quality), though it is statistically insignificant in both regimes. The effect of grants to GDP (i.e. $grants\_gdp$) also turns from a negative and insignificant effect in the lower regime to a positive and significant (at 5%) effect in the upper regime. Though insignificant, the interaction term ($purges\_grantsgdp$), also turns from positive in the lower regime to negative in the upper regime. In the lower regime, $L.lrgdpna$ and $lpop$ have a positive significant effect, at 1% and 5%, respectively, while csh_i has a negative significant effect (at 5%). In the upper regime, the effect of csh_xm is negative and significant (at 1%).

When egalitarian democracy (i.e. $v2x\_egaldem$) is used as a threshold variable, the threshold value is estimated at 0.253 but is not statistically significant. The linearity test shows, with $boots\_p = 0.000$, shows that egalitarian democracy has a non-linear effect on per capita real GDP in SSA. Though insignificant, the effect of $v2x\_egaldem$ turns from negative in the lower regime (i.e. a regime with low egalitarian democracy) to positive in the upper regime. The effect of $grants\_gdp$ is negative but insignificant in both regimes. The interaction term $egaldem\_grantsgdp$ has a positive albeit insignificant effect in the lower regime and a negative insignificant effect in the upper regime. In the lower regime, $L.lrgdpna$, and $lpop$ have a significant positive effect on real per capita GDP, at 5% and 1%, respectively. In the upper regime, all variables are not significant.

Using the variable "riots" as the threshold variable, the lower regime (i.e. below the estimated threshold) corresponds to the case with lower riots and vice-versa. The threshold value is estimated at 0.51 but is statistically insignificant. The linearity test confirms that riots have a non-linear effect on per capita GDP. Below the threshold (i.e. the low incidence of riots), riots have a counter-intuitive positive significant effect on real per capita GDP. The effect of $grants\_gdp$ is negative but insignificant in both regimes. The effect of the interaction term, $riots\_grantsgdp$ turns from negative in the lower regime to positive in the upper regime and is significant in both cases, at 5% and 1% respectively. The significance and sign of $riots\_grantsgdp$ in the lower regime implies that even at lower lower levels, riots impede the effectiveness of grants in SSA. Despite having a counter-intuitive positive effect, the magnitude of the coefficient on $riots\_grantsgdp$ in the upper regime is not big enough to cancel out the individual negative effect of riots on per capita real GDP. In the lower regime, $L.lrgdpna$ has a positive significant effect. In the upper regime, $lpop$, csh_g and csh_xm have a positive significant effect while the effect of csh_i is negative and significant at 5%.

In the threshold panel regression using "guerrilla" as the threshold variable, the lower regime (i.e. below the estimated threshold) corresponds to the situation with less guerrilla warfares or with good institutional quality. The estimated threshold is 1 but is insignificant. The linearity test, with $boots\_p = 0.000$, points to the fact that the effect of guerrilla warfare on per capita GDP is non-linear. Indeed, the effect on guerrilla is positive and significant (at 10%) in the lower regime but turns to a negative significant (at 10%) effect in the upper regime. In absolute terms, the effect of guerrilla is stronger in the lower regime. The effect of $grants\_gdp$ is positive and insignificant in both regimes. Also, $guerrilla\_grants$ has a negative significant (at 5%) in the lower regime, indicating that even at lower levels, guerrilla warfares reduce the effectiveness of grants. In the upper regime, csh_xm has a negative significant effect.

Once "$govcrise$" is used as the threshold variable, the upper regime is one with a high number (i.e. above the threshold) of government crises and thus corresponds to poor institutional quality. The threshold value is estimated at 0.33 and is significant at 1%. Since $boots\_p = 0.000$, then we reject the null hypothesis of no threshold effect and conclude that govcrise has a non-linear effect on per capita real GDP. However, govcrise has a positive insignificant effect in both regimes. Likewise, $grants\_gdp$ has a positive insignificant effect in both regimes. The interaction term, $govcrise\_grantsgdp$ has a negative and insignificant effect on both regimes. In the lower regime (i.e. an environment with less government crises), $L.lrgdpna$, $lpop$ and csh_g positively and significantly affect rel per capita GDP in SSA. With above threshold level of government crises, the effect of csh_g turns negative but is statistically insignificant.

Table 3.10: Institutional thresholds for the grants models

	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna_b	0.726***	0.286**	0.738***	0.573	0.493***
	(0.138)	(0.137)	(0.125)	(0.378)	(0.0940)
purges_b	-0.288				
	(2.496)				
purges_grantsgdp_b	0.0799				
	(0.677)				
grants_gdp_b	-0.00533	-0.107	-0.00224	0.00759	0.00566
	(0.0777)	(0.0725)	(0.0442)	(0.0929)	(0.0147)
lpop_b	0.480**	0.848***	0.107	0.276	0.295***
	(0.208)	(0.320)	(0.171)	(0.305)	(0.108)
csh_i_b	-1.411**	0.104	1.169	0.425	0.463
	(0.663)	(1.342)	(1.267)	(2.189)	(0.369)
csh_g_b	1.278	1.007	0.595	0.797	1.412*
	(0.942)	(1.875)	(1.062)	(3.453)	(0.722)
csh_xm_b	0.164	0.0341	-0.0870	0.137	-0.0405
	(0.620)	(0.846)	(0.724)	(1.446)	(0.139)
cons_d	-46.77	0.866	-0.659	6.743	-21.55
	(33.66)	(3.392)	(1.044)	(4.518)	(20.42)
L.lrgdpna_d	4.160	-0.141	0.0411	-1.080	1.823
	(2.817)	(0.312)	(0.137)	(0.759)	(1.918)
purges_d	1.089				
	(5.881)				

purges_grantsgdp_d	-1.847				
	(1.744)				
grants_gdp_d	5.153**	-0.0576	-0.0954	0.265	2.427
	(2.586)	(0.244)	(0.0857)	(0.186)	(2.864)
lpop_d	2.048	0.0980	0.247***	0.888	0.649
	(1.780)	(0.136)	(0.0582)	(0.577)	(1.338)
csh_i_d	19.53	0.0183	-1.909**	5.706	-38.37
	(17.52)	(1.423)	(0.881)	(5.371)	(49.23)
csh_g_d	33.60	-0.870	1.854*	-10.06	-24.24
	(30.26)	(1.884)	(1.080)	(11.22)	(27.93)
csh_xm_d	-39.03***	0.166	0.955*	-4.246**	18.29
	(14.90)	(1.243)	(0.525)	(2.094)	(21.35)
v2x_egaldem_b		-4.744			
		(3.301)			
egaldem_grantsgdp_b		0.552			
		(0.479)			
v2x_egaldem_d		1.879			
		(4.723)			
egaldem_grantsgdp_d		-0.0587			
		(0.736)			
riots_b			0.430**		
			(0.217)		
riots_grantsgdp_b			-0.118**		
			(0.0512)		
riots_d			-0.626***		
			(0.210)		
riots_grantsgdp_d			0.136**		
			(0.0550)		
guerrilla_b				0.671*	
				(0.344)	
guerrilla_grantsgdp_b				-0.0642**	
				(0.0299)	
guerrilla_d				-0.674*	
				(0.350)	
guerrilla_grantsgdp_d				0.0317	
				(0.0361)	
govcrise_b					1.048
					(0.826)
govcrise_grantsgdp_b					-0.256
					(0.188)
govcrise_d					10.21
					(11.73)
govcrise_grantsgdp_d					-2.623
					(3.286)

r	0.337***	0.253	0.510	1	0.333***
	(0.0487)	(0.218)	(1.007)	(3.419)	(0.0134)
N	29	30	29	29	29
T	13	13	13	13	13
Moments	429	429	429	429	429
boots_p	0.000	0.000	0.000	0.000	0.000

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

Repeating the same exercise for the models using $loans\_gdp$ as the aid variable, we present results in 3.11. Note that we could not generate results for the case where "$purges$" and "$govcrise$" are used as the threshod variables, respectively. In the model with $v2x\_egaldem$ used as the threshold variable, the estimated threshold is 0.14 but is statistically insignificant. The linearity test confirms that egalitarian democracy has a non-linear effect on real per capita GDP in SSA. The effect of egalitarian democracy turns from positive in the lower regime (i.e. with less egalitarian democracy relative to the threshold) to negative in the upper regime, though it is insignificant in both cases. Though insignificant, the effect of $loans\_gdp$ also turns from positive in the lower regime to negative in the upper regime. However, in the lower regime, the interaction term ($egaldem\_loansgdp$) has a negative but insignificant effect. Though still insignificant, the effect of $egaldem\_loansgdp$ turns positive in the upper regime. In the context of less egalitarian democracy in SSA, only $lpop$ has a positive significant effect (at 1%).

Using riots as the threshold variable, the estimated threshold is 0.34 but is not statistically significant. Riots are found to have a non-linear effect on real per capita GDP as per the linearity test (i.e. $boots\_p = 0.000$). Indeed, the effect of riots turns from positive in the lower regime (i.e. a regime with less or below threshold riots) to negative in the upper regime, though it is insignificant in both cases. The same applies to $loans\_gdp$. However, the effect of the interaction term, $riots\_loansgdp$, turns from positive in the lower regime to positive in the upper regime, though it is insignificant. In the lower regime, only $L.lrgdpna$ has a positive significant effect (at 1%).

In the panel threshold model with $guerrilla$ as the threshold variable, the threshold value is estimated at 1 and is statistically significant. The results of the linearity test indicate that guerrilla warfares have a non-linear effect on per capita real GDP. Below the threshold, there are less guerrilla warfares and thus good institutional quality and vice-versa. Though insignificant, the effect of guerrilla turns from positive in the lower regime to negative in the upper regime. The effect of $loans\_gdp$ is positive and insignificant in the lower regime but becomes negative and significant in the upper regime. In both regimes, the interaction term, $guerrilla\_loansgdp$ is negative but insignificant. In the upper regime, the effect of $L.lrgdpna$ is negative and significant at 1%.

Table 3.11: Institutional thresholds for the loans models

	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna_b	0.540	0.861***	0.776
	(0.370)	(0.156)	(3.015)
v2x_egaldem_b	4.657		
	(12.22)		
egaldem_loansgdp_b	-8.445		
	(8.997)		
loans_gdp_b	1.292	0.0707	0.00273
	(1.200)	(0.0748)	(2.680)
lpop_b	0.729***	0.155	0.275
	(0.282)	(0.113)	(0.381)
csh_i_b	0.451	0.920	-0.289
	(1.123)	(1.255)	(11.92)
csh_g_b	2.245	0.367	0.328
	(2.038)	(0.537)	(10.23)
csh_xm_b	-0.114	-0.213	0.416
	(0.769)	(0.805)	(0.345)
cons_d	3.826	-0.355	14.90***
	(2.665)	(1.093)	(4.209)
L.lrgdpna_d	-0.320	0.0477	-1.956***
	(0.203)	(0.103)	(0.668)
v2x_egaldem_d	-5.563		
	(12.37)		
egaldem_loansgdp_d	8.947		
	(8.591)		
loans_gdp_d	-1.476	-0.113	-1.766**
	(1.130)	(0.394)	(0.863)
lpop_d	-0.176	0.0722	0.252
	(0.140)	(0.0905)	(0.468)
csh_i_d	-0.136	-1.229	7.565
	(0.966)	(1.046)	(7.151)
csh_g_d	-1.013	0.0988	-6.812
	(2.395)	(1.825)	(4.981)
csh_xm_d	0.504	0.655	0.173
	(0.863)	(0.721)	(2.398)
riots_b		0.900	
		(0.663)	
riots_loansgdp_b		-1.052	
		(0.748)	
riots_d		-0.937	
		(0.759)	
riots_loansgdp_d		0.966	
		(0.840)	

guerrilla_b			0.257
			(0.425)
guerrilla_loansgdp_b			-0.0753
			(0.0991)
guerrilla_d			-0.240
			(0.443)
guerrilla_loansgdp_d			-0.0285
			(0.113)
r	0.140	0.340	1**
	(0.113)	(1.140)	(15.81)
N	29	28	28
T	13	13	13
Moments	429	429	429
boots_p	0.000	0.000	0.000

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

3.5 Concluding remarks

The aim of chapter three was to investigate the direct effect of foreign aid (% of GDP) on per capita real GDP in Sub-Saharan Africa. The chapter also investigated whether foreign aid components, each as % of GDP, have opposite direct effects on per capita real GDP. Further, the chapter also examined if the effect of aid and its components is non-linear or not using a very recent methodology developed by Amadou (2020). To test whether aid effectiveness varies at different levels of institutional quality, the study employed the methodology developed by Seo et al. (2019) and empirically used by Abate (2022) for a purpose similar to ours. The study also tested for the complementary effect[20] of foreign aid and institutional quality where the latter is proxied by egalitarian democracy ($v2x\_egaldem$), riots, purges, guerrilla warfares and government crises (govcrise). Following a general to specific approach regarding the composition of the sample, we run estimations on the global sample, the developing countries' sample, the income sub-groups samples, the developing Africa sample and the developing Sub-Saharan African countries' sample. The focus on developing Sub-Saharan African countries' sample is aimed at studying the effects of aid in the region for which it represents a larger share of GDP, and at reducing sample heterogeneity. In all the samples, the BC-LSDV estimator gives more robust results and, thus, we base our interpretations and conclusions on the BC-LSDV estimation results. We later compare our results with those obtained from non-linear models. In addition, non-linear models help us to test for non-linear efects of aid (and its components) and of institutional variables.

In the global sample, the direct effect of ODA_GDP is negative and significant, suggesting that foreign aid worsens economic performance. However, a negative coefficient may be obtained if the best performing countries in terms of real GDP per capita are those not receiving aid or where aid repre-

[20] Complementary effect is captured via the interaction terms between aid variables and institutional variables.

sents a small share of GDP. The complementary effect between egalitarian democracy and ODA (i.e. $egaldem\_ODA$) has a positive significant (at 1%) effect. Thus, egalitarian democracy helps to increase aid effectiveness. Conversely, the interaction terms, $govcrise\_ODA$ and $guerrilla\_ODA$ have negative significant effects, implying that government crises and guerrilla warfares hinder aid effectiveness. The direct effect of $L.lrgdpna$, csh_i and csh_xm is positive and significant, in line with cumulative causation and conditional income convergence among countries and the effectiveness of both the investment and trade channels.

Estimation results in the model using disaggregated aid variables are almost similar to those obtained in the model with aggregated aid. In the former, $L.lrgdpna$, csh_i and csh_xm have a positive and significant effect. The aim of disaggregating aid is to check whether aid grants[21] and aid loans[22] have opposite effects on per capita real GDP. This hypothesis is rejected since both grants and loans have negative coefficients, with that on grants being significant. The complementary effect of guerrilla and grants and of government crises and grants is negative and significant. As expected the complementary effect of egalitarian democracy and grants is positive and significant. Thus, guerrilla wafares and government crises reduce the effectiveness of aid grants whereas egalitarian democracy promotes the effectiveness of grants. The global sample obviously lumps together countries that are quite heterogenous, which can potentially lead to biased estimates. To reduce this bias, we do estimations for the developing world, LICs, LMICs, UMICs, developing Africa as well as developing SSA.

Just like in the global sample, BC-LSDV results show that the direct effect of ODA_GDP is negative and significant for developing countries. However, this effect varies per income group, where it is positive and insignificant for LICs, negative and insignificant for LMICs and negative and significant for UMICs. This could be due to the fact that ODA represents a small share of GDP for the countries that are doing well in terms of per capita real GDP. Similar to LMICs, the effect of ODA_GDP is negative and insignificant for the case of developing Africa. The hypothesis that coefficients for loans (% of GDP) and for grants (% of GDP) have opposite signs is not rejected in LICs, UMICs and developing Africa, with only the coefficient for grants being negative and significant for the case of UMICs. Using the model with aggregated aid, govcrise has a negative and significant coefficient only in the LMICs. As expected, the effect of guerrilla is negative and significant for the case of LICs. Also, $egaldem\_ODA$ has a positive and significant effect in developing countries and in UMICs. The effect of $govcrise\_ODA$ is negative and significant in developing countres, LICs and developing Africa, just like in the global sample. The coefficient on $guerrilla\_ODA$ is negative and significant in developing countries, a result similar to what was obtained for the case of the global sample. BC-LSDV estimation results from the model with disaggregated aid show that govcrise has a negative and significant effect only in LMICs and developing Africa. As expected, the effect of $guerrilla\_grants$ is negative and significant in developing countries; the effect of $govcrise\_grants$ is negative and significant for developing countries, LICs and developing Africa. The effect of $egal\_grants$ is positive and significant in UMICs, just like in the global sample. Estimations from the models with both aggregated and disaggregated aid show that $L.lrgdpna$ and csh_xm have a positive significant effect in all the samples. In the model with aggregated aid, the effect of csh_i is positive and significant in all samples, except in UMICs and developing Africa, while it is positive and only singificant in developing countries and LICs, for the case of BC-LSDV model with disaggregated aid. In the model with aggregated aid, the effect of population growth is positive and significant in developing countries, LICs and developing Africa while it is negative in UMICs and positive in both LICs and developing

[21] By aid grants, we mean grants to GDP ratio, percent.

[22] By aid loans, we mean loans to GDP ratio, percent.

Africa, in the model with disaggregated aid.

For the case of developing Sub-Saharan African countries, the effect of ODA is negative but insignificant. Results also show that government crises reduce the effectiveness of ODA. Among the common drivers of per capita income, $L.lrgdpna$, csh_xm, $growth\_pop$ and csh_i have a positive significant effect. Interestingly, the coefficient on $L.lrgdpna$ is positive and less than one, thus confirming that the conditional convergence hypothesis is valid in SSA. The positive effect of csh_xm and csh_i confirm the relevance of the trade and investment channel, respectively, whereas the positive effect of $growth\_pop$ implies that the Sub-Saharan African sub-region benefits from the demographic dividend. In the model with grants and loans, findings are almost similar. The effect of $L.lrgdpna$, csh_xm and $growth\_pop$ is still positive and significant. The interaction term, $govcrise\_grants$, has a negative significant effect. Finally, the coefficients for aid variables (i.e. loans and grants) have opposite signs but they are statistically insignificant.

The estimations of the dynamic non-linear panel threshold model with endogenous regressors of Amadou (2020) are mainly intended to test for the non-linear effect of aid variables and to estimate threshold values thereof. In addition, these results can also be used to test for the direct and complementary effects of aid variables and thus complement the results from BC-LSDV models. We only present results for SSA and for three cases, depending on which threshold variable, among aid variables, is used. In the model with aggregated aid, estimation results show that ODA_GDP has a positive but insignificant coefficient below and above the threshold[23]. The complementary effect of government crisis and ODA is negative and significant. Individually, $L.lrgdpna$ and egalitarian democracy have a positive and significant effect on per capita real GDP. With grants used as the threshold variable, the estimation results show that grants have a non-linear effect on per capita income. Though insignificant, grants have a negative sign when below the threshold and a positive sign when above the threshold. The complementary effect of riots and grants and of government crises and grants is negative and significant, which is line with the expectations. Also, $L.lrgdpna$ has a positive and significant effect. In the model with loans used as the threshold variable, the linearity test confirms that aid loans have a non-linear effect on per capita real GDP. Findings show that, though insignificant, loans have a negative sign when below the threshold and a positive sign when above the threshold. Individually, government crises have a negative significant effect while $L.lrgdpna$ and $growth\_pop$ have a positive significant effect. The main difference between BC-LSDV models and threshold models is that the former do not account for the possible non-linear effects of ODA (% of GDP) and its components (% of GDP) on per capita real GDP, which may effect the results. For example, the coefficient on grants is positive and insignificant in the BC-LSDV model with disaggregated aid. Though still insignificant, the coefficient on grants turns from negative in the lower regime to positive in the upper regime once grants are used as the threshold variable.

