INSTITUTIONS, TRADE AND ECONOMIC GROWTH: EVIDENCE FROM SUB-SAHARAN AFRICA

By

ABDUL-WAHAB, Junior

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

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Committee in charge:

Professor Chrysostomos TABAKIS, Supervisor _____

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Approval as of May, 2018

DECLARATION

I, Junior Abdul-Wahab, hereby declare that this work is the product of my own research with assistance from my supervisors, and has not been presented, to the best of my knowledge, wholly or in part, for the award of any academic degree. Reference to any other material is duly acknowledged.

DEDICATION

I dedicate this material to my beloved mum

ACKNOWLEDGEMENT

This research topic was largely influenced by a series of lectures, class discussions, and seminars I partook in during my time at KDI School; notably, “Korean Economic Development” class by Prof. Jungho Yoo and “Topics in Development Economics” class by Prof. Hee-Seung Yang. I express my sincerest gratitude to these Professors for rekindling my interest in development issues. I would like to extend my profound appreciation to my supervisors, Prof. Chrysostomos Tabakis (main) and Prof. Siwook Lee, for their patience, guidance, immense knowledge, and most importantly invaluable contribution to this work. Also, to KDI School, for offering me a truly amazing opportunity to study in such a highly distinguished and reputable institution. It was indeed a great honor and an incredible journey of self-discovery. Finally, to entire staff of KDI School, who in one way or the other helped make my stay in Korea a memorable one, I say thank you.

ABSTRACT

Institutional quality and trade have been found to influence economic performance in several empirical studies investigating the separate effect of trade and institutions on growth. Recent studies examining the simultaneous effect of instrumented measures of both variables on growth observe a significant impact for institutional quality, but not trade. This they often ascribe to the "primacy" of institutions. In this paper, we revisit the argument by employing an IV estimator and a "modern" panel data technique, system GMM, to investigate the partial effect of trade and institutions on economic growth in Sub-Saharan Africa (SSA), for the period 2000 – 2016. Using IV-2SLS, our findings confirm a positive impact for rule of law with no significant impact for trade. But then, our first-stage results show commonly used instruments for trade and institutions in the literature, which are also employed in this study, are themselves highly correlated, rendering our IV estimates unreliable. Using system GMM however, our findings indicate positive effect for trade and various measures of institutional quality on growth in SSA. Of measures of institutional quality, political stability and control of corruption are the most important followed by government effectiveness, rule of law and voice and accountability in that order.

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ACRONYMS

2SLS	Two-Stage Least Squares
AB	Arellano and Bond
AH	Anderson Hsiao
AR	Autoregressive
CEPII	Centre d'Études Prospectives et d'Informations Internationales
EAC	East Africa Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
FE	Fixed Effects
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
GNI	Gross National Product
IMF	International Monetary Fund
IV	Instrumental Variable
NIE	New Institutional Economics
NTT	New Trade Theory
NNTT	New New Trade Theory

OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
PWT	Penn World Tables
SADC	Southern Africa Development Community
SAP	Structural Adjustment Program
SSA	Sub-Saharan Africa
Sys-GMM	System Generalized Method of Moments
TFP	Total Factor Productivity
UNCTAD	United Nations Conference on Trade and Development
WDI	World Development Indicators
WGI	World Governance Indicators
WTO	World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Why do countries grow faster than others? As old as this question is, especially in development circles, there is still no consensus as to what the answer is, and as such remains a source of debate and disagreement among economist. The widely held view is that physical and human capital accumulation accounts for growth differences among countries. This view has been criticized, and rightly so, for being limited in its approach to understanding economic growth and development. For instance, Easterly and Levine (2002) show that output not accounted for by factors of production accounts for a huge portion of growth and income differences across countries. Moreover, factor accumulation argument alone fails to explain some more recent patterns of growth. In recent years, poorer countries are on average more likely to grow faster than high-income economies (*see* appendix I), even though the latter have more physical and human capital and are more technologically advanced. It therefore stands to reason that "something else" other than just capital accumulation might explain differences in growth across countries (Easterly & Levine, 2002). This view is reechoed by North and Thomas (1973), who note that factor accumulation and innovation are proximate but not fundamental cause of long-run growth. Perhaps a more appropriate question should be what motivates countries to devote resources to invest in physical and human capital and what influences them to innovate? Lewis (1954) concurs that the central problem in economic development is understanding what triggers an economy that was previously saving and investing less to suddenly and voluntarily transform itself into an economy that saves more and more of its national income. To expand this argument, recent history is full of episodes where previously poor countries suddenly attain and maintain higher incomes and standards of living. For example, the Four Asian Tigers

(Hong Kong, Singapore, Republic of Korea, and Taiwan) between the 1960s and 1990s and more recently China. Understanding what triggered the rapid transformation in these economies is to understand, to a great extent, the fundamental cause of rapid economic growth.