To investigate whether the effect of aid variables is conditional on the non-linear effect of institutional variables, we estimate a dynamic panel threshold model based on Seo et al. (2019) and use each of the five institutional variables as a threshold. We also include the interaction terms. In all the models, the null hypothesis of no threshold effect (equation 3.17) is rejected. Thus, the conclusion is that the effect of foreign aid and of its components on per capita real GDP in SSA varies according to the level of institutional quality. When purges are used as the threshold variable, the effect of ODA is negative in both thresholds but only statistically significant in the upper thresold, implying that an increase in purges results into negative effect of ODA on per capita real GDP. Also, the effect of purges is negative and significant

[23] See variables: "$below\_thres\_enr$" and "$above\_thres\_enr$".

only in the upper regime. Using riots as the threshold variable, the interaction term, $riots\_ODA$, has a negative and significant effect in the lower regime, indicating that even at lower levels, riots are not conducive for economic performance. Individually, riots have a negative significant effect in the upper regime. Using govcrise as the threshold variable, $govcrise\_ODA$ has a negative significant effect in the lower regime. Results from models with disaggregated aid variables show that, each of the institutional variables has a non-linear effect on per capita real GDP in all cases. When guerrilla is used as a threshold variable and using grants as the aid variable, the interaction between guerrilla and grants has a negative significant effect in the lower regime. Hence, guerrilla hampers the effectiveness of aid grants even when the former is at lower levels. Individually, guerrilla has a negative significant effect in the upper regime. Using riots as the threshold variable, $riots\_grants$ has a negative significant effect in the lower regime. Also, riots have a negative significant effect in the upper regime. Finally, we repeat the same exercise when aid loans are used as the aid variable and find that in all cases, the null hypothesis of no threshold effect is rejected. When guerrilla is used as the threshold variable, the effect of loans turns from positive in the lower regime to negative in the upper regime, but is only significant in the upper regime.

The main contribution of this study is to advance our knowledge on the effects of aid on per capita real GDP for several groups of countries, with a particular emphasis on Sub-Saharan African countries. Following a general to specific approach regarding sample composition, we address the issue of country heterogeneity by progressively restricting the sample to a group of more homogeneous countries (i.e. Sub-Saharan Africa). Rather than using regional dummies as in most studies, we do estimations for restricted samples, particularly for the Sub-Saharan sample. In addition, we also examined the disaggregated effect (by considering aid components: aid grants and aid loans) of foreign aid on per capita GDP. We further enrich our study by examining the complementary effect of each of the foreign aid components and institutional quality. Also, the study tests for the non-linear effect of foreign aid and its components using very recent methodologies that account for endogeneity. It also tests whether aid components have opposite effects on per capita income. Lastly, we tested for the effect of foreign aid conditional on the degree of institutional quality. Thus, the study examines the direct and conditional effects of aid variables. Addressing all these issues in one chapter was a challenging but quite interesting exercise.

CHAPTER 4

INSTITUTIONAL QUALITY AND ECONOMIC GROWTH

4.1 Introduction

Acemoglu and Robinson (2010b) assert that growth economists have for long focused on unpacking the reasons behind the observed cross-country differences in economic growth and development. The motivation is that high income levels reflect high standards of living. For example, when one compares an advanced, rich country with a less-developed one, there are striking differences in economic growth and development, with noticeable implications on various measures of well-being, such as literacy, infant mortality, life expectancy and nutrition. Some of the basic questions investigated over the past include: Why are there very large differences in income per capita across countries today? Why have some countries experienced positive growth rates of income per capita over long periods of time? Why do some countries grow rapidly while other countries stagnate? For example, Weil (2012) observed that the growth rate of output per capita has been quite disparate across countries, noting that some countries have recorded higher growth rates, ranging between 2% and 7.5%, while others have recorded below 2% or even negative growth.

Acemoglu and Robinson (2010b) note that the United States was richer in 1960 than other nations and was also able to grow at a steady pace thereafter (except since about 1990 and particularly since 2000). Countries like South Korea and Botswana managed to grow at a relatively rapid pace for 40 years, since 1960, whereas Spain grew relatively rapidly for about 20 years, but then slowed down thereafter; Brazil and Guatemala stagnated during the 1980s whereas Nigeria, just like most of Sub-Saharan African countries, recorded disastrous growth. They argue that welfare varies across time and across geographical sub-regions. For example, average real incomes today in the US and Western Europe are between 10 and 30 times larger than a century ago, and between 50 and 300 times larger than two centuries ago; average growth before the Industrial Revolution was very low compared to the post-industrial revolution period; there are enormous differences (by a factor of 20 or more) in income per capita across countries; and, there have been growth miracles such as for countries in East Asia and growth disasters, especially countries in sub-Saharan Africa. Broadly, a similar pattern of such cross-country income differences was observed by Durlauf (2005) and Jones (2016).

Therefore, most of the growth literature focuses on developing a coherent framework to investigate the above mentioned questions. Most of the early theoretical and empirical studies attributed cross-country differences in income per capita on differences in resource endowments, notably physical and human capital (Barro, 1991; Mankiw et al., 1992), innovation (Romer, 1990; Rebelo, 1991), and technological diffusion (Grossman & Helpman, 1991; Aghion & Howitt, 1990; Barro & Sala-i-Martin, 1997). As argued by Sachs and Warner (1997), the poor economic performance for Africa can be explained by factors such as investment in physical and human capital and population growth, just like in the case for developed countries. In addition, the literature has also fronted geographical, cultural, historical, trade, institutional and policy factors as potential causes of cross-country differences in income per capita (Alhassan & Kilishi, 2019). However, recent focus has emphasized on exploring the role of institutions in shaping economic growth and development. For example, North and Thomas (1973, p. 2) stimulated the debate on the effect of institutions on economic growth in their famous quote "therefore the factors we have listed (innovation, economies of scale, education, capital accumulation, etc.) are not sources of growth; they are growth. Factor accumulation and innovation are only proximate causes of growth and development. The fundamental cause of growth and economic development is institutions. The key to growth was and is an efficient economic system. Efficient in the sense that the system of property rights gives individuals incentives to innovate and produce, and, conversely inhibits those activities of rent-seeking, theft, arbitrary confiscation and/or excessive taxation, that reduce individual incentives."

At present, the main concern of African countries is how to attain sustainable economic growth and development, as was first stressed in the Millennium Development Goals (MDGs) and later, in the Sustainable Development Goals (SDGs). The aim is to reduce poverty, improve education and health care, among others. The African continent generally faces various development challenges (Heshmati, 2018), including the existence and persistence of poor institutions Alhassan and Kilishi (2019). Bad institutions have been viewed as causes of low economic growth, low factor productivity and low per capita income Acemoglu and Robinson (2010b) and this has been the case in Africa Kilishi, Mobolaji, Yaru, and Yakubu (2013).

Most of the empirical studies on Africa treat geographical and/or income sub-regions as dummy variables, explaining each sub-region's growth by the differences between its dummy variable from that of a chosen baseline sub-region Anyanwu (2014). Indeed, the few studies on Sub-Saharan Africa often do not explore in detail all the available indicators of institutional quality (i.e. political, economic and social institutions). In other papers, Sub-Saharan African countries are lumped together without regard to cross-country differences, especially with respect to income status. Chapter four of this thesis seeks to address these gaps and will focus on developing Sub-Saharan African countries to examine the direct effect of institutional quality on real per capita income. The paper uses a wide array of institutional variables from five data sets: World-wide Governance Indicators (WGI), International Country Risk Guide (ICRG), Cross National Time Series (CNTS), the Economic Freedom of the World Report of the Fraser Institute and, Varieties of Democracy (V-DEM). Unlike most studies on SSA, this study will base on the estimations from the Bias Corrected Least Squares Dummy Variables (BC-LSDV) model due to its good performance in short panels (Bruno, 2005b). As a robustness check, the BC-LSDV estimations will be compared with the System GMM (SGMM) estimations.

The rest of the chapter is organized as follows: section 2 gives a brief overview of both the theoretical and empirical literatures, section 3 covers the methodology and data description, section 4 presents and discusses results and, finally, section 5 gives the concluding remarks.

4.2 Literature Review

This section briefly reviews the theoretical and empirical literature on the role of institutional quality in shaping the economic performance of countries. The main clear-cut difference between (neo) classical economists and new-institutional economists is the recognition of the role of institutions in explaining cross-country differences in economic growth and development. Institutions not only have a direct effect on economic performance but also influence how other factors of production affect economic growth (Kirsten, 2009).

The renewed interest in the nexus between institutions and economic growth followed from the works of four nobel prize winners: Coase, North, Williamson and Ostrom. This was quickly picked up by the Bretton Woods institutions as emphasized in the World Bank's 2002 World Development Report and the IMF's 2003 World Economic Outlook. The body of literature on the economics of institutions falls under "New Institutional Economics (NIE)." Ronald Coase is one of the key contributors to the NIE literature following his works on "The Nature of the firm" (Coase, 1937) in which he stressed the importance of contracts and transaction costs in the vertical integration of the firm. This was later followed by his work on "The Problem of Social Cost" (Coase, 1960) in which he demostrates that externalities can de dealt with, not necessarily with government intervention, but via bargaining as long as transaction costs are zero. It is in this paper that he stresses the importance of defining and enforcing property rights. His other major contribution is that institutions can affect transaction costs in the markets and can therefore influence the distribution of resources.

Building on Coase's work, Williamson (1991) explored the factors that affect transaction costs, such as hold up and asset specificity. Altogether, Williamson and Coase explored the role of transaction costs, property rights and incomplete contracts . Ostrom's contribution was on human cooperation and shared resources. She demonstrated how natural resources, such as fisheries, oil fields and grazing land can be shared sustainably by a community without central authorities or privatization (Ostrom, Gardner, & Walker, 1994). Her other contribution was on the understanding of institutional diversity (Ostrom, 1994). North's contribution was on the definition of institutions, the macro-level linkage between institutions and economic growth and development, and on the analysis of the determinants of institutions (North, 1991, 1994, 1997; North & Thomas, 1973). More literature on institutional economics came from political science and political economy and generally covered: collective action (Olson, 1989), voting theory (Black, 1948; Downs, 1961; Shabman & Stephenson, 1994), social choice (Arrow, 1977) and public choice (Tullock, 1979).

Neo-classical and endogenous growth models emphasize that the main determinants of cross-country diffferences in economic performance are capital accumulation, innovations, diffusion of technology and initial conditions (Mankiw et al., 1992; Romer, 1990; Rebelo, 1991; Grossman & Helpman, 1991; Myrdal, 1957). Others cite financial development (Ang, 2008), socio-cultural conditions (Granovetter, 1985; Knack & Keefer, 1995, 1997), political environment (Lipset, 1959; Brunetti et al., 1998), geographical conditions (Gallup et al., 1999), demographic conditions (Brander & Dowrick, 1994; Kalemli-Ozcan, 2002), and recently, on the development and quality of institutions(North & Thomas, 1973; Rodrik et al., 2004; Acemoglu & Robinson, 2010b, 2012). In view of this, different schools of thought on economic growth have emerged, with close or disparate views on the main drivers of economic growth.

In fact, most of the recent literature argues that institutions are the main drivers of economic performance across countries. For example, Acemoglu and Robinson (2010a, p. 2) argue that "the differences in human capital, physical capital, and technology are only proximate causes in the sense that they pose the next question of why some countries have less human capital, physical capital, and technology and make bad use of their factors and opportunities. To develop more satisfactory answer to the question of why some countries are much richer than others and why some countries grow much faster than others, we need to look for potential fundamental causes, which may be underlying these proximate differences across countries." Thus, this chapter focuses on examining the role of institutions in shaping economic performance in Sub-Saharan Africa.

4.2.1 Meaning, scope and importance of institutions

Before exploring the theoretical and empirical literature on the role of institutions, it is imperative to first understand the meaning and scope of institutions (Lloyd & Lee, 2018). This is because it is hard to make much progress in the study of institutions if scholars define the term to mean almost anything. North (1990, p. 3) defines institutions as "the rules of the game in a society or, more formally, as the humanly devised constraints that shape human interaction". Based on this definition, Acemoglu and Robinson (2010b, p. 136) emphasize three aspects of institutions: (1) that they are " humanly devised," which contrasts with other potential fundamental causes, like geographical factors, that are outside human control; (2) that they are "the rules of the game" setting "constraints" on human behavior; (3) that their major effect will be through incentives.

North (1991) views institutions as both formal and informal restrictions imposed by human beings to guide economic, social and political interactions in a society. Informal restrictions include prohibitions, customs, traditions and norms of conduct whereas formal restrictions include the constitution and laws, among others. Together with economic constraints, these formal and informal restrictions determine choices, the cost of production, the cost of transactions, and thus the profitability and feasibility of doing business.

According to Ostrom (2005), institutions can be defined as boundary rules, position rules, authority rules, scope rules, aggregation rules, information rules and payoff rules. Boundary rules or entry and exit rules define the terms of entry and exit as well as the corresponding duties and responsibilities of participating economic agents. Position rules define specific and relative roles and responsibilities for each of the economic actors, and are therefore very much linked to boundary rules. Authority rules (associated with the above-mentioned rules) assign sets of actions that actors in given positions should, may, or should not take (the set of decisions open to them). Scope rules determine the range of outcomes that can be affected by these actions. Aggregation rules affect the degree of control that actors are able to exercise in initiating actions. Information rules affect the information that actors acquire and use. Payoff rules determine the costs and benefits associated with particular actions, outcomes, and actors. Since there is a myriad of definitions given to institutions by different authors, below is a summary of the main ones (Faghih and Samadi (2021, p. 109-110):

Table 4.1: Definitions of institutions

Author	Institutions are defined as:
Veblen (1899)	Habits created in the mind of the public and between them in common
Mitchell (1910)	Thought habits, as the guiding norms of conduct within an occupation
Commons (1931)	A collective action to control, liberate, or expand individual actions
Hamilton (1932)	A somewhat common and durable way of thinking or acting rooted in the habits or customs of a group of people
Foster (1981)	Patterns of order defined and regulated by correlated behaviors
Ruttan and Hayami (1984)	The rules of society or organizations that lead to harmony among people. They facilitate coordination by helping people form rational expectations when interacting with other people
North (1990)	Rules of the game in society or constraints that are imposed by people to regulate interactions. Institutions exist due to the structured incentives in human transactions (economic, social, and political)
Dopfer (1991)	The centerpieces of the work of agents, who are introduced through their own organizations or boards. Institutions are created under identical circumstances, which occur repeatedly
Knight and Jack (1992)	A set of rules that give structure to social interrelations in a particular manner
Burki and Perry (1998)	Formal and informal rules and enforcement mechanisms that shape the behavior of individuals and organizations in a society
Williamson (2000)	Mechanisms, which govern exchanges, and arrangements, which lower the costs of transactions. These arrangements have evolved and will be changed by changing the nature of transaction expenses
Nelson and Sampat (2001)	Social technologies in the utilization of productive economic activities through which human interaction is patterned, yet they are not intended to bring about social engineering
Acemoglu et al. (2003)	The cluster of social arrangements, including social and constitutional limits on the power of politicians and political elites, the rule of law, implementation of property rights, a minimum amount of equal opportunity, access to education, etc.
Rutherford (2003)	Incentives that shape the preference and values of individuals in society
Rodrik et al. (2004)	Rules of the game and are created as a result of desirable economic behavior, especially, that of property rights and the rule of law
Chong and Zanforlin (2004)	Implicit and explicit rules which help the members of a community influence each other, shape the behavior of economic agents, and help us explain the economic performance of countries
Searle (2005)	Any system with a number of rules that enable us to create institutional realities
Brown (2005)	A set of organizations, such as families, churches, schools, companies, stock market, business organizations, and trade unions, that try to have independent behavioral patterns
Hodgson (2006)	Durable systems of established social norms that give structure to social interactions

Continued on next page

Table 4.1 – Continued from previous page

Author	Institutions are defined as:
Greif (2006)	A set of social factors, rules, beliefs, values, and organizations that motivate regularity in individual and social behavior
Aoki (2007)	Sustainable patterns of social interaction that give rise to common knowledge among the players, which, in turn, can lead to a particular equilibrium condition in the game

Different scholars through time have been trying to explain the drivers of the economic prosperity of nations. Even in ancient times, rulers used to seek advise from the contemporary sages in an attempt to come up with rules to guide public administration, economic activities as well as law and order. These rules may be generally viewed as institutions. The genesis of the modern view about institutions started with Adam Smith. In his book, "The Wealth of Nations" (Smith, 1776) and subsequent witings and lectures, he emphasized on the theory of social development that generally explored the link between different levels of subsistence (hunting, pasturage, farming and commerce) and social and political structures. Building on the works of Adam Smith, Karl Marx came up with the "Superstructure" theory, in which he argues that society is made up of both the base (or substructure) and the superstructure. The base was defined as the mode of production, including forces and relations of production (e.g. employer-employee work conditions, technical division of labor, and property relatons) in which people participate to produce the necessities and amenities of life. The superstructure broadly included culture, institutions, political power, structures, roles, rituals, religion, media and state, all of which can affect the base. In modern institutional economics, the components of the superstructure are generally viewed as institutions. Later, Feuerbach also came up with "Materialism", which emphasized that material possessions and physical comfort were more important than spiritual values Cherno (1963).

The works of Adam Smith (Smith, 1776), Karl Marx (Marx & Levitsky, 1965), Feuerbach Cherno (1963) and others generally resulted into a debate on socialism and capitalism, two socio-economic systems that later on characterized the cold war that culminated in a world order dominated by capitalism (Rodrik, 2006). These early ideas also led to the emergency of different variants of "institutional economics", such as "American Institutionalism." The recognition of institutions was crippled by the shift from classical economics (which focused on the long-run) to neo-classical economics (which focused on the short term) and was even more re-enforced by the micro-macro paradox. Since the 1950's, scholars tried to explain cross-country differences in prosperity by use of growth models. The starting point was the Solow-Swan model (Solow, 1956; Swan, 1956), which emphasized capital accumulation. Further refinements explored the role of technological progress and human capital. Generally, neoclassical and endogenous growth models emphaze the role of human and physical capital, technological diffusion and innovations. Later, other factors like financial development and institutional quality were considered.

The empirical works of North (1981), Jones (2003) and Olson (1983) motivated researchers and policy analysts to investigate the nexus between institutional quality and economic growth. By challenging the tenets of classical economics, institutional economists argued that market distortions and other negative externalities can be corrected for via government intervention, hence the need to have institutions (North, 1990). As noted by Acemoglu, Johnson, and Robinson (2005) and Acemoglu and Robinson (2012), good institutions are more important than geography and culture in driving the long-run economic performance of a country. Indeed, sustainable economic growth and development has been recorded in countries with effective institutions (Ostrom, 2005; Faghih & Samadi, 2021). Empirical studies found that institutions

positively affect investment and long-term sustainable growth (Knack & Keefer, 1995; Barro & Sala-i-Martin, 1997; Mauro, 1995). For example, there has been consensus that property rights and rule of law are important drivers of economic growth (Rodrik et al., 2004). Similarly, (Acemoglu, Cutler, Finkelstein, & Linn, 2006) argue that private propery rights are not only important for sustainable economic growth but also for investment and financial development. Consequently, the cross-country differences in capital accumulation and output growth, are primarily caused by differences in institutional quality (Hall & Jones, 1999).

In view of the above definition and scope of institutions, (Olatunji, 2015) argues that there is a twofold role of institutions in economic growth and development. First, well-established institutions ensure the optimal use of national resources, hence minimizing slack and loss of productive capacity. Second, the existence of an appropriate institutional environment is a catalyst for improving effectiveness of other crucial growth determinants, such as physical and human capital that are viewed as important drivers of growth in neoclassical growth models. Given the importance of institutions in driving economic growth, Roland (2004) argued that since institutions change slowly in a given society, it is imperative for countries that aspire to achieve sustained economic growth and development to trace their historical and cultural paths and embed these in their development agenda at a possible accelerated rate. In general, institutions should lead to the creation of both formal and informal contracts and enforcement mechanisms thereof, via coordination, collective action and mutual action, all aimed at facilitating socio-economic relations, notably market exchanges (Kirsten, 2009).

In terms of scope, the term institutions is broadly used to include economic, political and social institutions covering aspects such as effective rule of law, a good business climate, more secure property rights and market-friendly social norms (Lehne, Mo, & Plekhanov, 2014). Rodrik (2005) gives four classifications of institutions: (1) market creating institutions; (2) market regulating institutions; (3) market stabilizing institutions; and, (4) market legitimizing institutions. Following this categorization, Bhattacharyya (2009) and Das and Quirk (2016) contend that market creating and market stabilizing institutions are more important in promoting growth. Acemoglu, Johnson, and Robinson (2001) consider two categories of institutions — (1) "extractive" institutions in which a "small" group of individuals do their best to exploit the rest of the population, and, (2) "inclusive" institutions in which "many" people are included in the governance process and have a fair share of national wealth.

A broader categorization of institutions is given in Anwana and Affia (1981) to include: (1) Governance Institutions, measured by a government effectiveness index, and a regulatory quality index; (2) Legal and security institutions, measured by a rule of law index, and a political stability index; (3) Political institutions, represented by a voice and accountability index, a political rights index, and a civil liberties index; (4) Economic, and regulatory institutions, which they measure using indices on fiscal freedom, business freedom, labor freedom, monetary freedom, investment freedom, and financial freedom; and, (5) Norms and social institutions, measured using the corruption perceptions index.

It has been highlighted that the measurement of institutional quality is quite cumbersome and there are currently several measures from different sources. A detailed survey of literature on the proxies of institutional quality is given in Faghih and Samadi (2021, p. 143-171). Other interesting aspects about institutions are: what actually determines (weak) strong institutions and what causes institutional change and how does this generally impact economic growth and development. As noted by Alhassan and Kilishi (2019), the determinants of institutions include: the current level of economic development, geographical conditions (such as proximity to the coast, belonging to the tropic and terrain ruggedness), natural resource

endowments, openness to trade, slave trade and colonialism that resulted into certain settler patterns and legal systems. Also, ethnic fractionalization has been blamed for the rise of political flux, weak institutions and poor economic performance (La Porta, Lopez-de Silanes, Shleifer, & Vishny, 1999). Further, some studies argue that economic institutions are shaped by the change in political institutions (Acemoglu & Robinson, 2010b). Since most of these factors are actually drivers of economic performance, there is endogeneity between the quality of institutions and economic growth.

4.2.2 Theoretical Literature

In an attempt to explain cross-country differences in economic growth, classical and neo-classical economists emphasized the importance of physical and human capital (Barro, 1991; Mankiw et al., 1992; Lucas, 1988; Temple, 1999), innovation (Romer, 1990; Rebelo, 1991) and diffusion of technology (Grossman & Helpman, 1991; Aghion & Howitt, 1992; Barro & Sala-i-Martin, 1997).

In the Harrod-Domar model (Harrod, 1939; Domar, 1946), acceleration of capital accumulation is key towards economic prosperity. Thus, countries differ in terms of prosperity due to differences in levels of capital accumulation and hence more effort should be placed on the mobilization of domestic savings as well as of foreign financing to cover shortfalls in domestic savings over investment needs. Alternative financing channels such as foreign aid (both 'soft loans' and grants), foreign direct investments, generation of foreign exchange via international trade (Chenery & Strout, 1966), are all aimed at enhancing investment and therefore accelerate the accumulation of physical and human capital to the desired levels.

The Solow-Swan model (Solow, 1956; Swan, 1956) upholds the importance of capital accumulation in explaining economic growth, and differences thereof, across countries. Despite some of the plausible assumptions, such as the relative stability of capital to output ratio and factor shares, the Solow-Swan model has some drawbacks: for example, it shows that for there to be non-zero growth in per capita income in the steady state, the role of exogenously determined technical change is paramount-an assumption that has been criticized by proponents of endogenous growth theories who find it quite odd to explain economic growth based on "unexplained" factors upon which policy makers have no control. Other weaknesses of the Solow-Swan model include the fact that empirical studies have revealed that even countries with similar technologies and preferences do not necessarily converge the same steady-state levels.

Following the argument of endogenous growth models, different scholars view sources of growth-such as financing (Schumpeter & Backhaus, 2003), including domestic savings and foreign aid as endogenous (McKinnon et al., 1973; Shaw, 1973; Fry, 1998; King & Levine, 1993a; Estrella & Mishkin, 1998; Bernanke & Gertler, 1995). This way, theory can provide analytical explanations for the differences in economic growth across countries and the rationale behind choices in these factors (Arrow, 1962; Oniki & Uzawa, 1965; Romer, 1986; Rebelo, 1991).

The most implausible assumption of neo-classical economics is the fact that markets are capable of determining efficient allocation and distribution of resources in an economy without the intervention of the state. As noted by Rodrik (2006), neo-classical economists emphasize that creation and allocation of wealth in society can be efficiently achieved through markets and this view was echoed by the Washington consensus. This is however true if the famous "perfect competition" assumptions holds, such that a

market-clearing equilibria can be attained and adjustments to shocks are quite costless. In a purely competitive environment, there is no particular role for institutions since markets are perfect and complete, there are no externalities and information is costless (Dorward, Kydd, Poulton, et al., 1998).

However, by recognizing that the assumptions of neo-classical economics are quite unrealistic in the real world, neo-institutional economists have come up with a view that due to several issues, such as those caused by imperfect information, the efficient creation and allocation of resources is impossible through the market mechanism and, therefore, institutions play an important role in addressing such challenges (North, 1994, 1997). With regards to explaining economic growth across countries, neo-institutional economists argue that factors such as physical and human capital are merely proximate causes of growth whereas "institutions" are the true "fundamental" causes of economic growth (North & Thomas, 1973). It is now widely believed that poor institutional quality creates an unfavorable environment for both domestic and foreign investment and thus hinders capital deepening in the economy, which, in turn, lowers productivity growth and per capita income. Thus, institutions have been recognized as key drivers of economic growth and as possible causes of cross-country income differentials in the recent literature (Acemoglu, Gallego, & Robinson, 2014).

There are various theoretical models that incorporate institutions in the explanation of long-term economic performance. In this study, we follow the approach discussed in Nawaz, Iqbal, and Khan (2014) in which an endogenous growth model is modified to cater for rent-seeking activities[1]. Rent-seeking is viewed as diversion of resources from productive sectors to unproductive ones and this is believed to be caused by weak institutions that cannot: ensure efficient allocation of resources, alleviate externalities and/or reduce transaction costs. We start by specifying a Cobb-Douglas production function (equation 4.1):

$$y_{it} = Ak_{it}^{\alpha} \tag{4.1}$$

Whereby y is output per worker, k is the stock of physical capital per worker, $A > 0$ is total factor productivity, α is the elasticity of output per worker with respect to physical capital per worker while i and t are country and time indices, respectively. Note that $0 < \alpha < 1$ in line with the diminishing returns hypothesis. To incorporate rent-seeking activities, we define r_{it} as rent-seeking of firm i at time t and assume that $0 \geq r_{it} \leq 1$. Thus, we modify equation 4.1 as follows:

$$y_{it} = (1 - r_{it})Ak_{it}^{\alpha} \tag{4.2}$$

In equation 3.2, we can have two extreme cases: When $r_{it} = 1$, then $y_{it} = 0$ and there is no production since all resources have been diverted to unproductive sectors[2]. Conversely, when $r_{it} = 0$, then we move back to equation 3.1, where production will depend on capital accummulation and technological progress. When r_{it} is closer to 1, then rent-seeking is high, denoting weak institutions. With strong institutions, the marginal utility of rent-seeking is low and thus r_{it} is close to 0. Using rent-seeking as a proxy for institutional quality, we can augment our Cobb-Douglas production function, bearing in mind

[1] We only present a simplified version of the theoretical model.

[2] r_{it} can be viewed as a rent-seeking index. Other authors considered the distortions index and instability index to capture the quality of institutions.

the linear homogeneity assumption. We thus, rewrite equation 4.2 as:

$$y_{it} = Ak_{it}^{\alpha} I_{it}^{1-\alpha} \tag{4.3}$$

Where $I_{it} = (1 - r_{it})$ stands for any variable that captures institutional quality.

4.2.3 Empirical Literature

In agreement with earlier works of Olson (1983), Acemoglu et al. (2001) emphasized that the observed cross-country differences in income cannot be merely explained by differences in either human or physical capital endowments or technology or both since these are only proximate causes of growth. To them, the key task is to identify the fundamental cause of such cross-country differences in economic growth. Differences in capital and technology across countries should only lead us to further inquiry into, for example, why do some countries have less endowments of these factors of production and/or why do some countries do not optimally use the available factors of production? Acording to Acemoglu (2006), inefficient institutions can hamper economic performance. Institutions become inefficient if groups with political power, the elites, choose policies that are favorable to them by facilitating the transfer of resources from the rest of the society to themselves via revenue extraction, manipulation of factor prices, and political consolidation. Also,the powerful minority may choose to impoversih their potential political rivals so as to cling to power. Ethnic diversity (or fractionalization) has also been found to negatively affect economic growth (Campos, Saleh, & Kuzeyev, 2011).

Acemoglu and Robinson (2012), emphasize that it is only "extractive" institutions, in which a "small" group of individuals exploit the rest of the population, that are detrimental to economic growth. They sum up their argument with a quote, thus: "Nations fail today because their extractive economic institutions do not create the incentives needed for people to save, invest, and innovate. Extractive political institutions support these economic institutions by cementing the power of those who benefit from the extraction. Extractive economic and political institutions, though their details vary under different circumstances, are always at the root of failure." To illustrate their point, they show that the part of Nogales city that falls under Arizona, United States is more developed than the part of Nogales city under Sonora, Mexico and attribute these differences to the fact that USA has better institutions compared to Mexico. The authors argue that extractive institutions exclude a big portion of the population from the political decision-making process, which leads to an attack on the economic rights of all who do not belong to the elite. The consequence of this is that majority of the population will lack reliable guarantees of property rights and the opportunity to receive income from their enterprises, which ultimately constrains economic growth. Conversely, inclusive institutions, aimed at including the widest possible strata of society in economic and political life, are more conducive for economic growth and development.

In fact, Acemoglu and Robinson (2012) and Rodrik et al. (2004) argue that institutions are more important in explaining cross-country differences in economic performance compared to other factors such as geography and culture. After arguing that the quality of institutions is a more important growth driver than anything else, (Rodrik et al., 2004), Rodrik (2005) however retracted his earlier argument by asserting that the role of institutions has been dramatized in what he calls "institutional fundamentalism",

which he likens to the "market fundamentalism" strewn all over the neo-classical growth theories and popularized by the Washington consensus. Thus, the debate on the role of institutions remains at the core of growth empirical studies even today.

Critics of the role of institutions generally concur with Sachs (2003) and, Gallup et al. (1999), who value factors such as ecology and geography over institutions in driving cross-country income differences. A more neutral approach is presented in Nunn and Puga (2012), who argued that the development of institutions is path-dependent within a broader geographical and ecological environment. Therefore, geography and ecology can be viewed to have an indirect effect on income differences across countries. The literature on the link between institutions and economic performance is huge and reviewing all of them is beyond the scope of this chapter. However, a comprehensive literature review on the subject matter can be found in some recent surveys (Lloyd & Lee, 2018; Dal Bó & Finan, 2020; Durlauf, 2020).

4.2.3.1 Empirical Literature on Developing Countries

Using security of property rights, governance, political freedom and government size as measures of institutional quality, Vijayaraghavan (2001) examine the link between institutions and economic growth across 43 countries – comprised of 9 developed and 34 developing economies, noting that cross-country differences in economic growth are especially explained by security of property rights and government size.

Another study combining developing and developing countries was conducted by (Mijiyawa, 2006) who considered a sample of 123 countries made up of 85 developing and 38 developed countries for the period 1960 to 2003. Using panel data methods, the study concluded that political and economic institutions had a positive and significant effect on economic growth.

Zouhaier and Kefi (2006) employed a static panel data model using 5 year non-overlapping period averages for the 1975-2000 period. The main conclusions from their study is that economic and political institutions have a significant effect on economic growth in the entire sample but not in developing countries, marred with bad political institutions that are detrimental to economic performance.

Anyanwu (2014) concluded that there is a positive and significant effect of governance, proxied by government effectiveness, on economic growth in Africa. His results show that a one percent increase in government effectiveness would increase economic growth by 0.166 percent, suggesting that the better the institutional quality of a country, the faster its economic growth.

Kebede and Takyi (2017) analyze the existence and direction of the causal relationship between institutional quality and economic growth in Sub-Saharan Africa using annual panel data for 27 countries for the period spanning 1996 to 2014. Using cointegration test they demonstrate that institutional quality and economic growth have a long run relationship. They also use a causality test to show that there is a unidirectional causality from economic growth to institutional quality but not the other way round.

Finally, Adedokun (2017) focused on the analysis of both the direct and complementary effect of institutional quality and concludes that government effectiveness not only promotes growth but also improves foreign aid effectiveness in SSA. In other words, his findings suggest that foreign aid is more effective in

those countries that have good institutions since they can make better use of aid received to promote economic growth.

4.3 Methodology

Most empirical work about the link between institutional quality has gaps. For example, many studies are either conducted for single-country cases or for a group of heterogenenous countries. In the latter, the issue of heterogeneity is not adequately catered for. The reviewed literature on Sub-Saharan Africa indicates that studies either used regional dummies to compare SSA to other regions or focused on SSA but lumped together all countries with complete disregard to possible differences among them (Anyanwu, 2014). We address some of these gaps by selecting a sample of developing countries in Sub-Saharan Africa. Despite the limitations related to data availability, especially for SSA countries, we explore all available data on institutions basing on five data sets: the Cross National Time Series (CNTS), The International Country Risk Guide (ICRG), the Wordwide Governance Indicators (WGI) and the Varieties of Democracy (V-DEM). The links to the data sources are given along with variable definitions presented in table 4.2.

Clearly, economic performance and institutional quality are endogenously related since they are both affected by similar factors (Alhassan & Kilishi, 2019). In this study, we estimate a dynamic panel data model[3] given in equation 4.4:

$$y_{i,t} = \alpha_i + \psi' y_{i,t-1} + \delta' Inst_{i,t} + \beta' x_{i,t} + \mu_t + \lambda_i + u_{i,t} \tag{4.4}$$

Where t stands for time index and i stands for country index. $y_{i,t}$ is the log of real GDP per capita and $y_{i,t}$ is its lag, $Inst_{i,t}$ is a given measure of institutional quality, $x_{i,t}$ is a vector of common drivers of economic performance , potentially correlated with $u_{i,t}$. These variables are: average share of gross capital formation in GDP (csh_i), average share of government consumption in GDP (csh_g), population growth ($growth_pop$) and, average share of trade in GDP (csh_xm). Inclusion of other variables such as the financial development index and ODA does not significantly change the results. We also include time dummies (μ_t) to account for macroeconomic shocks common to all included countries while λ_i are individual (i.e., country-specific) effects[4]. We estimate several models whereby in each of them we use (a) selected measure(s) of institutional quality.The parameters to be estimated are ($\alpha_i, \psi', \delta', \beta'$) whereas $u_{i,t}$ is the error term.

To estimate the above model, we use a three-year averaged data set spanning the period 1980-2017. Note that the WGI data base starts in 1996, the Fraser Institute data set starts in 1970, the ICRG data base starts in 1984, the V-DEM data base starts in 1789, while the CNTS data set begins in 1950, so estimations using variables from WDI and ICRG do not cover the entire 1980-2017 period. In the presence of reverse causality between GDP per capita and other variables, notably between GDP per capita and measures of institutional quality, the use of OLS and standard static panel data models gives biased results

[3]Which in principle, worsens the problem of endogeneity.

[4]We include fixed effects because countries are not randomly selected from a large sample but rather selected following the income criterion (i.e., based on income status).

and this is further worsened by the inclusion of the lagged dependent variable as one of the regressors. Earlier studies attempted to solve this issue by use of valid external instuments, which are themselves very hard to find (Wooldridge, 2012; Roodman, 2009c, 2009b).

The correlation between $u_{i,t}$ and the other explanatory variables implies that the random effects model is invalid by assumption. Due to the dynamic panel data bias as well as the endogeneity problem, the fixed effects model is also biased (Roodman, 2009b). The problem of endogenity is dealt with by GMM estimators: the Anderson-Hsiao estimator (Anderson & Hsiao, 1981), the Arellano and Bond in 1991 (Arellano & Bond, 1991) estimator, and the system GMM estimator (Blundell & Bond, 1998). As explained in Roodman (2009a), the Blundell and Bond's estimator (1998) is more efficient as it allows the inclusion of more moment conditions and thus expands the pool of available internal (i.e., lags of included variables) instruments that can be used. However, the estimator has two main weaknesses; first, it depends on absence of second-order serial correlation; second, it may result into over-identification or proliferation of instruments. Thus, both identification tests (the Hansen test and Sargan test) and the AR test should be conducted and/or reported.

Since the system GMM was designed for samples with larger N and small T, it suffers from weak sample properties if N is small, which is the case for this study. As demosntrated by Trabelsi (2016), the Bias-Corrected Least Squares Dummy Variable (BC-LSDV) estimator developed by Bruno (2005b) outperforms the system GMM estimator and other estimators in the context of finite samples (i.e., when N is small) even in the presence of endogeneity and Nickel bias. In view of the above, we present and discuss BC-LSDV results and only use system GMM results for robustness checks. In table 4.2, we give variable names, their definitions and sources. The main data sources are Penn World Tables, version 10 (PWT10)[5], the World Governance Indicators (WGI) of the World Bank[6], the International Country Risk Guide (ICRG)[7], the Cross National Time Series (CNTS)[8], the Varieties of Democracy (V-DEM) data set[9] and the Fraser Institute[10].