In trying to explain these recent growth trends, two main assertions have emerged. The first posits that integration into the world economy through trade is the main driver of rapid economic transformation. Thus, countries that are more open to trade will grow faster since trade is believed to facilitate knowledge and technology transfer as well as capital inflows. Trade also leads to greater competition, economies of scale, and knowledge spill over in the domestic economy. Proponents of this argument often cite the growth experiences of the Four Asian Tigers. These economies are believed to have capitalized on the expansion in world trade in the 1960s to launch arguable the greatest economic success story in recent history.

The second, and probably more recent argument stresses the importance of institutions[1] in influencing economic decisions and subsequently economic growth. Advocates of this argument reason that countries with well-functioning institutions are more likely to safeguard property rights, enforce contracts and implement market friendly policies which in turn influences decision to invest in factors of production among other things (North, 1991; Acemoglu, Johnson & Robinson, 2005). Weak institutions on the other hand create uncertainties for economic actors thereby stifling incentives to invest or innovate. Countries with stronger institutions are therefore expected to grow faster. In explaining recent trends in growth, institutionalists argue that poor countries are more likely to attain higher growth rates when they implement institutional reforms. For instance, China's economic resurgence in the 1980s is attributed to reforms adopted following the death of longtime communist leader Mao

[1] North (1991), "Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)" (p. 97).

Zedong (Acemoglu, 2008). Other cases for institutional reforms preceding exceptional economic performance are made by several authors for countries such as Botswana (see Goldsmith, 1998; Lewin 2011) and Mauritius (see Zafar, 2011) in Africa, and Chile (see Kalter, 2004) in South America.

1.2 Statement of Problem

Presently, Sub-Saharan Africa (SSA) is the poorest region in the world owing to recent economic growth success in Asia, precisely China and India, which were once home to a significant number of the world's poor. Africa's development predicament is a widely discussed issue and a matter of great concern to development partners and international community at large; and despite various multilateral efforts at restructuring the economies of SSA countries, the region has little to show in terms of economic performance.

Interestingly, available evidence shows that some high performing East Asian countries had income levels comparable to most SSA countries in the 1950s. GDP per capita in South Korea ($854) and Taiwan ($916) in 1950 was much less than it was in countries such as Ghana ($1,122) and Senegal ($1,259) (Bolt, Timmer, & van Zanden, 2014). Presently, GDP per capita in both Taiwan and South Korea is multiple of what it was some decades ago whilst GDP per capita of most African countries has either stagnated or declined over the same period. A thought-provoking question for researchers and policy makers is how these economies which were once at par if not worse than SSA in the 1950s, were able to propel themselves out of economic misery to the most celebrated economic success story in recent history.

It is a widely held view that the East Asian miracle was propelled by a policy shift towards export expansion (Rodrik, 1994; Stiglitz, 1996). The four Asian Tigers' share of world exports, which was about 1% in 1960, rose substantially over a period of three decades reaching 10% in the early 1990s (UNTADstat, 2017). This expansion in exports was followed by

unprecedented improvement in almost all socio-economic variables in all four economies. Unsurprisingly, many countries have tried replicating the East Asian experience with very little success. Birdsall et al. (1993) points out that the strict and rigorous institutional mechanisms required for policy success in East Asia was not followed in most of these countries. It should be understood that economic reforms are primarily matters of public policy, and their success is determined by the quality of institutions. In places where institutions are weak, policy is likely to be ineffective (Goldsmith, 1998). Weak institutions are mostly credited with the failure of some well-intended policies in SSA. Goldsmith (1998) argues that GDP per capita, gross domestic saving and merchandise exports in SSA declined between 1980 and 1995 following the implementation of the International Monetary Fund (IMF)/World Bank Structural Adjustment Programs (SAPs). The SAPs incorporated a bundle of free market policies primarily aimed at promoting privatization and trade. These policies collectively became known as the "Washington Consensus". Curiously, however, the implementation of these policies brought several countries to the brink of collapse. According to Owusu and Ng'ambi (2002), agricultural liberalization in accordance with the implementation of the "Washington Consensus" caused severe food crisis in Malawi. Stiglitz (2005) indicates that countries that adopted the "Washington Consensus" performed poorly economically compared to decades preceding the adoption of the policies. On the contrary, China with a largely planned but open economy with private property rights experienced expansion in international trade as well as better economic performance (see Qian, 2002). The failure of the "Washington Consensus" as pointed out by Stiglitz (2005) and Rodrick (2006) is a result of its strict adherence to the principle of market fundamentalism[2] without any regard for the institutional and policy environment within which the policies were to be implemented. In reality, markets