Table 4.2: Definition of variables and data sources

Variable	Variable Definition	Source
$rgdpna$	Real GDP at constant 2011 national prices (in mil. 2011 USD)	PWT10
$lrgdpna$	log of Real GDP at constant 2011 national prices (in mil. 2011 USD)	Computed
csh_i	Share of investment in GDP	PWT10
csh_g	Share of government consumption in GDP	PWT10
csh_xm	Trade openness (share of total trade in GDP)	PWT10
pop	Population (Millions)	PWT10
$growth\_pop$	Population growth (percent)	Computed

Continued on next page

[5] **https://www.rug.nl/ggdc/productivity/pwt/?lang=en**
[6] **https://datacatalog.worldbank.org/search/dataset/0038026**
[7] **https://guides.tricolib.brynmawr.edu/icrg**
[8] **https://www.cntsdata.com/**
[9] **https://www.v-dem.net/**
[10] **https://www.fraserinstitute.org/economic-freedom/approach**

Table 4.2 – Continued from previous page

Variable	Variable Definition	Source
cc_est	An estimate of control of corruption, with -2.5 (weak) and 2.5 (strong)	WGI
ge_est	An estimate of government effectiveness, with -2.5 (weak) and 2.5 (strong)	WGI
rl_est	An estimate of rule of law, with -2.5 (weak) and 2.5 (strong)	WGI
rq_est	An estimate of regulatory quality, with -2.5 (weak) and 2.5 (strong)	WGI
va_est	An estimate of voice and accountability, with -2.5 (weak) and 2.5 (strong)	WGI
$indecon\_wgi$	Index of economic institutions derived using WGI variables except va_est, with 0 (weak) and 1 (strong)	Computed
$inst\_wgi$	Index of institutional quality derived using WGI variables, with 0 (weak) and 1 (strong)	Computed
gov_stab_icrg	Government stability index, ranges between 0 and 12 higher values denote more government stability	ICRG
$socio\_cond\_icrg$	Socio-economic conditions index, ranges between 0 and 12 higher values denote more social stability	ICRG
inv_prof_icrg	Investment profile index, ranges between 0 and 12 higher values denote better investment profile	ICRG
int_conf_icrg	Internal conflict index, ranges between 0 and 12 higher values denote less internal conflicts	ICRG
ext_conf_icrg	External conflict index, ranges between 0 and 12 higher values denote less external conflicts	ICRG
$corrup\_icrg$	Corruption index, ranges between 0 and 6 higher values denote less corruption	ICRG
$military\_icrg$	Military in politics index, ranges between 0 and 6 higher values denote less military involvement in politics	ICRG
law_ord_icrg	Law and order index, ranges between 0 and 6 higher values denote more observance of law & order	ICRG
eth_tens_icrg	Ethnic tension index, ranges between 0 and 6 higher values denote less ethnic tensions	ICRG
dem_acc_icrg	Democratic accountability index, ranges between 0 and 6 higher values denote more democratic accountability	ICRG
$bureau\_qua\_icrg$	Bureaucratic quality index, ranges between 0 and 4 higher values denote more bureaucratic quality	ICRG
$religion\_icrg$	Religious tensions index, ranges between 0 and 6 higher values denote less religious tensions	ICRG
pol_risk	Political stability index, ranges between 0 and 100 higher values denote more political stability	ICRG

Continued on next page

Table 4.2 – Continued from previous page

Variable	Variable Definition	Source
$v2x\_polyarchy$	Electoral democracy index, ranges between 0 and 1 higher values denote more electoral democracy	V-DEM
$v2x\_libdem$	Liberal democracy index, ranges between 0 and 1 higher values denote more liberal democracy	V-DEM
$v2x\_partipdem$	Participatory democracy index, ranges between 0 and 1 higher values denote more participatory democracy	V-DEM
$v2x\_delibdem$	Deliberate democracy index, ranges between 0 and 1 higher values denote more deliberate democracy	V-DEM
$v2x\_egaldem$	Egalitarian democracy index, ranges between 0 and 1 higher values denote more egalitarian democracy	V-DEM
$v2x\_regime$	A democracy index, ranges between 0 and 3 higher values denote more democracy	V-DEM
$v2x\_regime\_amb$	A democracy index (including categories for ambiguous cases), ranges between 0 and 9 higher values denote more democracy	V-DEM
$assassi$	Number of assassinations	CNTS
$gstrikes$	Number of anti-government strikes	CNTS
$guerrilla$	Number of guerrilla warfares	CNTS
$govcrise$	Number of government crises	CNTS
$purges$	Number of purges	CNTS
$riots$	Number of riots	CNTS
$revol$	Number of revolutions	CNTS
$demonst$	Number of anti-government demonstrations	CNTS
$confind$	Indicator of political risk derived using CNTS variables	Computed
$Area1$	Size of government	Fraser Institute
$Area2$	Legal System and Property Rights	Fraser Institute
$Area3$	Sound money	Fraser Institute
$Area4$	Freedom to trade internationally	Fraser Institute
$Area5$	Regulation	Fraser Institute
$SummaryIndex$	Economic Freedom Index - Summary	Fraser Institute

4.4 Data Analysis and Empirical Results

4.4.1 Descriptive analysis

As already noted in chapter three (table 3.1), Sub-Saharan Africa remains the poorest sub-region. Growth in Africa has been hampered by lack of adequate and reliable financing, explaining why the continent depends much on official development assistance and concessional loans. It has been highlighted that to be able to achieve sustainable growth and development, the existing financing gaps need to be closed

by scaling up ODA and concessional loans to Africa (Hammouda & Osakwe, 2006). In addition, many countries in Africa still have poor institutions and this also constrains economic performance (Acemoglu & Robinson, 2010c). For Sub-Saharan Africa, unimpressive economic performance and high poverty levels can be blamed on poor institutions, such as unfavorable business regulations (Dwumfour, 2020). For illustrative purposes, we show the status of institutional quality using institutional variables from the WGI. Indeed, figure 4.1 below shows that the Sub-Saharan African (SSA) sub-region fares poorly in all aspects of institutional quality.

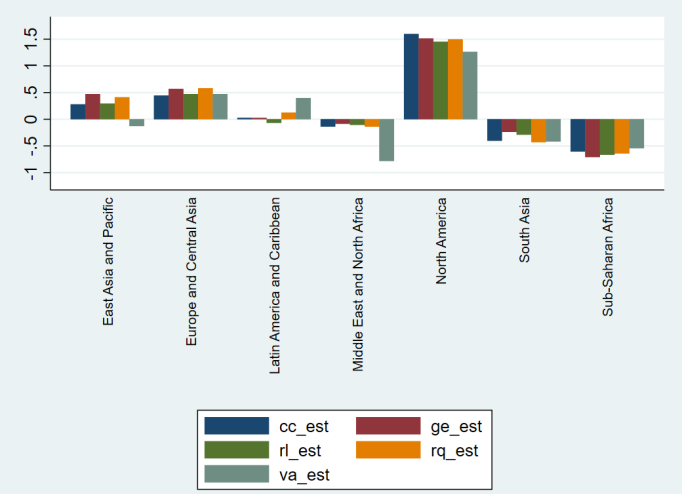

Figure 4.1: Institutional quality by region

However, good institutions have the potential to positively influence economic performance as for example indicated by the positive correlation between WGI institutional variables and per capita real GDP (figure 4.2).

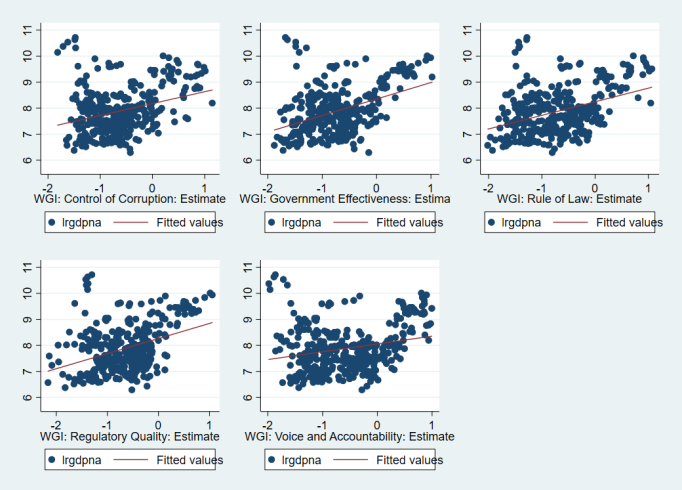

Figure 4.2: Relationship between institutional quality and lrgdpna in SSA

4.4.2 Empirical results

We base on the BC-LSDV estimation results to make interpretations though we present SGMM, FE and OLS results in the appendix as robustness checks (appendix 4.1). We only present results for developing countries in SSA to deal with heterogeneity issues. Since most of the insitutional variables are correlated (see appendix 3.2, 5.6 and, 5.7), we estimate several models by including institutional variables in alternating order. Generally, BC-LSDV estimations are closer to the FE estimations than the SGMM estimations and also successfully deal with the Nickel bias (looking at the coefficient on L.lrgdpna). Results in table 4.3 show that institutional variables from the WGI data base are important drivers of economic performance in Sub-Saharan Africa. Since the variables from the WGI data base are highly correlated, we first use the Principal Components Analysis (PCA) to derive an index of institutional quality[11], which we call "$inst\_wgi$", in line with Ghalia, Fidrmuc, Samargandi, and Sohag (2019). Results in column (1) indicate that $inst\_wgi$ has a positive significant (at 1%) effect on per capita income, implying that good governance positively affects economic performance in SSA countries, consistent with Adedokun (2017). Columns (2) to (6) indicate that regulatory quality (rq_est) and voice and accountability (va_est) have a positive and significant (at 1%) individual effect while rule of law (rl_est) also has a positive effect, but significant at 5%. These findings are similar to those in (Omoteso & Mobolaji, 2014). Also, the control of corruption (cc_est), and government effectiveness (ge_est) have a positive significant effect, which is in line with Anyanwu (2014) and Cieślik and Goczek (2018). Common to all models in table 4.3, $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive significant effect on per capita real GDP in SSA, confirming conditional convergence, demographic dividend spill-overs and effectiveness of the trade channel. While theory and most empirical findings show that the share of investment in GDP is an important driver of economic performance, our results do not support this perhaps due to the fact that most of the SSA countries are aid dependent[12], are more reliant on public investment and generally tend to make poor investment decisions by investing in white elephants (Moyo, 2009). In addition, government acountability is quite poor in SSA countries yet public investment has been found to be an important driver of economic growth only in countries with high government accountability (Morozumi & Veiga, 2016).

Table 4.3: BC-LSDV estimations using WGI data

	(1)	(2)	(3)	(4)	(5)	(6)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.651***	0.652***	0.651***	0.642***	0.657***	0.661***
	(0.030)	(0.031)	(0.030)	(0.031)	(0.033)	(0.033)
growth_pop	0.017***	0.018***	0.017***	0.016***	0.016***	0.015***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
csh_i	0.020	-0.022	0.020	0.038	0.007	0.064
	(0.075)	(0.084)	(0.075)	(0.081)	(0.084)	(0.080)
csh_g	-0.010	0.019	-0.010	-0.025	-0.013	-0.050

[11]The variable $inst\_wgi$ corresponds to the first principal component.

[12]This has been found to crowd-out domestic revenue collections in developing countries (Clist, 2016; Bakhtiari, Izadkhasti, & Tayebi, 2013).

	(0.127)	(0.114)	(0.127)	(0.114)	(0.116)	(0.112)
csh_xm	0.216***	0.193***	0.216***	0.181***	0.173***	0.164***
	(0.051)	(0.044)	(0.051)	(0.045)	(0.045)	(0.045)
inst_wgi	0.054***					
	(0.014)					
cc_est		0.097***				
		(0.026)				
ge_est			0.089***			
			(0.023)			
rq_est				0.095***		
				(0.021)		
rl_est					0.066**	
					(0.026)	
va_est						0.114***
						(0.024)
N	351	352	351	352	352	352

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The institutional variables from the Fraser Institute are very highly correlated, perhaps the reason for the similarity of coefficients and their respective standard errors for the control variables in all the six (6) estimations (table 4.4). However, the fraser Institute also gives the "SummaryIndex", which is an overall index of economic freedom. Note that Area3 (i.e., sound money) is an indicator of macroeconomic policies and is in some studies considered to be part of institutions (Faghih & Samadi, 2021). Estimation results show that the overall indicator of economic freedom has a positive significant effect on per capita real GDP in developing SSA countries, which is consistent with findings by Doucouliagos and Ulubasoglu (2006). Generally, political and economic governance have been found to be important drivers of economic growth (Kaufmann, Kraay, & Zoido-Lobatón, 1999). Since both csh_g and $Area1$ are measures of government size, we drop the latter in column (2). Individually, legal system and property rights (Area2), sound money (Area3), freedom to trade internationally (Area4), and regulation (Area5), have a positive significant effect on economic performance in developing SSA, in line with other empirical studies (Alagidede & Mensah, 2018; Haydaroğlu, 2016; Adefabi et al., 2011; Vijayaraghavan, 2001; Mijiyawa, 2006; Zouhaier & Kefi, 2006). Note that the SGMM estimations using Fraser Institute data (see appendices) drop out $SummaryIndex$, $Area2$, $Area3$, $Area4$, and $Area5$ due to collinearity. The coefficient on $L.lrgdpna$ is greater than one, which shows explosiveness. Also, the BC-LSDV estimation results show that the coefficient on $L.lrgdpna$ is closer to what we have in the FE estimations than in the SGMM estimations.

Table 4.4: BC-LSDV estimations using Fraser Institute data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna
L.lrgdpna	0.903***	0.903***	0.903***	0.903***	0.903***	0.903***
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
growth_pop	0.016***	0.016***	0.016***	0.016***	0.016***	0.016***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
csh_i	0.141*	0.141*	0.141*	0.141*	0.141*	0.141*
	(0.083)	(0.083)	(0.083)	(0.083)	(0.083)	(0.083)
csh_g	-0.063	-0.063	-0.063	-0.063	-0.063	-0.063
	(0.076)	(0.076)	(0.076)	(0.076)	(0.076)	(0.076)
csh_xm	0.200***	0.200***	0.200***	0.200***	0.200***	0.200***
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
SummaryIndex	0.065***					
	(0.014)					
Area2			0.124***			
			(0.040)			
Area3				0.055***		
				(0.011)		
Area4					0.054***	
					(0.011)	
Area5						0.089***
						(0.018)
N	528	528	528	528	528	528

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The ICRG data set has 12 institutional variables and all of them are highly correlated. The data set also contains a political stability index (pol_risk), which is simply the aggregate of the twelve indicators. Findings show that political stability has a positive significant effect on economic performance in SSA countries, in line with Omoteso and Mobolaji (2014). Individually, only a few variables are significant.To save space, we only present significant results in table 4.5 below[13]. In the ICRG data set, the "ethnic tensions" component assesses the degree of tension within a country attributable to racial, nationality,

[13]For complete results, see appendix 4.2.

or language divisions. Lower ratings are given to countries where racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise. Higher ratings are given to countries where tensions are minimal, even though such differences may still exist. The fact that eth_tens has a positive significant (at 5%) effect on per capita income implies that countries with minimal tensions have better economic performance than countries plagued by ethnic tensions (i.e., those with smaller values of eth_tens). The component of internal conflicts (int_conf_icrg) covers the assessment of political violence in the country and its actual or potential impact on governance. The highest rating is given to those countries where there is no armed or civil opposition to the government and the government does not indulge in arbitrary violence, direct or indirect, against its own people. The lowest rating is given to a country embroiled in an on-going civil war. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The subcomponents are: Civil War/Coup Threat; Terrorism/Political Violence; and, Civil Disorder. For the case of SSA, int_conf_icrg has a positive and significant (at 1%) on per capita real GDP, indicating that countries with the lowest internal conflicts tend to perform better than those with high levels of violence.

The component of external conflict (ext_conf_icrg) measures the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade restrictions, territorial disputes, sanctions, etc) to violent external pressure (cross-border conflicts to all-out war). External conflicts can adversely affect foreign business in many ways, ranging from restrictions on operations to trade and investment sanctions, to distortions in the allocation of economic resources, to violent change in the structure of society. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The subcomponents are: War; Cross-Border Conflict; and, Foreign Pressures. For the SSA countries, ext_conf has a positive significant effect, indicating that countries with the lowest external conflicts tend to perform better than those with high levels of external conflicts.

The component of law and order (law_ord_icrg) has two elements that are assessed separately, with each element being scored from zero to three points. To assess the "Law" element, the strength and impartiality of the legal system are considered, while the "Order" element is an assessment of popular observance of the law. Thus, a country can enjoy a high rating – 3 – in terms of its judicial system, but a low rating – 1 – if it suffers from a very high crime rate if the law is routinely ignored without effective sanction (for example, wide-spread illegal strikes). Generally, law and order has a significant (at 5%) effect on per capita real GDP in SSA, indicating, as expected, that countries that fare better on law and order tend to have better economic performance than those that fare poorly. In addition, $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive significant effect on per capita real GDP in SSA. The importance of political stability and rule of law is stressed in the empirical works of Omoteso and Mobolaji (2014) and Levine (1999).

Table 4.5: BC-LSDV estimations using ICRG data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna
L.lrgdpna	0.893***	0.932***	0.910***	0.938***	0.912***
	(0.027)	(0.029)	(0.030)	(0.029)	(0.028)
growth_pop	0.020***	0.024***	0.023***	0.025***	0.022***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
csh_i	0.086	0.104	0.051	0.066	0.125
	(0.102)	(0.085)	(0.086)	(0.087)	(0.101)
csh_g	-0.104	-0.061	-0.011	-0.007	-0.044
	(0.093)	(0.128)	(0.125)	(0.124)	(0.097)
csh_xm	0.134**	0.148**	0.163**	0.182***	0.135**
	(0.054)	(0.070)	(0.066)	(0.067)	(0.055)
pol_risk	0.004***				
	(0.001)				
int_conf_icrg		0.013***			
		(0.005)			
ext_conf_icrg			0.012***		
			(0.004)		
eth_tens_icrg				0.021**	
				(0.011)	
law_ord_icrg					0.020**
					(0.009)
N	368	309	309	309	368

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In the V-DEM data base, $v2x\_polyarchy$ covers the electoral principle of democracy and embodies the core value of making rulers responsive to citizens through periodic elections. This measure is fundamental to all other measures of democracy: a regime without elections cannot be called "democratic" in any sense. The component of $v2x\_egaldem$ covers the egalitarian principle and holds that material and immaterial inequalities inhibit the actual use of formal political (electoral) rights and liberties. Ideally, all groups should enjoy equal de jure and de facto capabilities to participate; to serve in positions of political power; to put issues on the agenda; and to influence policymaking. Following the literature in this tradition, gross inequalities of health, education, or income are understood to inhibit the exercise of political

power and the de facto enjoyment of political rights. This component also includes $v2x\_polyarchy$. Estimations for the case of SSA presented in table 4.6 show that egalitarian democracy has a positive and significant effect on real per capita GDP, but only at 10%. However, once global measures of democracy are used, results improve since both $v2x\_regime$ and $v2x\_regime\_amb$ have a positive and significant effect, at 1%, suggesting that democracy promotes economic performance in developing Sub-Saharan African countries, which is consistent with findings in Jaunky (2013).

Table 4.6: BC-LSDV estimations using V-DEM data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna
L.lrgdpna	0.877***	0.879***	0.895***	0.895***	0.896***	0.896***	0.895***
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.026)	(0.026)
growth_pop	0.016***	0.016***	0.017***	0.017***	0.016***	0.016***	0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
csh_i	0.126	0.126	0.115	0.115	0.109	0.117	0.114
	(0.098)	(0.098)	(0.106)	(0.104)	(0.104)	(0.105)	(0.103)
csh_g	-0.072	-0.083	-0.082	-0.088	-0.078	-0.077	-0.093
	(0.103)	(0.104)	(0.109)	(0.107)	(0.107)	(0.106)	(0.107)
csh_xm	0.249***	0.244***	0.230***	0.231***	0.231***	0.232***	0.233***
	(0.055)	(0.056)	(0.052)	(0.051)	(0.051)	(0.051)	(0.050)
v2x_regime	0.038***						
	(0.012)						
v2x_regime_amb		0.013***					
		(0.004)					
v2x_polyarchy			0.070				
			(0.075)				
v2x_libdem				0.126			
				(0.086)			
v2x_partipdem					0.125		
					(0.124)		
v2x_delibdem						0.110	
						(0.086)	
v2x_egaldem							0.175*
							(0.105)
N	456	456	456	456	456	456	456

Standard errors in parentheses

Source: own estimations.

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

In the CNTS data base, government crises ($govcrise$) are defined as any rapidly developing situation that threatens to bring the downfall of the present regime - excluding situations of revolt aimed at such overthrow. Revolutions ($revol$) are defined as any illegal or forced change in the top government elite, any attempt at such a change, or any successful or unsuccessful armed rebellion whose aim is independence from the central government. For the case of SSA and in line with expectations, $govcrise$ and $revol$ have a negative significant effect on real GDP per capita. The results in table 4.7 are in line with those of Aisen and Veiga (2013), Alesina, Özler, Roubini, and Swagel (1996), and Jong-A-Pin and Yu (2010), indicating that political instability negatively affects economic growth. As in the previous estimations, $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive significant effect on per capita real GDP in SSA.

Table 4.7: BC-LSDV estimations using CNTS data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna	(8) lrgdpna
L.lrgdpna	0.895***	0.896***	0.894***	0.888***	0.896***	0.895***	0.889***	0.895***
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.033)	(0.032)	(0.033)
growth_pop	0.017***	0.017***	0.017***	0.015***	0.017***	0.017***	0.016***	0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
csh_i	0.098	0.102	0.117	0.077	0.104	0.105	0.109	0.104
	(0.085)	(0.082)	(0.084)	(0.082)	(0.083)	(0.083)	(0.083)	(0.085)
csh_g	-0.050	-0.055	-0.049	-0.068	-0.053	-0.055	-0.075	-0.050
	(0.106)	(0.105)	(0.106)	(0.104)	(0.106)	(0.108)	(0.105)	(0.108)
csh_xm	0.235***	0.236***	0.238***	0.248***	0.234***	0.234***	0.232***	0.234***
	(0.050)	(0.049)	(0.050)	(0.048)	(0.049)	(0.049)	(0.049)	(0.049)
assassi	-0.016							
	(0.028)							
gstrikes		-0.028						
		(0.028)						
guerrilla			0.001					
			(0.001)					
govcrise				-0.180***				
				(0.048)				
purges					-0.022			

					(0.031)			
riots						-0.005		
						(0.007)		
revol							-0.059***	
							(0.018)	
demonst								0.001
								(0.006)
N	447	447	447	447	447	447	447	447

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

As noted in table 1 of Faghih and Samadi (2021, p. 146), institutions are generally categorized into economic and legal, social, and political institutions. However, some sub-components overlap across the three categories, making clear demarcation among them quite cumbersome. Also, even though some indexes of institutions may be uncorrellated, they could be measuring the same thing. Thus, having a multiple regression model combining a number of institutional variables is quite challenging. To deal with this issue, we first use the WGIs and categorize them between economic and legal institutions as well as political institutions. As in Asongu and Nwachukwu (2018), we consider va_est as political institutions and the rest of the WGIs as economic and legal institutions. Since the WGIs are highly correlated, we use PCA to derive an index of economic and legal institutions ($indecon\_wgi$). Our estimation results (table 4.8) show that political institutions have a positive and significant effect on per capita real GDP in developing Sub-Saharan African countries. Economic and legal institutions also have a positive effect, but are only significant at 10%, largely because only rq_est has a positive and significant effect. As noted above, political and economic institutions are important determinants of economic performance (Omoteso & Mobolaji, 2014; Levine, 1999).

Table 4.8: Combined BC-LSDV estimations using WGI data

	(1)	(2)	(3)	(4)	(5)	(6)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.644***	0.640***	0.653***	0.662***	0.643***	0.648***
	(0.032)	(0.032)	(0.031)	(0.032)	(0.031)	(0.031)
growth_pop	0.017***	0.017***	0.016***	0.015***	0.016***	0.016***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
csh_i	0.048	0.063	0.036	0.066	0.063	0.066
	(0.072)	(0.073)	(0.085)	(0.083)	(0.079)	(0.075)
csh_g	-0.014	-0.026	-0.025	-0.051	-0.042	-0.034

	(0.127)	(0.127)	(0.113)	(0.112)	(0.112)	(0.125)
csh_xm	0.197***	0.198***	0.177***	0.163***	0.174***	0.195***
	(0.051)	(0.051)	(0.044)	(0.044)	(0.045)	(0.049)
va_est	0.096***	0.096***	0.096***	0.116***	0.094***	0.100***
	(0.021)	(0.026)	(0.031)	(0.027)	(0.025)	(0.024)
indecon_wgi	0.031*					
	(0.018)					
cc_est		0.039	0.043			
		(0.038)	(0.034)			
rl_est		-0.030		-0.003		
		(0.034)		(0.029)		
rq_est		0.042			0.054**	
		(0.026)			(0.023)	
ge_est		0.010				0.037
		(0.032)				(0.028)
N	351	351	352	352	352	351

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Using institutional data sets other than the WGI, we find that political stability (pol_risk) and democracy ($v2x\_regime\_amb$) have a positive significant effect on the economic performance of developing Sub-Saharan African countries. As before, the political stability index is an aggregate of the twelve components in the ICRG data set while the democracy index ranges between 0 and 9 and includes ambigious categories. We opt to use $v2x\_regime\_amb$ since it is highly correlated with $v2x\_regime$. Using PCA, we derive a conflict index ($confind$) from all the political instability measures in the CNTS data base. Estimation results (table 4.9) show that $confind$ has the expected sign, though insignificant, due to the fact that only government crisis consistently has a negative significant effect, revolutions have a negative significant effect in column (1) and other measures of political instability are not significant. These findings confirm that economic freedom, and democracy are conducive for economic performance in developing Sub-Saharan African countries, and provide some support for the hypothesis that political instability hinders economic growth.

Table 4.9: Other combined BC-LSDV estimations

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna
L.lrgdpna	0.885***	0.893***	0.879***	0.887***	0.876***	0.871***
	(0.032)	(0.027)	(0.027)	(0.031)	(0.025)	(0.025)
growth_pop	0.015***	0.020***	0.016***	0.021***	0.017***	0.015***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
csh_i	0.084	0.086	0.126	0.084	0.144	0.117
	(0.082)	(0.102)	(0.098)	(0.089)	(0.094)	(0.090)
csh_g	-0.081	-0.104	-0.083	-0.083	-0.071	-0.085
	(0.104)	(0.093)	(0.104)	(0.126)	(0.102)	(0.101)
csh_xm	0.245***	0.134**	0.244***	0.164**	0.258***	0.268***
	(0.048)	(0.054)	(0.056)	(0.068)	(0.057)	(0.055)
SummaryIndex	0.083***	0.067***	0.037*	0.078***	0.062***	0.063***
	(0.023)	(0.020)	(0.022)	(0.022)	(0.021)	(0.020)
revol	-0.039**					-0.027
	(0.019)					(0.022)
govcrise	-0.157***					-0.156***
	(0.051)					(0.044)
pol_risk		0.004***		0.003**		
		(0.001)		(0.001)		
v2x_regime_amb			0.013***	0.010*	0.014***	0.011**
			(0.004)	(0.005)	(0.005)	(0.005)
confind					-0.000	
					(0.010)	
N	447	368	456	309	435	435

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.5 Concluding Remarks

The aim of this chapter was to examine the direct effect of institutional quality on economic growth in Sub-Saharan Africa, a region that is still underresearched. The focus on developing countries of SSA also helps dealing with issues of country heterogeneity that plagued numerous empirical studies of the effects of institutions on economic growth. We base our interpretations on the BC-LSDV estimations given that the BC-LSDV model is more appropriate for samples with short panels than alternative models such as SGMM, FE or OLS. Our estimations generally show that the BC-LSDV estimations are closer to the FE estimations than to the SGMM estimation results. We explore four data sets for the institutional variables: the WGI, CNTS, V-DEM, ICRG and Fraser Institute. OLS, FE and SGMM estimations are presented in the appendix as robustness checks. According to appendix 4.2, most of the institutional variables are correllated. Hence, we estimate several models, each containing one measure of institutional quality, in addition to the main drivers of economic performance. Common to all estimations, $L.lrgdpna$, $growth\_pop$ and csh_xm have a positive significant effect on per capita real GDP in SSA. Since the coefficient on $L.lrgdpna$ is less than one, this confirms the conditional convergence hypothesis for the case of SSA countries. The signinficance of $growth\_pop$ implies that SSA countries reap the benefits from the demographic dividend. The significance of csh_xm implies that the trade channel is effective in SSA countries as trade openness is beneficial. While most SSA countries are net importers, their imports are dominated by capital and intermediate goods which are used for development purposes.

BC-LSDV estimations show that all the institutional variables from the WGI have a positive significant effect on per capita real GDP, supporting the assertion that "governance matters" (Kaufmann et al., 1999). Control of corruption (cc_est) captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption. It also includes "capture" of the state by elites and private interests. Thus, the fight against such forms of corruption is quite beneficial for SSA. Government effectiveness (ge_est) is defined to capture perceptions of the quality of public services, the quality of the service and the degree of independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. For SSA, the higher the level of government effectiveness, the higher the level of economic performance. Rule of law (rl_est) captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. In view of this definition, rule of law has a positive and significant effect on per capita real GDP. Regulatory quality (rq_est) is defined to capture perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Therefore, the higher the government capacity to formulate and implement such policies, the higher the economic performance in SSA. Voice and accountability (va_est) captures the perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. For the case of SSA, voice and accountability has a positive significant effect on per capita income. The estimations using WGIs uses data from 1996 to 2017 and thus might be suffering from less degrees of freedom, especially because we are using a 3-years averaged data set[14]. Also, it is worth noting that the WGIs have been criticized by many authors. However, these criticisms are often exaggerated and unfounded as noted in Kaufmann (2007).

[14]This could be the reason why the SGMM estimations are less robust.

Since no single measure of institutional quality has been deemed sufficient (Lloyd & Lee, 2018), we examine the effect of institutional variables from other sources other than the WGI, notably from V-DEM, CNTS, the Fraser Institute and ICRG. Variables from the Fraser institute ($Area2$, $Area3$, $Area4$, $Area5$, and $SummaryIndex$) have a positive significant effect on per capita income in SSA. Thus, legal system and Property Rights (being closely related to rl_est from WGI and to $Area2$ from the Fraser Institute) , sound money (an indicator of macroeconomic policy), freedom to trade internationally, regulation and the overall measure economic freedom are important for growth in SSA.

Only four variables from the ICRG data set have a positive significant effect on economic performance in SSA. These are: int_conf_icrg, which measures the degree of risk of having internal conflicts; eth_tens, which measures the risk of having ethinic tensions in a country; ext_conf_icrg, which captures the risk of having internal conflicts; and, law_ord_icrg, which measures the extent to which law and order are observed and adhered to in society. The positive and statistivally significant coefficients for these variables indicate that the absence or a low risk of ethnic tensions and internal or external conflicts are good for growth, and confirm previous results indicating the positive effect of the observance of the rule of law. Also, $v2x\_egaldem$, which captures the degree of egalitarian democracy has a positive significant (at 10%) effect on real GDP per capita in SSA. Using more comprehensive measures of democracy, we find that both $v2x\_regime$ and $v2x\_regime\_amb$ have a positive and significant (at 1%) effect on economic performance in developing Sub-Saharan African countries.

In addition, only two variables (i.e., $govcrise$ and $revol$) from the CNTS data set have a negative significant effect on real GDP per capita in SSA. Government crises ($govcrise$) measures major government crises, which involve any rapidly developing situation that threatens to bring the downfall of the present regime, excluding situations of revolts that can also lead to such overthrow. Revolutions ($revol$) capture any illegal or forced change in the top government elite, any attempt at such a change, or any successful or unsuccessful armed rebellion whose aim is independence from the cental government. In view of these definitions, it is clear that both $govcrise$ and $revol$ have detrimental effects on economic performance in SSA, consistent with previous findings indicating that government and regime instability is bad for growth (Aisen & Veiga, 2013; Alesina et al., 1996; Jong-A-Pin & Yu, 2010).

Finally, when several institutional indicators are combined in the same regression (tables 4.8 and 4.9), estimation results show that voice and accountability consistently has a positive significance effect on economic performance. The indicator of economic institutions (i.e., ind_wgi) has a positive effect but only at 10%, since only regulatory quality has a positive significant effect. Using institutional variables from sources other than the WGI, we find that economic freedom, democracy, and political stability consistently have a positive significant effect. While government crisis consistently has a negative significant effect. To counter-check the results on political stability, we use indicators of political instability and find that revolutions have a negative significant effect in the first column of table 4.9 when they are put together with $SummaryIndex$ in the same regression.

CHAPTER 5

GENERAL CONCLUSIONS

5.1 Introduction

In this chapter, we give a brief overview of the research topics addressed, the research objectives, methods and data used to attain research objectives, and describe the main findings of this thesis. The first research topic is on the link between financial development and economic growth, which is covered in chapter two. Most of the previous empirical studies about Sub-Saharan Africa are plagued with heterogeneity bias given that they lump together countries that do not necessarily have similar characteristics. We address this gap by considering only developing countries of Sub-Saharan Africa. Since we have a small sample with a short panel, the SGMM estimations are less robust compared to BC-LSDV estimations, a fact that has been ignored by most empirical studies about SSA. The focus on SSA is also motivated by the fact that the sub-region remains the poorest yet still under-researched. An empirical investigation of some of the critical drivers of economic performance is thus worth undertaking. The third chapter focuses on developing SSA to examine whether or not foreign aid and its components have a direct, complementary, non-linear and conditional effect on per capita real GDP. We also test whether aid components (loans versus grants) have opposite effects. Further, we investigate whether the effect of aid and its components varies with different levels of institutional quality. In the fourth chapter, we once again focus on developing SSA countries so as to better understand how institutions affect growth in this group of mostly poor countries and reducing any biases that may result from sample heterogeneity. We examine the individual effect of each of the institutional variables from five different sources: the Cross National Time Series (CNTS), The International Country Risk Guide (ICRG), the Wordwide Governance Indicators (WGI), the Economic Freedom of the World Report of the Fraser Institute, and the Varieties of Democracy (V-DEM). The use of a large pool of institutional variables is one of the important innovations of this thesis. In all the estimations, we use a 3 years averaged data set spanning the 1980-2017 period.

5.2 Main Findings

In chapter two, we show that none of the traditional indicators of financial development affects economic performance in SSA, perhaps due to the fact that the share of credit and broad money in GDP is still low, and therefore does not capture all the aspects of financial development, notably access, depth and efficiency (Ang, 2008; Sahay et al., 2015). We also show that bank-based measures of financial development are more important compared to measures derived from capital markets. The used set of new IMF indicators of financial development cover access, depth and efficiency of both financial institutions and financial markets. In the global sample, BC-LSDV results show that the efficiency of financial institutions has a positive significant effect on per capita income while the depth of financial markets has a negative significant effect. The same findings remain valid even when we introduce pairwise interaction terms between new IMF financial development indicators and the dummy variable for developing countries. The interaction term between FIE and the dummy variable for developing countries has a positive significant effect on per capita GDP, which is suggestive of the importance of FIE in developing countries. Also, the interaction term between FIE and the SSA dummy variable is negative and significant, suggesting that the efficiency of financial institutions is lower in SSA compared to other geographical sub-regions and is still an impediment to the performance of real GDP per capita. However, the use of interaction dummies to assess the differential effects of financial development on per capita income or economic growth across sub-groups has been criticized. Thus, this study goes a step further by presenting estimation results per income groups and per geographical groupings of interest.

The BC-LSDV estimation results for developing countries show that FIE has a positive and significant effect on per capita income.Regarding the income groupings, both FIA and FID have a significant positive effect in LICs while in both LMICs and UMICs, FIE has a positive and significant effect. Regarding geographical sub-regions, results show that the aggregate indicator of financial development (i.e. FD), the indicator for financial institutions development (FI) and the indicator for financial institutions access (FIA) have a positive and significant effect on GDP per capita in developing African countries, stressing the importance of bank based indicators of financial development. For developing SSA, it is clear that FID has a positive significant effect on per capita income.

The results for developing countries, developed countries, LICs, LMICs, UMICs, developing Africa and developing SSA are broadly consistent with the robustness checks, using a 5-years averaged data set, with the only exceptions being: (1) for developed countries, FID is not significant in the robustness checks; (2) for LMICs, FID is only significant (at 10%) and negative in the robustness checks; (3) for developing SSA, FIE is only significant (at 10%) and negative in the robustness checks. All the other results (i.e. in terms of the effect of new indicators of financial development on per capita income) are broadly the same, confirming the fact that the BC-LSDV model performs well in small samples. Also, findings show that the effect of financial development on per capita income varies across the income groups since different indicators of financial development are important in different income sub-groups. While FIA has a significant positive effect in developing Africa, FID is significant and positive for the case of developing SSA. Thus, the effect of financial development also depends on the geographical region's specific realities.

In chapter three, we estimate BC-LSDV models with both aggregated and disaggregated aid variables, assuming linearity and non-linearity of aid and institutional variables, respectively. Estimation results from the linear BC-LSDV model with aggregated aid show that ODA_GDP has a negative but insignificant effect. Since $govcrise\_odagdp$ has a negative significant (at 1%) effect, government crises hinder aid ef-

fectiveness in SSA. The findings from the model with disaggregated aid show that aid variables have opposite albeit statistically insignificant effects on per capita income in SSA, with $grants\_gdp$ and $loans\_gdp$ having a positive and negative effect, respectively. The interaction term, $govcrise\_grantsgdp$, has a negative significant (at 1%) effect, implying that the effect of grants is negative in situations characterized by government crises. According to the results from the dynamic panel threshold model with endogeneous regressors, each of the aid variables has a non-linear effect on per capita GDP in SSA. However, none of the aid variables is significant below and above the threshold. When ODA is used as a threshold variable, the interaction term ($govcrise\_odagdp$) between government crisis and ODA_GDP has a negative and statistically significant (at 5%) effect, implying that government crises have detrimental effects on aid effectiveness in SSA. When $grants\_gdp$ is used as a threshold variable, the interaction terms ($riots\_grantsgdp$ and $govcrise\_grantsgdp$) indicate that riots and government crises hinder the effectiveness of aid grants in SSA, respectively. Using $loans\_gdp$ as the threshold, we find that the direct effect of government crises is negative and significant at 5%. Using institutional variables as the threshold variables, ODA (% GDP) is only significant when purges are used as the threshold variable and it has a negative effect in the upper regime (i.e. with poor institutional quality). In all cases, grants (% of GDP) are not significant below and above the threshold. Aid loans (% of GDP) only have a negative significant effect in the upper regime when guerrilla is used as the threshold variable.

In chapter four, we examine the direct effect of institutional variables on economic performance in a sample of developing Sub-Saharan African countries. Just like in chapters 2 and 3, we find that the BC-LSDV model is more robust in short panels, common to macro-economic data, and our BC-LSDV estimations are closer to FE estimations than to the System Generalized Method of Moments (SGMM) estimations. Estimation results show that governance, economic freedom, democracy and political stability are important drivers of economic performance in SSA. Individually, legal systems and property rights, sound money, freedom to trade internationally, regulation, control of corruption, government effectiveness, regulatory quality, rule of law, voice and accountability, law and order, egalitarian democracy and lower risk of having both internal and external conflicts have a positive significant effect on per capita real GDP in SSA. Conversely, regime and government instability (i.e., government crises and revolutions) have a negative significant effect.