[2] Market fundamentalism – Belief that when left alone to operate, markets can solve all economic and social problems and always lead to efficient outcome.

will function properly if the rules that govern economic activities are well established and likely to be enforced. As noted by Serra and Stiglitz (2008), in the presence of asymmetric information and imperfect market, the economic theory on which the "Washington Consensus" was formed is flawed.

Additionally, in societies where property rights are not well defined, economic agents have no incentive to devote resources towards investment in physical or human capital or the use of more efficient technologies (Acemoglu et al., 2005). As reiterated by Olson (1996) most poor countries are poor because they lack basic institutions that enforce contracts and protect property rights, and so they lose the potential gains from such transactions. The risk of expropriation of assets has been a major concern for foreign investment in the sub-region. Foreigners are at risk of losing their entire operations due to outright confiscation by governments (such as the land reform in Zimbabwe in 1980 or the expropriation of mines in DR Congo in 2009). In some cases, they are forced to sell controlling stakes in their operation to government or locals. The situation is made worse by lack of independent and impartial domestic courts in countries where these incidents occur, thus forcing foreign firms to seek international arbitration which may take years to reach a ruling. Likewise, political instability is endemic in the sub-region and has long been a major concern to both domestic and foreign investors. It has affected investment and economic growth in general. Foreign investment, like trade, is a much-needed source of foreign technology transfer without which output and productivity in the sub-region are adversely affected.

It is very surprising that after decades of implementing trade liberalization and other market-oriented policies, African economies continue to experience slow growth, stagnation and deprivation despite the success of comparable policies in different parts of the world. This shows trade alone is not enough to guarantee economic prosperity. The potential for trade to accelerate growth also depends on factors that take advantage of opportunities integration

presents. As some country experience has shown, political stability, stable macroeconomic management, and rule of law are key to ensuring the gains from trade are sufficiently realized and the opportunities presented by them are adequately exploited to ensure economic success.

1.3 Research Questions

This study therefore seeks to find answers to the questions below.

- ✓ Do trade openness and institutional quality exert a simultaneous impact on economic growth in SSA?
- ✓ Which form or forms of institution is significant for economic growth in SSA?

1.4 Objectives of the Study

The core objective of this research is to examine the relationship between institutions, trade and economic growth in SSA. To do this we will attempt to;

- ✓ Empirically analyze the impact of trade and institutions on economic growth.
- ✓ Investigate the various forms of institutions and how they impact on economic growth.

1.5 Significance of the Study

Although 15 percent of the world's population live in SSA, half of the number of people living in absolute poverty are found in the region (see Poverty Figures – World Bank, 2017). It is widely acknowledged that one of the fastest ways to lift that much people from abject poverty to some minimum standard of living is through rapid economic growth. Recognizing this, there has been various policies and programs implemented in the sub-region with the aim of stimulating economic growth. However, these policies have one after the other failed to meet expectations. This has led to the region being nicknamed the "graveyard" of well-intended policies. This study argues that the reason for this policy failure as well as the region's

development snag is due to poor institutional structures. By recognizing the role of institutions in the economic growth process, this study seeks to provoke a rethinking of the approach to solving Africa's development problems.

1.6 Scope and Source of Data

This study covers 45 SSA countries for the period 2000 to 2016. Liberia, Sierra Leone, and South Sudan omitted due to inconsistent data. Data on GDP per capita, trade-GDP ratio, gross fixed capital formation, and population growth is sourced from World Bank's Worldwide Development Indicators (WDI) Database. Measures of institutional quality namely, rule of law, control of corruption, regulatory quality, voice and accountability, government effectiveness, and political stability and absence of violence are sourced from Worldwide Governance Indicators (WGI) Database. Data on index of human capital is obtained from the Penn World Table (PWT) version 9.0, the index is constructed using returns to education (Psacharopoulos, 1994) and average years of schooling (Barro & Lee, 2012). The use of secondary school enrolment rate as proxy for human capital is avoided due to inconsistent enrolment data for most African countries. The human capital index from the PWT is available for only 34 SSA countries and for the period 2000 – 2014. This implies that in specifications where the human capital index is used the sample decreases from 45 to 34 countries. To circumvent this problem, in specifications where the human capital index is used, results for the 45-country sample will also be presented, albeit without the human capital variable. Furthermore, like other studies investigating the relationship between trade and growth or institutions and growth, we are faced with some econometric hurdles. Notably, issues of reverse causality and probable measurement errors which are notorious sources of endogeneity. We intend to mitigate this problem by employing two estimation techniques namely an instrumental variable (IV) method and a

system generalized method of moments (system GMM). Trade is instrumented using an index built by Frankel and Romer (1999) in the IV estimation. The index is developed from a modified gravity model and it is widely used in empirical studies. Bilateral trade data for the model is obtained from the database of the United Nations Commodity Trade Statistics. Data on countries geographic characteristics is based on work by Mayer and Zignago (2011), and it is obtained from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Furthermore, institution is instrumented using data on measure of European settler mortality by Acemoglu, Johnson and Robinson (2001).

1.7 Organization of the Study

This study is organized into five main chapters. Introduction, problem statement and research questions are presented in Chapter 1. Chapter 2 presents the literature review. Methodology is discussed in Chapter 3. The main findings are presented in Chapter 4. Chapter 5 outlines concluding remarks and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

A comprehensive review of the relevant theoretical and empirical literature on the relationship between trade and growth, and institutions and growth are presented in this chapter. We further discuss more recent literature relating institutions, trade and economic growth.

The rest of chapter is arranged as follows: Section 2.2 discusses the theoretical literature, section 2.3 looks at the empirical literature and section 2.4 concludes.

2.2 Theoretical Literature

The idea that trade promotes growth predates modern economics and has defined economic thought as early as the sixteenth century. The mercantilist believed that through growth in net exports nations could accumulate wealth and achieve higher growth (Landreth and Colander, 2002). Classical trade theories by Adam Smith (1776) and David Ricardo (1817) focus on the gains from trade arising from allocation efficiency as resources are moved to more productive sectors of the economy. They predict that in the end trade will not only boost domestic production but international output through international division of labor and specialization. The classical theory of trade was formulated within the framework of perfect competition, comparative cost advantage and constant returns to scale. This framework limits the range of goods a country can efficiently produce to its endowments of factors of production. More recent theories of trade transcend these boundaries to demonstrate that there are benefits to discovering and specializing in producing high externality goods. Lately, the impact of trade on economic performance is attributed to dynamic gains driven by greater knowledge spillover, technological progress, competition, and economies of scale.

The new-growth theory for instance recognizes trade as a key driver of economic development especially in developing countries due to its role in facilitating knowledge and technology transfer. New growth theorist maintain that international trade would promote growth in developing countries through technology spillover and external stimulation. Thus, overtime developing countries will gradually acquire and learn foreign technologies as they trade with advanced countries. Furthermore, trade will encourage innovation due to increased competition in the domestic market.

The New Trade Theory (NTT), largely influenced by the works of economists such as Paul Krugman, sought to address some of the shortcomings of the traditional trade theories by taking into account some realities and complexities of modern trade. For instance, empirical data indicates that a substantial amount of world trade takes place between countries with similar factor endowments and technology. With little difference between trading parties, traditional trade theories predict little gains from trade. However, a number of countries have actually prospered trading this way. To explain this fact, NTT incorporates factors such as economies of scale, network effects and imperfect competition. Although countries may be similar in terms of factor endowments and productivity, trade may still be beneficial due to economies of scale. Economies of scale can be internal or external to a firm. With external economies of scale, the industry average cost declines as the number of firms increases. When scale economies are internal, the average cost of the firm declines as its output increases due to some cost advantages the firm enjoys as it scales up production. The presence of internal economies of scale alters the structure of the market leading to some form of monopolistic competition; with firms producing differentiated products and competing on the basis of brand or quality. The number of firms or the extent to which firms can scale up production is constrained by the size of the market. With international trade, market size expands considerably allowing for production at a much larger scale. Countries therefore specialize and produce a narrow variety