The main recommendations from the three chapters is that Sub-Saharan African countries need to further develop their financial systems so as to be able to efficiently mobilize and channel savings to productive investments. Sub-Saharan African economies can potentially reap from the development of capital markets, which are still nascent in many countries and explain the predominance of bank-based indicators of financial development. Political instabilities not only hinder aid effectivess but also have a negative significant effect on economic performance in SSA. Thus, SSA countries should devise means to attain political stability, particularly by entreching democracy, observing law and order and safeguarding economic and political freedoms since all these have a positive significant effect on economic performance.

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APPENDICES TO CHAPTER 2

Appendix 2.1: Data Description		
Variable Name	Label	Source
csh_i	Average share of gross capital formation in GDP (real)	PWT 10.0
csh_xm	Average share of trade in GDP (real)	PWT 10.0
csh_g	Average share of government consumption in GDP (real)	PWT 10.0
rl_est	Rule of law: Estimate	WGI
aid_tot	Total Official aid (% of GDP)	OECD
yr_sch	Average Years of Schooling	Barro-Lee
pop	Population (in millions)	PWT 10.0
Area2	Legal system and property rights	Fraser Institute
law_ord_icrg	Law and Order	ICRG
rgdpna	Real GDP at constant 2011 national prices (in mil. 2011US$)	PWT 10.0
CPS_GDP	Credit to Private Sector (% of GDP)	GFDD
M3_GDP	Broad Money (% of GDP)	GFDD
rl_est2, Area22, law_ord_icrg2	interpolated versions of institutional variables, respectively	WGI, Fraser Institute & ICRG
FD	Financial Development Index	IMF
FI	Financial Institutions Index	IMF
FM	Financial Markets Index	IMF
FID	Financial Institutions Depth	IMF
FIA	Financial Institutions Access	IMF
FIE	Financial Institutions Efficiency	IMF
FMD	Financial Markets Depth	IMF
FMA	Financial Markets Access	IMF
FME	Financial Markets Efficiency	IMF

Appendix 2.2: Symmetric Correlation Matrix-Financial Development Indicators

	FID	FIA	FIE	FMD	FMA	FME
FID	1.000					
FIA	0.674***	1.000				
FIE	0.477***	0.493***	1.000			
FMD	0.807***	0.551***	0.407***	1.000		
FMA	0.681***	0.571***	0.382***	0.727***	1.000	
FME	0.554***	0.442***	0.280***	0.664***	0.516***	1.000
N	2210					

t statistics in parentheses

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

Appendix 2.3: Collinearity Test using VIFs

Variable	VIF	1/VIF
FID	5.32	0.187873
FMD	5.07	0.197386
lrgdpna		
L1.	4.12	0.242757
rl_est2	3.63	0.275226
l1_yr_sch2	3.17	0.315840
FIA	3.01	0.332295
FMA	2.84	0.352524
FME	2.76	0.362203
p2	2.06	0.485687
p5	2.06	0.486296
p3	2.03	0.493275
p6	2.01	0.497226
p4	1.99	0.501402
lpop	1.99	0.501498
p7	1.98	0.504863
csh_xm	1.95	0.513916
p8	1.93	0.516859
p10	1.90	0.527547
p9	1.89	0.527712
p11	1.85	0.540747
p12	1.83	0.545023
csh_i	1.61	0.620278
FIE	1.55	0.646154
csh_g	1.23	0.815948
Mean VIF	2.49	

Appendix 2.4: Robustness checks using 5-year averaged data

Table 5.1: Panel Data Regressions per income grouping

	Developing	Developed/HIC	LIC	LMIC	UMIC
L.lrgdpna	0.690***	0.644***	0.571***	0.600***	0.672***
	(0.03)	(0.04)	(0.07)	(0.05)	(0.05)
lpop	-0.144*	-0.204***	0.601**	-0.622***	-0.162
	(0.08)	(0.05)	(0.24)	(0.11)	(0.11)
csh_xm	0.167***	-0.002	0.697***	0.108**	0.154**
	(0.05)	(0.03)	(0.18)	(0.05)	(0.07)
csh_i	0.218	0.256**	0.796***	0.082	-0.219
	(0.13)	(0.11)	(0.27)	(0.15)	(0.22)
csh_g	-0.493***	-0.057	-0.276	-0.280*	-0.986***
	(0.12)	(0.17)	(0.17)	(0.15)	(0.20)
FID	-0.024	-0.089	1.489**	-0.369*	-0.139
	(0.17)	(0.13)	(0.68)	(0.22)	(0.20)
FIA	0.089	0.026	4.303***	-0.100	0.011
	(0.12)	(0.09)	(1.34)	(0.16)	(0.15)
FIE	0.157**	0.286***	-0.012	0.254***	0.198**
	(0.08)	(0.08)	(0.17)	(0.06)	(0.10)
FMD	0.046	-0.123	-0.637	0.109	0.269
	(0.14)	(0.08)	(0.48)	(0.15)	(0.20)
FMA	-0.021	0.049	-9.587	-0.195	-0.036
	(0.20)	(0.07)	(15.15)	(0.21)	(0.19)
FME	-0.001	-0.006	3.025	0.026	-0.067
	(0.08)	(0.04)	(3.00)	(0.06)	(0.10)
rl_est2	0.084***	0.073***	0.044	0.037	0.121***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
N	775	392	194	268	313

Standard errors in parentheses. Source: own estimations.

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table 5.2: Estimations for developing Africa

	Africa-dev1	Africa-dev2	Africa-dev3
L.lrgdpna	0.704***	0.705***	0.703***
	(0.04)	(0.04)	(0.04)
lpop	0.154*	0.153*	0.187**
	(0.09)	(0.09)	(0.09)
csh_xm	0.223***	0.223***	0.220***
	(0.05)	(0.05)	(0.05)
csh_i	0.236	0.236	0.287**
	(0.15)	(0.15)	(0.14)
csh_g	-0.155	-0.155	-0.127
	(0.16)	(0.16)	(0.15)
FD	0.493*		
	(0.28)		
rl_est2	0.050*	0.050*	0.055**
	(0.03)	(0.03)	(0.03)
FI		0.245	
		(0.20)	
FM		0.261	
		(0.28)	
FIA			0.406**
			(0.16)
FID			0.013
			(0.20)
FIE			-0.011
			(0.08)
FMA			0.163
			(0.31)
FMD			-0.032
			(0.28)
FME			0.109
			(0.12)

Standard errors in parentheses. Source: own estimations.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.3: Modified estimations for developing SSA

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna
L.lrgdpna	0.839***	0.838***	0.833***	0.854***	0.855***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
lpop	0.400**	0.423**	0.502***	0.445***	0.508***
	(0.16)	(0.17)	(0.18)	(0.17)	(0.18)
csh_xm	0.417***	0.428***	0.446***	0.427***	0.439***
	(0.09)	(0.10)	(0.10)	(0.10)	(0.11)
csh_i	0.356*	0.361*	0.301	0.330*	0.290
	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
aid_tot	0.054***	0.053***	0.052***	0.060***	0.058***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FD	0.002				
	(0.38)				
FI		-0.067			
		(0.19)			
FM		0.291			
		(0.73)			
FID			0.608*		0.579
			(0.35)		(0.35)
FIA			0.126		0.148
			(0.40)		(0.40)
FIE			-0.164*		-0.173*
			(0.09)		(0.09)
FMD				0.262	0.164
				(0.33)	(0.33)
FMA				0.072	-0.191
				(0.63)	(0.62)
FME				-0.912	-0.792
				(0.90)	(0.89)
N	253	253	253	253	253

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX 3.1: contains tables 5.4, 5.5, 5.6 and, 5.7

Table 5.4: Correlation matrix

	law_ord_icrg2	gov_stab_icrg2	socio_cond_icrg2	inv_prof_icrg2	int_conf_icrg2	ext_conf_icrg2
law_ord_icrg2	1	0.43	0.73	0.48	0.73	0.56
gov_stab_icrg2	0.43	1	0.48	0.61	0.52	0.42
socio_cond_icrg2	0.73	0.48	1	0.72	0.55	0.43
inv_prof_icrg2	0.48	0.61	0.72	1	0.49	0.37
int_conf_icrg2	0.73	0.52	0.55	0.49	1	0.7
ext_conf_icrg2	0.56	0.42	0.43	0.37	0.7	1
corrup_icrg2	0.79	0.33	0.63	0.31	0.54	0.42
military_icrg2	0.8	0.45	0.73	0.57	0.74	0.57
eth_tens_icrg2	0.27	0.16	0.11	0.02	0.41	0.26
religion_icrg2	0.35	0.29	0.2	0.24	0.45	0.33
dem_acc_icrg2	0.74	0.49	0.66	0.59	0.71	0.55
bureau_qua_icrg2	0.83	0.46	0.75	0.55	0.67	0.56
assassi	-0.32	-0.21	-0.21	-0.24	-0.44	-0.24

gstrikes	-0.17	-0.28	-0.21	-0.25	-0.26	-0.16
guerrilla	-0.11	-0.03	-0.06	-0.05	-0.14	-0.14
govcrise	-0.03	-0.2	-0.13	-0.17	-0.13	0.01
purges	-0.16	-0.11	-0.11	-0.13	-0.18	-0.14
riots	-0.1	-0.16	-0.07	-0.06	-0.17	-0.13
revol	-0.3	-0.17	-0.26	-0.24	-0.43	-0.28
demonst	-0.12	-0.17	-0.08	-0.03	-0.2	-0.12
v2x_polyarchy	0.7	0.45	0.61	0.54	0.68	0.54
v2x_libdem	0.76	0.42	0.66	0.55	0.67	0.53
v2x_partipdem	0.72	0.44	0.63	0.55	0.7	0.54
v2x_delibdem	0.73	0.44	0.64	0.56	0.67	0.52
v2x_egaldem	0.8	0.42	0.71	0.54	0.69	0.51

Table 5.5: Correlation matrix (continued)

	corrup_icrg2	military_icrg2	eth_tens_icrg2	religion_icrg2	dem_acc_icrg2	bureau_qua_icrg2
law_ord_icrg2	0.79	0.8	0.27	0.35	0.74	0.83
gov_stab_icrg2	0.33	0.45	0.16	0.29	0.49	0.46
socio_cond_icrg2	0.63	0.73	0.11	0.2	0.66	0.75
inv_prof_icrg2	0.31	0.57	0.02	0.24	0.59	0.55
int_conf_icrg2	0.54	0.74	0.41	0.45	0.71	0.67
ext_conf_icrg2	0.42	0.57	0.26	0.33	0.55	0.56
corrup_icrg2	1	0.7	0.19	0.29	0.66	0.79
military_icrg2	0.7	1	0.24	0.32	0.83	0.83
eth_tens_icrg2	0.19	0.24	1	0.33	0.18	0.14
religion_icrg2	0.29	0.32	0.33	1	0.26	0.3
dem_acc_icrg2	0.66	0.83	0.18	0.26	1	0.82
bureau_qua_icrg2	0.79	0.83	0.14	0.3	0.82	1
assassi	-0.2	-0.3	-0.13	-0.14	-0.33	-0.26

gstrikes	-0.19	-0.18	-0.12	-0.17	-0.13	-0.16
guerrilla	-0.09	-0.14	-0.13	-0.13	-0.09	-0.07
govcrise	-0.12	-0.05	-0.07	-0.06	-0.12	-0.08
purges	-0.18	-0.22	-0.14	-0.14	-0.23	-0.18
riots	-0.07	-0.09	-0.27	-0.1	0.02	-0.01
revol	-0.23	-0.32	-0.2	-0.16	-0.3	-0.26
demonst	-0.14	-0.1	-0.22	-0.04	-0.02	-0.04
v2x_polyarchy	0.59	0.79	0.26	0.35	0.79	0.72
v2x_libdem	0.66	0.82	0.27	0.36	0.8	0.77
v2x_partipdem	0.62	0.8	0.26	0.37	0.79	0.73
v2x_delibdem	0.64	0.82	0.26	0.34	0.81	0.74
v2x_egaldem	0.69	0.84	0.29	0.3	0.8	0.78

Table 5.6: Correlation matrix (continued)

	assassi	gstrikes	guerrilla	govcrise	purges	riots	revol	demonst
law_ord_icrg2	-0.32	-0.17	-0.11	-0.03	-0.16	-0.1	-0.3	-0.12
gov_stab_icrg2	-0.21	-0.28	-0.03	-0.2	-0.11	-0.16	-0.17	-0.17
socio_cond_icrg2	-0.21	-0.21	-0.06	-0.13	-0.11	-0.07	-0.26	-0.08
inv_prof_icrg2	-0.24	-0.25	-0.05	-0.17	-0.13	-0.06	-0.24	-0.03
int_conf_icrg2	-0.44	-0.26	-0.14	-0.13	-0.18	-0.17	-0.43	-0.2
ext_conf_icrg2	-0.24	-0.16	-0.14	0.01	-0.14	-0.13	-0.28	-0.12
corrup_icrg2	-0.2	-0.19	-0.09	-0.12	-0.18	-0.07	-0.23	-0.14
military_icrg2	-0.3	-0.18	-0.14	-0.05	-0.22	-0.09	-0.32	-0.1
eth_tens_icrg2	-0.13	-0.12	-0.13	-0.07	-0.14	-0.27	-0.2	-0.22
religion_icrg2	-0.14	-0.17	-0.13	-0.06	-0.14	-0.1	-0.16	-0.04
dem_acc_icrg2	-0.33	-0.13	-0.09	-0.12	-0.23	0.02	-0.3	-0.02
bureau_qua_icrg2	-0.26	-0.16	-0.07	-0.08	-0.18	-0.01	-0.26	-0.04
assassi	1	0.01	0.05	0.12	0.2	-0.02	0.48	0

gstrikes	0.01	1	0.1	0.16	0.03	0.41	0.04	0.42
guerrilla	0.05	0.1	1	-0.02	0.22	0.31	0.06	0.24
govcrise	0.12	0.16	-0.02	1	0.02	0.01	0.16	0.04
purges	0.2	0.03	0.22	0.02	1	0.13	0.13	0.09
riots	-0.02	0.41	0.31	0.01	0.13	1	-0.03	0.75
revol	0.48	0.04	0.06	0.16	0.13	-0.03	1	0.02
demonst	0	0.42	0.24	0.04	0.09	0.75	0.02	1
v2x_polyarchy	-0.32	-0.09	-0.13	-0.01	-0.26	-0.11	-0.33	-0.08
v2x_libdem	-0.31	-0.1	-0.12	-0.02	-0.24	-0.09	-0.33	-0.08
v2x_partipdem	-0.32	-0.09	-0.12	-0.02	-0.24	-0.1	-0.33	-0.08
v2x_delibdem	-0.32	-0.09	-0.14	-0.02	-0.27	-0.1	-0.33	-0.09
v2x_egaldem	-0.33	-0.1	-0.12	-0.01	-0.23	-0.11	-0.33	-0.1

Table 5.7: Correlation matrix (continued)

	v2x_polyarchy	v2x_libdem	v2x_partipdem	v2x_delibdem	v2x_egaldem
law_ord_icrg2	0.7	0.76	0.72	0.73	0.8
gov_stab_icrg2	0.45	0.42	0.44	0.44	0.42
socio_cond_icrg2	0.61	0.66	0.63	0.64	0.71
inv_prof_icrg2	0.54	0.55	0.55	0.56	0.54
int_conf_icrg2	0.68	0.67	0.7	0.67	0.69
ext_conf_icrg2	0.54	0.53	0.54	0.52	0.51
corrup_icrg2	0.59	0.66	0.62	0.64	0.69
military_icrg2	0.79	0.82	0.8	0.82	0.84
eth_tens_icrg2	0.26	0.27	0.26	0.26	0.29
religion_icrg2	0.35	0.36	0.37	0.34	0.3
dem_acc_icrg2	0.79	0.8	0.79	0.81	0.8
bureau_qua_icrg2	0.72	0.77	0.73	0.74	0.78
assassi	-0.32	-0.31	-0.32	-0.32	-0.33

gstrikes	-0.09	-0.1	-0.09	-0.09	-0.1
guerrilla	-0.13	-0.12	-0.12	-0.14	-0.12
govcrise	-0.01	-0.02	-0.02	-0.02	-0.01
purges	-0.26	-0.24	-0.24	-0.27	-0.23
riots	-0.11	-0.09	-0.1	-0.1	-0.11
revol	-0.33	-0.33	-0.33	-0.33	-0.33
demonst	-0.08	-0.08	-0.08	-0.09	-0.1
v2x_polyarchy	1	0.97	0.97	0.97	0.94
v2x_libdem	0.97	1	0.97	0.98	0.97
v2x_partipdem	0.97	0.97	1	0.96	0.95
v2x_delibdem	0.97	0.98	0.96	1	0.97
v2x_egaldem	0.94	0.97	0.95	0.97	1

Appendix 3.2: Definition of institutional variables

Variable	Definition
v2x_elecdem	The Electoral Democracy Index: This index measures the principle of electoral or representative democracy, including whether elections were free and fair, as well as the prevalence of a free and independent media. This index is part of all the other indices as a central component of democracy. It varies between 0 and 1, with higher values denoting more electoral democracy
v2x_egaldem	Egalitarian Democracy Index: This index measures the level of equal access to resources, power, and freedoms across various groups within a society, in addition to the level of electoral democracy. It varies between 0 and 1, with higher values denoting more egalitarian democracy
purges	Any systematic elimination by jailing or execution of political opposition within the ranks of the regime or the opposition
riots	Any violent demonstration or clash of more than 100 citizens involving the use of physical force. For the 2021 Edition, additional tags were added to the LINKS files to differentiate riots related to: (1) Black Lives Matter (BLM); (2) COVID-19 (COVID)
guerrilla	Any armed activity, sabotage, or bombings carried on by independent bands of citizens or irregular forces and aimed at the overthrow of the present regime. Such activity may take the form of sporadic attacks on police posts, small villages, government patrols, or military barracks. A country is also considered to have terrorism/guerrilla war when sporadic bombing, sabotage, or terrorism occurs
govcrise	Major Government Crises: Any rapidly developing situation that threatens to bring the downfall of the present regime - excluding situations of revolt aimed at such overthrow.

APPENDICES TO CHAPTER 4

APPENDIX 4.1: Robustness checks: SGMM, FE and OLS estimations

Table 5.8: SGMM estimations using WGI data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna
L.lrgdpna	0.912***	0.897***	0.925***	0.894***	0.789***	0.943***
	(0.060)	(0.065)	(0.055)	(0.049)	(0.066)	(0.048)
growth_pop	0.012	0.019**	0.014	0.013	0.011	0.012
	(0.008)	(0.009)	(0.009)	(0.010)	(0.011)	(0.007)
csh_i	-0.109	-0.121	-0.027	-0.109	-0.255	-0.025
	(0.195)	(0.181)	(0.159)	(0.197)	(0.403)	(0.179)
csh_g	-0.308	-0.267	-0.328	-0.395	-0.189	-0.232
	(0.216)	(0.228)	(0.198)	(0.245)	(0.272)	(0.191)
csh_xm	0.322**	0.279	0.252*	0.249	0.326	0.350**
	(0.154)	(0.198)	(0.146)	(0.189)	(0.237)	(0.141)
inst_wgi	0.079**					
	(0.036)					
cc_est		0.176*				
		(0.095)				
ge_est			0.122*			
			(0.064)			
rq_est				0.164***		
				(0.049)		
rl_est					0.237***	

					(0.073)	
va_est						0.093*
						(0.053)
N	351	352	351	352	352	352
T	7.977	8.000	7.977	8.000	8.000	8.000
Groups	44.000	44.000	44.000	44.000	44.000	44.000
hansenp	0.506	0.438	0.282	0.457	0.382	0.679
j	32.000	34.000	34.000	34.000	34.000	34.000
ar1p	0.001	0.001	0.003	0.003	0.010	0.002
ar2p	0.434	0.574	0.474	0.791	0.505	0.550

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.9: SGMM estimations using Fraser Institute data

	(1)	(2)	(3)	(4)	(5)	(6)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	1.030***	1.057***	1.049***	1.049***	1.049***	1.049***
	(0.040)	(0.055)	(0.047)	(0.047)	(0.047)	(0.047)
growth_pop	0.015**	0.014	0.015**	0.015**	0.015**	0.015**
	(0.007)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)
csh_i	0.292**	0.374**	0.344**	0.344**	0.344**	0.344**
	(0.137)	(0.181)	(0.163)	(0.163)	(0.163)	(0.163)
csh_g	-0.068	-0.092	-0.065	-0.065	-0.065	-0.065
	(0.134)	(0.164)	(0.138)	(0.138)	(0.138)	(0.138)
csh_xm	0.137	0.175	0.152*	0.152*	0.152*	0.152*
	(0.083)	(0.117)	(0.086)	(0.086)	(0.086)	(0.086)
N	528	528	528	528	528	528
T	12.000	12.000	12.000	12.000	12.000	12.000
Groups	44.000	44.000	44.000	44.000	44.000	44.000
hansenp	0.647	0.404	0.560	0.560	0.560	0.560
j	39.000	32.000	37.000	37.000	37.000	37.000
ar1p	0.001	0.001	0.001	0.001	0.001	0.001
ar2p	0.515	0.510	0.511	0.511	0.511	0.511

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.10: SGMM estimations using ICRG data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna	(8) lrgdpna
L.lrgdpna	0.928***	0.944***	0.930***	0.913***	0.941***	0.928***	0.954***	0.922***
	(0.052)	(0.048)	(0.028)	(0.039)	(0.045)	(0.067)	(0.048)	(0.060)
growth_pop	0.022**	0.021**	0.024***	0.023***	0.024***	0.024***	0.023**	0.027***
	(0.009)	(0.008)	(0.006)	(0.007)	(0.007)	(0.008)	(0.009)	(0.009)
csh_i	0.170	0.020	0.083	0.242	0.324	0.230	0.102	0.243
	(0.369)	(0.200)	(0.326)	(0.286)	(0.334)	(0.233)	(0.303)	(0.271)
csh_g	0.028	0.012	0.075	0.036	0.031	0.079	-0.005	-0.107
	(0.204)	(0.196)	(0.153)	(0.193)	(0.189)	(0.264)	(0.218)	(0.200)
csh_xm	0.243	0.285***	0.225**	0.209**	0.322***	0.424***	0.307***	0.342***
	(0.213)	(0.077)	(0.085)	(0.092)	(0.087)	(0.139)	(0.103)	(0.112)
pol_risk	0.006***							
	(0.002)							
gov_stab_icrg		0.026*						
		(0.015)						
socio_cond_icrg			0.032*					
			(0.016)					
inv_prof_icrg				0.026				
				(0.016)				
int_conf_icrg					0.017			
					(0.012)			
ext_conf_icrg						0.023		
						(0.019)		
corrup_icrg							0.034	
							(0.025)	
military_icrg								0.032
								(0.020)
N	368	309	309	309	309	309	309	309
T	11.871	11.885	11.885	11.885	11.885	11.885	11.885	11.885
Groups	31.000	26.000	26.000	26.000	26.000	26.000	26.000	26.000
hansenp	0.260	0.230	0.276	0.282	0.149	0.292	0.112	0.272
j	24.000	24.000	26.000	24.000	24.000	24.000	24.000	24.000
ar1p	0.004	0.005	0.009	0.005	0.005	0.006	0.003	0.003

ar2p	0.207	0.216	0.187	0.196	0.213	0.143	0.191	0.207

Standard errors in parentheses

Source: own estimations.

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table 5.11: SGMM estimations using ICRG data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna
L.lrgdpna	0.985***	0.970***	0.933***	0.941***	0.965***
	(0.056)	(0.055)	(0.029)	(0.038)	(0.064)
growth_pop	0.023***	0.028***	0.026***	0.025**	0.025**
	(0.007)	(0.007)	(0.007)	(0.010)	(0.012)
csh_i	0.252	0.174	0.075	0.066	0.078
	(0.333)	(0.237)	(0.328)	(0.217)	(0.428)
csh_g	-0.212	0.011	0.024	-0.035	-0.154
	(0.197)	(0.179)	(0.247)	(0.192)	(0.278)
csh_xm	-0.101	0.347***	0.326***	0.278**	0.380**
	(0.297)	(0.095)	(0.112)	(0.122)	(0.167)
law_ord_icrg	0.087***				
	(0.031)				
eth_tens_icrg		0.039*			
		(0.019)			
dem_acc_icrg			-0.003		
			(0.023)		
bureau_qua_icrg				0.015	
				(0.044)	
religion_icrg					0.046
					(0.055)
N	368	309	309	309	309
T	11.871	11.885	11.885	11.885	11.885
Groups	31.000	26.000	26.000	26.000	26.000
hansenp	0.298	0.431	0.153	0.163	0.216
j	24.000	24.000	24.000	24.000	24.000
ar1p	0.004	0.005	0.005	0.004	0.007
ar2p	0.248	0.192	0.172	0.186	0.194

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.12: SGMM estimations using V-DEM data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna
L.lrgdpna	1.000***	1.012***	0.984***	0.966***	0.977***	0.985***	0.972***
	(0.061)	(0.061)	(0.068)	(0.060)	(0.064)	(0.067)	(0.068)
growth_pop	0.013	0.015	0.015**	0.016*	0.016**	0.015**	0.016*
	(0.009)	(0.009)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)
csh_i	0.203	0.211	0.283*	0.330*	0.308*	0.273*	0.328*
	(0.218)	(0.211)	(0.168)	(0.174)	(0.166)	(0.161)	(0.177)
csh_g	0.081	0.091	0.106	0.142	0.105	0.083	0.141
	(0.228)	(0.241)	(0.190)	(0.182)	(0.181)	(0.192)	(0.200)
csh_xm	0.492*	0.490**	0.429**	0.471**	0.448**	0.420**	0.460**
	(0.249)	(0.231)	(0.171)	(0.179)	(0.167)	(0.183)	(0.177)
v2x_regime	0.035						
	(0.054)						
v2x_regime_amb		0.005					
		(0.018)					
v2x_polyarchy			-0.064				
			(0.152)				
v2x_libdem				-0.048			
				(0.168)			
v2x_partipdem					-0.034		
					(0.294)		
v2x_delibdem						0.029	
						(0.192)	
v2x_egaldem							-0.107
							(0.218)
N	456	456	456	456	456	456	456
T	12.000	12.000	12.000	12.000	12.000	12.000	12.000
Groups	38.000	38.000	38.000	38.000	38.000	38.000	38.000
hansenp	0.800	0.746	0.561	0.410	0.476	0.556	0.454
j	36.000	36.000	38.000	38.000	38.000	38.000	38.000
ar1p	0.001	0.001	0.002	0.002	0.001	0.001	0.002

ar2p	0.493	0.497	0.460	0.463	0.459	0.461	0.459

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.13: SGMM estimations using CNTS data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna	(8) lrgdpna
L.lrgdpna	0.981***	0.972***	0.987***	0.973***	0.984***	0.975***	0.963***	0.984***
	(0.065)	(0.054)	(0.059)	(0.090)	(0.049)	(0.057)	(0.055)	(0.066)
growth_pop	0.016*	0.017*	0.018*	0.016*	0.021**	0.017	0.012	0.018
	(0.009)	(0.010)	(0.009)	(0.008)	(0.010)	(0.011)	(0.012)	(0.012)
csh_i	0.456**	0.366*	0.447**	0.484**	0.499***	0.389**	0.425**	0.452*
	(0.185)	(0.214)	(0.197)	(0.221)	(0.165)	(0.179)	(0.158)	(0.239)
csh_g	0.179	0.177	0.168	0.205	0.207	0.127	0.117	0.109
	(0.181)	(0.180)	(0.189)	(0.187)	(0.225)	(0.173)	(0.185)	(0.190)
csh_xm	0.370*	0.403**	0.368*	0.334**	0.404**	0.372**	0.253	0.304
	(0.215)	(0.190)	(0.193)	(0.162)	(0.162)	(0.184)	(0.187)	(0.184)
assassi	-0.097							
	(0.143)							
gstrikes		-0.023						
		(0.094)						
guerrilla			0.001					
			(0.001)					
govcrise				-0.437				
				(0.297)				
purges					0.188**			
					(0.092)			
riots						-0.004		
						(0.008)		
revol							-0.123	
							(0.082)	
demonst								0.009
								(0.033)

N	447	447	447	447	447	447	447	447
T	11.763	11.763	11.763	11.763	11.763	11.763	11.763	11.763
Groups	38.000	38.000	38.000	38.000	38.000	38.000	38.000	38.000
hansenp	0.593	0.421	0.395	0.489	0.319	0.388	0.456	0.268
j	38.000	38.000	38.000	38.000	38.000	38.000	38.000	38.000
ar1p	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
ar2p	0.464	0.503	0.486	0.295	0.516	0.484	0.489	0.502

Standard errors in parentheses

Source: own estimations.

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table 5.14: Combined SGMM estimations using WGI data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna
L.lrgdpna	0.924***	0.883***	0.903***	0.870***	0.914***	0.923***
	(0.060)	(0.079)	(0.064)	(0.051)	(0.047)	(0.062)
growth_pop	0.018	0.019	0.017	0.012	0.013	0.013
	(0.011)	(0.017)	(0.011)	(0.010)	(0.008)	(0.008)
csh_i	-0.064	-0.174	-0.105	-0.204	-0.079	-0.041
	(0.181)	(0.286)	(0.201)	(0.252)	(0.169)	(0.164)
csh_g	-0.299	-0.348	-0.254	-0.230	-0.310	-0.284
	(0.209)	(0.317)	(0.205)	(0.169)	(0.209)	(0.188)
csh_xm	0.281	0.301	0.335*	0.296**	0.340**	0.279*
	(0.192)	(0.248)	(0.173)	(0.126)	(0.150)	(0.151)
va_est	0.030	-0.023	0.036	-0.001	0.085	0.043
	(0.052)	(0.075)	(0.053)	(0.049)	(0.061)	(0.065)
indecon_wgi	0.070					
	(0.047)					
cc_est		0.107	0.137			
		(0.084)	(0.094)			
ge_est		-0.032				0.088
		(0.141)				(0.084)
rl_est		0.128		0.167***		
		(0.082)		(0.060)		
rq_est		0.012			0.066	
		(0.092)			(0.091)	

N	351	351	352	352	352	351
T	7.977	7.977	8.000	8.000	8.000	7.977
Groups	44.000	44.000	44.000	44.000	44.000	44.000
hansenp	0.469	0.634	0.556	0.717	0.774	0.488
j	38.000	38.000	38.000	38.000	38.000	38.000
ar1p	0.003	0.008	0.002	0.007	0.001	0.004
ar2p	0.596	0.656	0.577	0.555	0.641	0.496

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.15: Combined SGMM estimations using other data

	(1)	(2)	(3)	(4)	(5)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.971***	0.909***	0.950***	0.886***	0.926***
	(0.087)	(0.051)	(0.063)	(0.036)	(0.078)
growth_pop	0.017**	0.019***	0.013*	0.020*	0.018**
	(0.008)	(0.007)	(0.007)	(0.010)	(0.008)
csh_i	0.172	0.216	0.262	0.378*	-0.072
	(0.290)	(0.390)	(0.166)	(0.208)	(0.272)
csh_g	-0.131	-0.047	0.074	0.112	-0.033
	(0.207)	(0.123)	(0.208)	(0.227)	(0.164)
csh_xm	0.345*	0.203*	0.416**	0.322***	0.529**
	(0.187)	(0.104)	(0.181)	(0.113)	(0.209)
revol	-0.014				
	(0.078)				
govcrise	-0.072				
	(0.199)				
pol_risk		0.003*		0.003	
		(0.001)		(0.002)	
v2x_regime_amb			0.014	0.015	-0.011
			(0.013)	(0.010)	(0.017)
confind					-0.024
					(0.041)
N	447	368	456	309	435
T	11.763	11.871	12.000	11.885	11.757
Groups	38.000	31.000	38.000	26.000	37.000

hansenp	0.717	0.735	0.780	0.744	0.820
j	34.000	32.000	36.000	28.000	34.000
ar1p	0.001	0.004	0.002	0.006	0.001
ar2p	0.459	0.208	0.506	0.227	0.427

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.16: FE estimations using WGI data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna
L.lrgdpna	0.588***	0.588***	0.588***	0.579***	0.592***	0.601***
	(0.059)	(0.028)	(0.027)	(0.028)	(0.028)	(0.027)
growth_pop	0.015*	0.017***	0.015***	0.015***	0.015***	0.014***
	(0.009)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
csh_i	0.004	-0.044	0.004	0.024	-0.013	0.049
	(0.156)	(0.083)	(0.082)	(0.081)	(0.083)	(0.081)
csh_g	-0.010	0.019	-0.010	-0.030	-0.009	-0.052
	(0.126)	(0.118)	(0.117)	(0.117)	(0.119)	(0.115)
csh_xm	0.235**	0.210***	0.235***	0.196***	0.188***	0.177***
	(0.094)	(0.051)	(0.052)	(0.050)	(0.051)	(0.050)
inst_wgi	0.060**					
	(0.025)					
cc_est		0.107***				
		(0.027)				
ge_est			0.099***			
			(0.025)			
rq_est				0.107***		
				(0.024)		
rl_est					0.078***	
					(0.025)	
va_est						0.118***
						(0.023)
_cons	3.189***	3.256***	3.256***	3.341***	3.226***	3.165***
	(0.461)	(0.231)	(0.229)	(0.234)	(0.236)	(0.221)

N	351	352	351	352	352	352
T	7.977	8.000	7.977	8.000	8.000	8.000
Groups	44.000	44.000	44.000	44.000	44.000	44.000
hansenp						
j						
ar1p						
ar2p						

Standard errors in parentheses

Source: own estimations.

$^{*}\ p < 0.1,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Table 5.17: FE estimations using Fraser Institute data

	(1)	(2)	(3)	(4)	(5)	(6)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.833***	0.833***	0.833***	0.833***	0.833***	0.833***
	(0.020)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
growth_pop	0.016***	0.016***	0.016***	0.016***	0.016***	0.016***
	(0.002)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
csh_i	0.163**	0.163	0.163	0.163	0.163	0.163
	(0.076)	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
csh_g	-0.085	-0.085	-0.085	-0.085	-0.085	-0.085
	(0.079)	(0.087)	(0.087)	(0.087)	(0.087)	(0.087)
csh_xm	0.220***	0.220**	0.220**	0.220**	0.220**	0.220**
	(0.045)	(0.091)	(0.091)	(0.091)	(0.091)	(0.091)
SummaryIndex	-4.717					
	(3.700)					
Area2			0.596			
			(0.399)			
Area3				0.086		
				(0.058)		
Area4					-0.315	
					(0.211)	
Area5						0.639
						(0.428)
_cons	30.499	1.194***	-1.401	0.512	3.109**	-2.997
	(22.999)	(0.207)	(1.706)	(0.459)	(1.342)	(2.770)

N	528	528	528	528	528	528
T	12.000	12.000	12.000	12.000	12.000	12.000
Groups	44.000	44.000	44.000	44.000	44.000	44.000
hansenp						
j						
ar1p						
ar2p						

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.18: FE estimations using ICRG data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna	(8) lrgdpna
L.lrgdpna	0.821***	0.856***	0.843***	0.839***	0.855***	0.829***	0.855***	0.835***
	(0.024)	(0.029)	(0.030)	(0.030)	(0.029)	(0.030)	(0.029)	(0.030)
growth_pop	0.019**	0.024***	0.023***	0.023***	0.023***	0.022***	0.023***	0.023***
	(0.007)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
csh_i	0.103	0.089	0.073	0.089	0.114	0.048	0.083	0.090
	(0.141)	(0.097)	(0.097)	(0.096)	(0.095)	(0.096)	(0.097)	(0.095)
csh_g	-0.124	-0.050	-0.065	-0.055	-0.090	-0.038	-0.035	-0.049
	(0.080)	(0.131)	(0.130)	(0.129)	(0.128)	(0.128)	(0.130)	(0.129)
csh_xm	0.135**	0.187***	0.180***	0.190***	0.149**	0.159**	0.197***	0.178***
	(0.061)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.065)	(0.064)
pol_risk	0.005***							
	(0.001)							
gov_stab_icrg		0.003						
		(0.007)						
socio_cond_icrg			0.012					
			(0.008)					
inv_prof_icrg				0.011**				
				(0.006)				
int_conf_icrg					0.014***			
					(0.004)			
ext_conf_icrg						0.016***		

						(0.005)		
corrup_icrg							0.008	
							(0.010)	
military_icrg								0.018**
								(0.008)
_cons	1.081***	0.964***	1.058***	1.040***	0.901***	1.080***	0.972***	1.108***
	(0.194)	(0.248)	(0.250)	(0.245)	(0.242)	(0.243)	(0.245)	(0.249)
N	368	309	309	309	309	309	309	309
T	11.871	11.885	11.885	11.885	11.885	11.885	11.885	11.885
Groups	31.000	26.000	26.000	26.000	26.000	26.000	26.000	26.000
hansenp								
j								
ar1p								
ar2p								

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.19: FE estimations using ICRG data

	(1)	(2)	(3)	(4)	(5)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.839***	0.857***	0.852***	0.842***	0.849***
	(0.026)	(0.029)	(0.029)	(0.030)	(0.029)
growth_pop	0.022***	0.024***	0.023***	0.024***	0.024***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
csh_i	0.142*	0.070	0.098	0.088	0.081
	(0.084)	(0.096)	(0.096)	(0.096)	(0.096)
csh_g	-0.056	-0.030	-0.057	-0.059	-0.044
	(0.093)	(0.129)	(0.130)	(0.129)	(0.129)
csh_xm	0.131**	0.183***	0.192***	0.179***	0.185***
	(0.058)	(0.064)	(0.064)	(0.064)	(0.064)
law_ord_icrg	0.028***				
	(0.009)				
eth_tens_icrg		0.023**			
		(0.010)			
dem_acc_icrg			0.012		

			(0.008)		
bureau_qua_icrg				0.020*	
				(0.012)	
religion_icrg					0.019*
					(0.011)
_cons	1.050***	0.905***	0.974***	1.077***	0.964***
	(0.209)	(0.245)	(0.244)	(0.250)	(0.244)
N	368	309	309	309	309
T	11.871	11.885	11.885	11.885	11.885
Groups	31.000	26.000	26.000	26.000	26.000
hansenp					
j					
ar1p					
ar2p					

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.20: FE estimations using V-DEM data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.810***	0.811***	0.822***	0.822***	0.822***	0.822***	0.822***
	(0.036)	(0.036)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
growth_pop	0.016***	0.016***	0.016***	0.016***	0.016***	0.016***	0.016***
	(0.005)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
csh_i	0.141	0.141	0.139	0.140	0.134	0.141	0.137
	(0.118)	(0.120)	(0.087)	(0.087)	(0.087)	(0.087)	(0.087)
csh_g	-0.104	-0.117	-0.117	-0.125	-0.115	-0.115	-0.130
	(0.105)	(0.103)	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)
csh_xm	0.272***	0.266**	0.254***	0.254***	0.255***	0.254***	0.256***
	(0.098)	(0.098)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
v2x_regime	0.043***						
	(0.015)						
v2x_regime_amb		0.015**					
		(0.006)					
v2x_polyarchy			0.073				

			(0.063)				
v2x_libdem				0.129*			
				(0.073)			
v2x_partipdem					0.124		
					(0.105)		
v2x_delibdem						0.110	
						(0.072)	
v2x_egaldem							0.173*
							(0.095)
_cons	1.312***	1.305***	1.253***	1.245***	1.253***	1.244***	1.233***
	(0.253)	(0.253)	(0.186)	(0.185)	(0.186)	(0.186)	(0.185)
N	456	456	456	456	456	456	456
T	12.000	12.000	12.000	12.000	12.000	12.000	12.000
Groups	38.000	38.000	38.000	38.000	38.000	38.000	38.000
hansenp							
j							
ar1p							
ar2p							

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.21: FE estimations using CNTS data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.820***	0.821***	0.819***	0.817***	0.821***	0.820***	0.816***	0.820***
	(0.023)	(0.023)	(0.023)	(0.022)	(0.023)	(0.023)	(0.022)	(0.023)
growth_pop	0.016***	0.016***	0.016***	0.015***	0.016***	0.016***	0.015***	0.016***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
csh_i	0.113	0.116	0.132	0.092	0.118	0.119	0.125	0.119
	(0.094)	(0.093)	(0.095)	(0.091)	(0.093)	(0.093)	(0.092)	(0.093)
csh_g	-0.097	-0.101	-0.096	-0.112	-0.099	-0.102	-0.121	-0.097
	(0.102)	(0.102)	(0.102)	(0.100)	(0.102)	(0.103)	(0.101)	(0.103)
csh_xm	0.258***	0.258***	0.261***	0.269***	0.257***	0.257***	0.256***	0.258***
	(0.050)	(0.050)	(0.051)	(0.049)	(0.050)	(0.050)	(0.050)	(0.050)
assassi	-0.014							

	(0.028)							
gstrikes		-0.028						
		(0.026)						
guerrilla			0.001					
			(0.001)					
govcrise				-0.185***				
				(0.039)				
purges					-0.019			
					(0.035)			
riots						-0.005		
						(0.007)		
revol							-0.066***	
							(0.019)	
demonst								0.001
								(0.007)
N	447	447	447	447	447	447	447	447
T	11.763	11.763	11.763	11.763	11.763	11.763	11.763	11.763
Groups	38.000	38.000	38.000	38.000	38.000	38.000	38.000	38.000
hansenp								
j								
ar1p								
ar2p								

Standard errors in parentheses

Source: own estimations.