of goods, whilst importing what they don't produce from other countries. By limiting production to a narrow variety, each country is able to reap benefits associated with increasing returns and network effects. More varieties of the good is produced than if each country produced alone and at a much lower cost to consumers in both countries. Another important element of the NTT is that first-movers in a particular industry enjoy substantial economies of scale thereby dominating global markets. For this reason, economies that industrialized early have some form of competitive advantage. It also implies developing countries may struggle to enter global markets due to economies of scale already enjoyed by high-income countries. Some advocates of the NTT argue that for developing countries, using protectionist policies to build industries capable of competing in the world market or those that generate huge positive externalities could be beneficial for growth. They maintain that protectionist policies were key to the development of the auto industry in Japan, which is presently one of the biggest in the world, as well as other industries with huge technological impacts in most East Asian countries (MacEwan, 1999). However, the use of protectionist policies to support the growth of industries is highly contentious. One argument often made by critics is that government may not be well informed about which industry to support and how to go about it. Also, governments sometimes act to maximize their self-interest which may not necessarily be in the public's interest (Krueger, 1974; Bhagwati, 1982). Thus, intervention might lead to rent-seeking or the promotion of inefficient industries. Moreover, the strict institutional requirement necessary for such an intervention to be successful may not be present in most developing countries. Strong institutions are crucial in determining the type of policies to be implemented, how best to execute them and how to ensure its continuity (Goldsmith, 1998). Nevertheless, for most developing countries who are late entrants into the world market, some form of selective protectionism may be necessary in developing important industries in the face of increasing competition.

Melitz (2003) pioneered a new trend in the study of international trade with specific focus on differences among firms in the same industry of the same country. This trend is commonly referred to as the "New" New Trade Theory (NNTT). Unlike previously discussed theories, the NNTT relaxes the assumption of homogenous productivity across firms in the same industry. The theory recognizes that firms within the same industry have different productivity levels. Likewise, within the same industry some firms may engage in exports whilst others may not. Even within the so-called export industries, not all firms engage in exports; and among exporters productivity largely differs. In fact, available evidence shows only a small number of highly productive firms engage in exports. According to Bernard et al. (2007), only 4.4% of the total number of firms in the U.S in 2000 were engaged in exports, of which the top 10% accounted for 96% of total exports by value. Lileeva and Trefler (2010) also show that Canadian manufacturing firms which began exporting between 1984 and 1996 were 7% more productive and 58% larger than non-exporters. NNTT explains that, given the high fixed cost involved in participating in international markets, only highly productive and profitable firms are likely to get involved. Hence, highly productive firms self-select into export markets. Helpman, Melitz and Yeaple (2004), extend this argument to firms engaged in local production abroad or Foreign Direct Investment (FDI). They show that, among exporters only highly productive ones are able to cover the huge costs involved in setting up production abroad. According to NNTT, exposure to international trade will reallocate resources towards more efficient firms. When a country opens up to trade, least efficient firms will be forced out of the industry whilst more efficient firms gain in terms of increased production and profits. Although reallocation may entail some short-run costs, there is often considerably benefits to be gained in the long-run. Proponents of NNTT therefore caution against any government policy that might interfere with the reallocation process. This suggests protection given to domestic firms may inhibit or prevent a country from reaping the full benefits of trade.

The links between institutions and economic performance is attributed to seminal works by Coase (1937; 1960), Williamson (1971) and North (1991) which initiated a movement known as the New Institutional Economics (NIE). The term NIE was first used by Williamson (1975) to distinguish it from Institutional Economics. NIE, unlike Institutional Economics, does not completely reject neoclassical theory but rather modifies and extends it to address some of its shortcomings. NIE incorporates transaction cost economics, contract theory, and property rights into economic growth analysis and its primary argument is that institutions matter for economic development. The concept of transaction cost is attributed to the work by Coase (1937). Coase quizzed why firms exist if individuals could engage directly with each other to undertake exchange? To which he answered that there is transaction cost in organizing such arrangements and firms will emerge if it costs less to transact with them than directly through the market. By eliminating impediments to direct exchange, firms can reduce transaction cost substantially. Coase (1992) cautions that when transaction cost outweighs the potential gains from a particular exchange, that exchange will not take place and this may affect productivity in an economy. Williamson (1971) is credited for contributions in contract theory by stressing the importance of incomplete contracts. Contracts are supposed to stipulate what parties to an economic exchange can and cannot do and how some negative fallouts can be resolved. However, due to the fact that a party to a contract may have some private information or may act in a way that may not be verified in courts, contracts in the real world are mostly incomplete. Incomplete contracts give rise to opportunistic behaviour by individuals who may want to cheat to benefit more from the exchange. Property right on the other hand determines how economic resources are owned and used. It protects individuals from risk of expropriation and hence encourages investment (Acemoglu & Johnson, 2005). Institutions reduce risks, uncertainties and lower transaction costs associated with economic exchanges through property rights protection, contract enforcement and policy predictability. Hence, in societies where there is

certainty that contracts will be enforced and property rights protected, people will be more willing to specialize, invest in assets, and undertake complex transactions which will lead to economic growth (North, 1991).

North (1991) makes a critical distinction between organizations (players of the game) and institutions (rules of the game). He notes that there exists a symbiotic relationship between the two which is crucial to economic performance. Institutions make available opportunities that organizations can take advantage of, and as organizations evolve they alter the structure of institutions. Therefore, in societies where existing institutions do not invest in enhancing productivity, organizations will accordingly evolve to be inefficient thereby making societies unproductive. Subsequently, these inefficient organizations influence institutions by making them less likely to engage in productive activities, and the cycle repeats itself. The opposite also holds.

Acemoglu et al. (2005) develop a comprehensive framework that explains how good or bad institutions emerge and why they persist over time. They argue that, at any point in time, the group with sufficient political power to alter the rules determine the set of institutions that prevails in society. This implies bad institutions may persist if the group with political power are unwilling to change them. The balance of political power is however jointly dictated by the distribution of economic resources and political institutions. Institutioins that encourage economic growth will emerge if power is allocated to those who are inclined to exercise control on the use of their power and whose interest are in broad-based policies that encourage participation in economic activities. Acemoglu et al. (2005) use historical cases to demonstrate the assumptions, working and the implications of their framework. They argue that successful reforms that led to unprecedented development such as the Glorious Revolution in Britain and the East Asian “Miracle” could be explained within the framework.

2.3 Empirical Literature

There is a vast amount of empirical literature on the trade-growth link. Studies such as Dollar (1992), Sachs and Warner (1995), Frankel and Romer (1999), Dollar and Kraay (2002; 2004) and Irwin and Terviö (2002) maintain that countries that are more open tend to growth faster. Others such as Harrison (1996) and Jin (2004) suggest trade-growth link is ambiguous whilst some go as far as to suggest trade retards growth. For Rodrik (2001), the only relationship that exist between trade and growth is that countries reduce trade restrictions as they get richer. The literature focusing on Africa or developing countries is similarly mixed (see Greenaway et al., 2002; Rodrik et al., 2004). A growing number of studies have also investigated the relationship between institutions and economic performance, prominent among them are Hall and Jones (1999) and Acemoglu et al. (2001). These studies are largely supportive of the positive link between institutions and growth. More recent studies such as Dollar and Kraay (2003), Alcalá and Ciccone (2004), and Rodrik, Subramanian and Trebbi (2004) examine the impact of both trade and institutions on economic performance. The remainder of this sections presents a detailed discussion of some of the above-mentioned studies.

In their widely cited paper, Sachs and Warner (1995) investigating the effect of trade liberalization on economic performance for the period 1970 – 1989 reveal that open economies outperform closed economies. They showed that for a group of open economies, developing countries tend to grow faster than developed ones. Open developing economies attained 4.49 percent annual per-capita income growth, whilst open developed economies grew at 2.29 percent per year over the same period. Close developed economies however experienced higher income growth (0.74 percent) than developing economies (0.69 percent). They further asserted that open economies in general surpassed closed economies on both structural change and avoidance of extreme macroeconomic crises. However, failure to control for endogeneity between openness and growth casts some doubts on the conclusion of Sachs and Warner (1995).

Simple correlation between openness and growth cannot be sufficiently identified as causal impact.

Frankel and Romer (1999) on the other hand examined the income effect of trade openness whilst controlling for endogeneity between trade and income. They maintain that since a country's geographic characteristics affects trade, and are not correlated to other determinants of income, they can be suitably used to derive IV estimates of trade on income. Therefore, using a modified gravity model, they estimated predicted trade share using geographic characteristics which they employed as instruments for actual trade share. Using cross-country data for 150 countries, they demonstrate that a percentage point increase in the trade share raises income per capita by 1.97 percent. They reveal that trade affects income through human and physical capital accumulation as well as increased productivity. The novelty in Frankel and Romer (1999) is the use of predicted trade share from a modified gravity model as instrument for actual trade share. This study follows similar approach to instrument trade in economic growth regressions.