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table 5.22: Combined FE estimations using WGI data

	(1)	(2)	(3)	(4)	(5)	(6)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.584***	0.577***	0.591***	0.598***	0.582***	0.589***
	(0.058)	(0.058)	(0.059)	(0.059)	(0.059)	(0.055)
growth_pop	0.016*	0.015*	0.015*	0.014	0.014	0.015*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)
csh_i	0.026	0.043	0.013	0.043	0.048	0.048
	(0.156)	(0.159)	(0.153)	(0.149)	(0.153)	(0.153)
csh_g	-0.009	-0.022	-0.021	-0.047	-0.045	-0.034

	(0.112)	(0.109)	(0.111)	(0.115)	(0.110)	(0.114)
csh_xm	0.215**	0.216**	0.194**	0.178**	0.189**	0.214**
	(0.089)	(0.092)	(0.088)	(0.084)	(0.084)	(0.090)
va_est	0.095**	0.089**	0.095**	0.112***	0.092**	0.099**
	(0.038)	(0.040)	(0.038)	(0.039)	(0.036)	(0.038)
indecon_wgi	0.039*					
	(0.022)					
cc_est		0.044	0.055			
		(0.048)	(0.037)			
ge_est		0.011				0.048
		(0.057)				(0.046)
rl_est		-0.021		0.012		
		(0.043)		(0.041)		
rq_est		0.052			0.069**	
		(0.035)			(0.029)	
N	351	351	352	352	352	351
T	7.977	7.977	8.000	8.000	8.000	7.977
Groups	44.000	44.000	44.000	44.000	44.000	44.000
hansenp						
j						
ar1p						
ar2p						

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.23: Combined FE estimations using other data

	(1)	(2)	(3)	(4)	(5)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.815***	0.821***	0.811***	0.813***	0.806***
	(0.034)	(0.024)	(0.036)	(0.030)	(0.037)
growth_pop	0.014***	0.019**	0.016***	0.020**	0.016***
	(0.005)	(0.007)	(0.005)	(0.008)	(0.005)
csh_i	0.100	0.103	0.141	0.101	0.159
	(0.135)	(0.141)	(0.120)	(0.157)	(0.149)
csh_g	-0.126	-0.124	-0.117	-0.116	-0.112

	(0.114)	(0.080)	(0.103)	(0.132)	(0.110)
csh_xm	0.266**	0.135**	0.266**	0.160**	0.281***
	(0.100)	(0.061)	(0.098)	(0.071)	(0.102)
SummaryIndex	-3.075	-2.968	-4.989**	-4.657*	-5.060**
	(2.045)	(2.809)	(2.238)	(2.708)	(2.361)
revol	-0.045*				
	(0.025)				
govcrise	-0.159*				
	(0.082)				
pol_risk		0.005***		0.004***	
		(0.001)		(0.001)	
v2x_regime_amb			0.015**	0.011*	0.016**
			(0.006)	(0.006)	(0.006)
confind					0.000
					(0.008)
N	447	368	456	309	435
T	11.763	11.871	12.000	11.885	11.757
Groups	38.000	31.000	38.000	26.000	37.000
hansenp					
j					
ar1p					
ar2p					

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.24: OLS estimations using WGI data

	(1)	(2)	(3)	(4)	(5)	(6)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.955***	0.966***	0.955***	0.961***	0.963***	0.969***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
growth_pop	0.012***	0.012***	0.012***	0.010**	0.011***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
csh_i	0.092	0.096	0.092	0.156**	0.108	0.131*
	(0.074)	(0.076)	(0.074)	(0.071)	(0.076)	(0.077)
csh_g	-0.032	-0.076	-0.032	-0.015	-0.041	-0.052

	(0.142)	(0.148)	(0.142)	(0.143)	(0.146)	(0.151)
csh_xm	0.128***	0.110***	0.128***	0.113***	0.112***	0.103***
	(0.038)	(0.037)	(0.038)	(0.037)	(0.038)	(0.038)
inst_wgi	0.037***					
	(0.009)					
cc_est		0.046***				
		(0.015)				
ge_est			0.061***			
			(0.015)			
rq_est				0.038**		
				(0.018)		
rl_est					0.040***	
					(0.015)	
va_est						0.028**
						(0.013)
_cons	0.267***	0.237**	0.308***	0.237**	0.232**	0.177*
	(0.100)	(0.107)	(0.103)	(0.110)	(0.104)	(0.103)
N	351	352	351	352	352	352
T						
Groups						
hansenp						
j						
ar1p						
ar2p						

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.25: OLS estimations using Fraser Institute data

	(1)	(2)	(3)	(4)	(5)	(6)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.979***	0.979***	0.979***	0.979***	0.979***	0.979***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
growth_pop	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
csh_i	0.183***	0.183***	0.183***	0.183***	0.183***	0.183***

	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)
csh_g	-0.039	-0.039	-0.039	-0.039	-0.039	-0.039
	(0.082)	(0.082)	(0.082)	(0.082)	(0.082)	(0.082)
csh_xm	0.080**	0.080**	0.080**	0.080**	0.080**	0.080**
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
SummaryIndex	0.050***					
	(0.016)					
Area2			0.075*			
			(0.038)			
Area3				0.035***		
				(0.011)		
Area4					0.048***	
					(0.009)	
Area5						0.057***
						(0.018)
_cons	-0.229	-0.003	-0.243	-0.192	-0.179	-0.289*
	(0.141)	(0.098)	(0.204)	(0.141)	(0.116)	(0.167)
N	528	528	528	528	528	528
T						
Groups						
hansenp						
j						
ar1p						
ar2p						

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.26: OLS estimations using ICRG data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna	lrgdpna
L.lrgdpna	0.968***	0.970***	0.964***	0.966***	0.970***	0.972***	0.972***	0.968***
	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)	(0.011)	(0.011)
growth_pop	0.017***	0.018***	0.018***	0.018***	0.018***	0.019***	0.018***	0.019***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
csh_i	0.136*	0.095	0.092	0.110	0.153*	0.112	0.105	0.114

	(0.075)	(0.089)	(0.085)	(0.086)	(0.086)	(0.090)	(0.089)	(0.089)
csh_g	-0.037	0.020	-0.022	0.024	-0.052	0.042	0.027	-0.008
	(0.090)	(0.106)	(0.100)	(0.105)	(0.097)	(0.104)	(0.108)	(0.106)
csh_xm	0.058*	0.090*	0.098**	0.101**	0.055	0.093*	0.099**	0.081
	(0.032)	(0.050)	(0.048)	(0.047)	(0.054)	(0.051)	(0.048)	(0.051)
pol_risk	0.001***							
	(0.000)							
gov_stab_icrg		0.013*						
		(0.008)						
socio_cond_icrg			0.018*					
			(0.009)					
inv_prof_icrg				0.010				
				(0.007)				
int_conf_icrg					0.014***			
					(0.005)			
ext_conf_icrg						0.004		
						(0.007)		
corrup_icrg							0.014	
							(0.011)	
military_icrg								0.011*
								(0.006)
_cons	0.078	-0.069	-0.064	-0.049	-0.099	-0.012	-0.088	-0.046
	(0.106)	(0.153)	(0.130)	(0.128)	(0.137)	(0.145)	(0.140)	(0.129)
N	368	309	309	309	309	309	309	309
T								
Groups								
hansenp								
j								
ar1p								
ar2p								

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.27: OLS estimations using ICRG data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna
L.lrgdpna	0.974***	0.976***	0.972***	0.965***	0.974***
	(0.011)	(0.012)	(0.011)	(0.012)	(0.011)
growth_pop	0.016**	0.020***	0.019***	0.019***	0.019***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)
csh_i	0.160**	0.099	0.121	0.111	0.109
	(0.075)	(0.088)	(0.092)	(0.088)	(0.090)
csh_g	-0.068	-0.016	0.035	0.028	0.018
	(0.088)	(0.100)	(0.110)	(0.107)	(0.111)
csh_xm	0.052	0.072	0.095**	0.105**	0.087*
	(0.033)	(0.055)	(0.048)	(0.048)	(0.051)
law_ord_icrg	0.024***				
	(0.006)				
eth_tens_icrg		0.019*			
		(0.011)			
dem_acc_icrg			0.006		
			(0.006)		
bureau_qua_icrg				0.015	
				(0.011)	
religion_icrg					0.006
					(0.006)
_cons	0.042	-0.128	-0.071	-0.028	-0.095
	(0.113)	(0.152)	(0.137)	(0.127)	(0.147)
N	368	309	309	309	309
T					
Groups					
hansenp					
j					
ar1p					
ar2p					

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.28: OLS estimations using V-DEM data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna
L.lrgdpna	0.962***	0.962***	0.969***	0.969***	0.968***	0.968***	0.970***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)
growth_pop	0.014***	0.014***	0.013***	0.013***	0.013***	0.013***	0.013***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
csh_i	0.148**	0.135*	0.074	0.060	0.071	0.071	0.064
	(0.070)	(0.069)	(0.078)	(0.078)	(0.079)	(0.078)	(0.077)
csh_g	0.014	0.003	-0.002	-0.008	0.002	0.005	-0.012
	(0.095)	(0.096)	(0.098)	(0.097)	(0.097)	(0.097)	(0.097)
csh_xm	0.149***	0.148***	0.153***	0.151***	0.154***	0.156***	0.151***
	(0.047)	(0.047)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)
v2x_regime	0.043***						
	(0.010)						
v2x_regime_amb		0.014***					
		(0.003)					
v2x_polyarchy			0.106**				
			(0.043)				
v2x_libdem				0.135***			
				(0.043)			
v2x_partipdem					0.193***		
					(0.069)		
v2x_delibdem						0.121***	
						(0.040)	
v2x_egaldem							0.164***
							(0.053)
_cons	0.115	0.053	0.006	0.011	0.011	0.014	-0.009
	(0.083)	(0.094)	(0.099)	(0.099)	(0.099)	(0.100)	(0.099)
N	456	456	456	456	456	456	456
T							
Groups							
hansenp							
j							
ar1p							

ar2p	

Standard errors in parentheses

Source: own estimations.

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table 5.29: OLS estimations using CNTS data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna	(8) lrgdpna
L.lrgdpna	0.973***	0.974***	0.973***	0.969***	0.973***	0.973***	0.969***	0.971***
	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
growth_pop	0.012***	0.012***	0.012***	0.011***	0.012***	0.012***	0.012***	0.012***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
csh_i	0.101	0.111	0.113	0.063	0.111	0.111	0.119	0.115
	(0.091)	(0.090)	(0.090)	(0.088)	(0.090)	(0.090)	(0.086)	(0.090)
csh_g	0.040	0.036	0.045	0.013	0.041	0.044	-0.009	0.053
	(0.100)	(0.102)	(0.100)	(0.091)	(0.099)	(0.102)	(0.092)	(0.102)
csh_xm	0.147***	0.144***	0.148***	0.156***	0.146***	0.148***	0.141***	0.153***
	(0.046)	(0.046)	(0.046)	(0.044)	(0.046)	(0.046)	(0.046)	(0.046)
assassi	-0.032							
	(0.024)							
gstrikes		-0.019						
		(0.020)						
guerrilla			0.000					
			(0.001)					
govcrise				-0.200***				
				(0.072)				
purges					-0.016			
					(0.029)			
riots						0.001		
						(0.004)		
revol							-0.063**	
							(0.028)	
demonst								0.006*
								(0.004)

N	447	447	447	447	447	447	447	447
T								
Groups								
hansenp								
j								
ar1p								
ar2p								

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.30: Combined OLS estimations using WGI data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna
L.lrgdpna	0.966***	0.958***	0.966***	0.964***	0.963***	0.954***
	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)	(0.011)
growth_pop	0.012***	0.013***	0.012***	0.011***	0.011***	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
csh_i	0.101	0.060	0.094	0.106	0.138*	0.095
	(0.078)	(0.083)	(0.077)	(0.077)	(0.077)	(0.075)
csh_g	-0.077	-0.057	-0.077	-0.045	-0.033	-0.026
	(0.149)	(0.157)	(0.149)	(0.152)	(0.154)	(0.152)
csh_xm	0.111***	0.125***	0.110***	0.112***	0.112***	0.129***
	(0.038)	(0.038)	(0.038)	(0.038)	(0.037)	(0.039)
va_est	0.006	0.003	0.007	0.006	0.014	-0.006
	(0.014)	(0.016)	(0.014)	(0.017)	(0.015)	(0.017)
indecon_wgi	0.025***					
	(0.009)					
cc_est		0.013	0.041***			
		(0.025)	(0.015)			
ge_est		0.098***				0.066***
		(0.037)				(0.020)
rl_est		-0.009		0.035*		
		(0.028)		(0.021)		
rq_est		-0.046			0.026	
		(0.034)			(0.022)	

N	351	351	352	352	352	351
T						
Groups						
hansenp						
j						
ar1p						
ar2p						

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.31: Combined OLS estimations using other data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna
L.lrgdpna	0.966***	0.968***	0.962***	0.963***	0.962***
	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)
growth_pop	0.011***	0.017***	0.014***	0.018***	0.014***
	(0.003)	(0.006)	(0.004)	(0.006)	(0.004)
csh_i	0.074	0.136*	0.135*	0.122	0.130
	(0.086)	(0.075)	(0.069)	(0.084)	(0.088)
csh_g	-0.020	-0.037	0.003	-0.076	0.026
	(0.087)	(0.090)	(0.096)	(0.103)	(0.101)
csh_xm	0.151***	0.058*	0.148***	0.076	0.150***
	(0.044)	(0.032)	(0.047)	(0.052)	(0.048)
SummaryIndex	0.052***	0.070***	0.023	0.049***	0.026
	(0.017)	(0.017)	(0.018)	(0.017)	(0.018)
revol	-0.045				
	(0.028)				
govcrise	-0.176**				
	(0.071)				
pol_risk		0.001***		0.002	
		(0.000)		(0.001)	
v2x_regime_amb			0.014***	0.009**	0.014***
			(0.003)	(0.004)	(0.004)
confind					0.007
					(0.006)

N	447	368	456	309	435
T					
Groups					
hansenp					
j					
ar1p					
ar2p					

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX 4.2: BC-LSDV estimations with all ICRG variables

Table 5.32: BC-LSDV estimations using ICRG data

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna	(5) lrgdpna	(6) lrgdpna	(7) lrgdpna	(8) lrgdpna
L.lrgdpna	0.938***	0.924***	0.919***	0.932***	0.910***	0.936***	0.917***	0.912***
	(0.031)	(0.034)	(0.033)	(0.029)	(0.030)	(0.030)	(0.034)	(0.028)
growth_pop	0.024***	0.024***	0.024***	0.024***	0.023***	0.024***	0.024***	0.022***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
csh_i	0.084	0.062	0.069	0.104	0.051	0.079	0.079	0.125
	(0.087)	(0.091)	(0.088)	(0.085)	(0.086)	(0.090)	(0.087)	(0.101)
csh_g	-0.023	-0.036	-0.027	-0.061	-0.011	-0.014	-0.024	-0.044
	(0.129)	(0.131)	(0.127)	(0.128)	(0.125)	(0.131)	(0.126)	(0.097)
csh_xm	0.186***	0.179**	0.192***	0.148**	0.163**	0.195***	0.178***	0.135**
	(0.067)	(0.071)	(0.067)	(0.070)	(0.066)	(0.069)	(0.068)	(0.055)
gov_stab_icrg	0.001							
	(0.007)							
socio_cond_icrg		0.005						
		(0.009)						
inv_prof_icrg			0.008					
			(0.005)					
int_conf_icrg				0.013***				
				(0.005)				
ext_conf_icrg					0.012***			
					(0.004)			
corrup_icrg						0.005		
						(0.010)		
military_icrg							0.012	
							(0.008)	
law_ord_icrg								0.020**
								(0.009)
N	309	309	309	309	309	309	309	368

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5.33: BC-LSDV estimations using ICRG data ...(continued)

	(1) lrgdpna	(2) lrgdpna	(3) lrgdpna	(4) lrgdpna
L.lrgdpna	0.938***	0.930***	0.927***	0.931***
	(0.029)	(0.033)	(0.033)	(0.032)
growth_pop	0.025***	0.024***	0.024***	0.025***
	(0.003)	(0.003)	(0.003)	(0.003)
csh_i	0.066	0.083	0.082	0.077
	(0.087)	(0.091)	(0.088)	(0.085)
csh_g	-0.007	-0.028	-0.030	-0.027
	(0.124)	(0.133)	(0.128)	(0.126)
csh_xm	0.182***	0.190***	0.181***	0.184***
	(0.067)	(0.070)	(0.067)	(0.067)
eth_tens_icrg	0.021**			
	(0.011)			
dem_acc_icrg		0.009		
		(0.007)		
bureau_qua_icrg			0.012	
			(0.012)	
religion_icrg				0.011
				(0.011)
N	309	309	309	309

Standard errors in parentheses

Source: own estimations.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$