A parallel group of literature have been investigating the relationship between institutions and growth. Hall and Jones (1999) provide evidence that supports the view that a country's long-run economic performance depends primarily on government policies and institutions. In examining output per worker differential across countries, they observed that government polies and institutions, which they termed social infrastructure, was the main determinant of productivity differences. They argue that the huge disparities in output per worker is only partly explained by educational attainment and physical capital. They use correlates of Western European influence such as the proportion of the population that speaks English and a major European language and distance from the equator as instruments for institutions (social infrastructure). Their result indicates that a 0.01 difference in institutions (social infrastructure) corresponds to a difference in output per worker of 5.14 percent.

In probably the most influential work on the subject, Acemoglu et al. (2001) use variations in European settler mortality to examine the impact of institutions on economic performance. Settler mortality measures mortality rate of soldiers, bishops and sailors of European origins in settlements prior to 1850. They are of the view that since Europeans couldn't settle in places where they faced high mortalities, they set up extractive institutions and these institutions persisted and formed the basis of present institutions. Since past institutions could only affect income today through present institutions, they argue that settler mortality could be used as instrument for present institutions. Employing an instrumental variable (IV) approach, they estimate that the impact of institutions on income per capita is 0.94. They also revealed that once institution is controlled for neither geography nor African dummy is significant. Suggesting that Africa's poor economic performance is not due to geography but because of weak institutions. Following Acemoglu et al. (2001), a number of subsequent studies have employed European settler mortality rates as instrument for present institutions. However, the settler mortality variable has recently come under severe criticism. Albouy (2012) argues that of the 64 countries in the study, only 28 had mortality rates that are originally attributed to the settlements. The remaining 36 were estimated by the authors using similarity of diseased environment. In response, Acemoglu et al. (2012) maintain that their estimates are robust and have been confirmed by other historical records and therefore are reliable.

Another category of research has emerged in recent years examining the impact of both institutions and trade on economic performance. Rodrik et al. (2004) examine contributions of integration and institutions in influencing income differences across countries. They employ settler mortality as in Acemoglu et al. (2001) as instruments for institutions in a sample of 80 countries and the proportion of population that speaks English and other major European languages as instruments for a larger sample of 140 countries as in Hall and Jones (1999). Frankel-Romer (1999) predicted trade was used as instruments for actual trade in both samples.

The IV estimate shows that a unit increase in institutional quality produces a 2.15 increase in log income in the 80-country sample and a 1.32 increase in log income in the 140-country sample. Rodrik et al. (2004) concurs with Acemoglu et al. (2001) that geography has no significant effect on income once institutions are controlled for. Furthermore, trade was insignificant with a negative coefficient in almost all specifications. This they attribute to the primacy of institutions, that is, the quality of institutions "trumps" all other factors when it comes to cross-country growth regressions.

Alcalá and Ciccone (2004) use a different measure of trade openness which they call "real openness". They were of the opinion that the traditional measures of trade openness, thus nominal values of trade divided by that of GDP, yields biased estimate of trade on productivity. They therefore estimate real openness using the ratio of nominal trade to PPP GDP. Alcalá and Ciccone (2004) found a positive and robust relationship for both real openness and institutional quality on income.

Dollar and Kraay (2003) analyze the relationship between trade, institutions and growth using both levels and dynamic regressions. They reason that, results obtained from levels equation may be uninformative about the partial impact of institutions and trade on economic growth since instruments for both institutions and trade are highly correlated. However, dynamic regressions might be more appropriate since changes in institutions and trade are not likely to be correlated. Indeed, their estimation results for the levels regression shows that trade loses its significance when both trade and institutions are instrumented. Also, the significance of the institution variable is largely due to the inclusion of four "neo-Europes" – Australia, United States of America, New Zealand, and Canada – in the sample. They attribute the insignificance of both trade and institutions to high correlation between fitted values of trade and institution. For the levels equation, Dollar and Kraay (2003) instrument institutions using proportion of population that speaks English and other major European language as in Hall and Jones (1999),

and also European settler mortality as in Acemoglu et al. (2001). They note that the instrument by Hall and Jones (1999) was available for a larger sample of countries although settler mortality by Acemoglu et al. (2001) was much compelling, albeit being available for a smaller number of countries. The use of either instruments does not alter their conclusion. Following Frankel and Romer (1999), they instrument trade using fitted values of trade estimated from a gravity model. The decadal dynamic regression however showed a strong positive relationship between instrumented changes in institutional quality and changes in trade on economic growth. They instrument changes in trade and institutional quality using their levels at the beginning of the previous decade. Dollar and Kraay (2003) is influential in discovering that the widely used instruments of trade and institutions are themselves highly correlated.

2.4 Conclusion

Given the discussions above, one can only assume that the debate on the impact of trade and institutions on economic growth is just beginning to take off. This study advances the discussion in the following ways. First, giving that the institution argument centers around the role played by geography and colonization on past institutions and subsequently institutions today, it is relevant to analyze the impact of institutions and trade within a relatively homogenous sample of countries with very similar geography and colonial history. By so doing, we eliminate a great deal of cross-country regression bias.

Secondly, by using panel data we can control for unobserved country specific effect which might cause bias in coefficient estimates. Furthermore, we are able to exploit some advantages it has over cross-section estimation by allowing us to estimate how changes in institutions and trade over time affects growth.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

In this chapter, we present the theoretical framework, description of variables and data source, model for empirical estimation, and discussion of econometric methodology.

The chapter is arranged as follows: Section 3.2 presents the theoretical framework. Section 3.3 outlines description of all variables. Section 3.4 illustrates the model for empirical estimation. Section 3.5 discusses the choice of econometric methodology. Section 3.6 concludes.

3.2 Theoretical framework

The baseline model for this study is based on the human capital augmented Solow model advanced by Mankiw, Romer and Weil (1992). Following Solow (1956), Mankiw et al. (1992) construct their model by adding a human capital variable to a traditional Cobb-Douglas production function. The modified production function hence took the form;

$$Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta} \tag{3.1}$$

Where t represents time, *Y* output, *K* physical capital, α output elasticity of physical capital, *H* human capital, β output elasticity of human capital, *A* level of technology, *L* labour, and *AL* effective labour. Dividing both sides of equation *3.1* by *AL* gives the equation in intensive form:

$$y_t = k_t^{\alpha} h_t^{\beta} \tag{3.2}$$

Where y_t is output per effective labour, k_t is physical capital per effective labour and h_t is human capital per effective labour. Following Solow (1956), they note that effective labour

A_tL_t grows at a rate $(n+g)$, where n and g are growth rates of labour and technology respectively, and capital depreciates at a fixed rate δ (for simplicity Mankiw et al. (1992) assume both human and physical capital depreciate at the same rate). They further assumed a fraction of income $sy_{(t)}$ is saved and split between investment in physical capital (s_k) and human capital (s_h) such that $s = s_{k+}s_h$. Therefore, the rate of physical and human capital per effective labour accumulation overtime is given as;

$$\frac{dk_t}{dt} = \dot{k}_t = s_k y_t - (n+g+\delta)k_t$$

$$\frac{dh_t}{dt} = \dot{h}_t = s_h y_t - (n+g+\delta)h_t$$

(3.3)

$s_k y_t$ and $s_h y_t$ are the fractions of output per effective labour that are invested in physical and human capital, and the term $(n+g+\delta)$ represents the minimum level of investment necessary to keep k_t or h_t from falling.

The steady-state equilibrium growth path, that is, the state at which both physical and human capital are constant, is given as;

$$\dot{k}_t = \dot{h}_t = 0$$

(3.4)

We can find the steady state levels of k and h by inserting y_t in equation *(3.2)* into equation *(3.3)* and setting both $\dot{k}_t$ and $\dot{h}_t$ in equation *(3.3)* to zero. This therefore yields;

$$k^* = \left(\frac{s_k^{1-\beta} s_h^{\beta}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)}$$

$$h^* = \left(\frac{s_k^{\alpha} s_h^{1-\alpha}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)}$$

(3.5)

Accordingly, output per effective labour at the steady state will be;

$$y^* = (k^*)^{\alpha}(h^*)^{\beta}$$

$$y^* = [(\frac{s_k^{1-\beta} s_h^{\beta}}{n+g+\delta})^{1/(1-\alpha-\beta)}]^{\alpha}[(\frac{s_k^{\alpha} s_h^{1-\alpha}}{n+g+\delta})^{1/(1-\alpha-\beta)}]^{\beta}$$

(3.6)

Finding natural logs of both sides of equation *3.6* above and simplifying yields:

$$lny^* = -\frac{\alpha+\beta}{1-\alpha-\beta} ln(n+g+\delta) + \frac{\alpha}{1-\alpha-\beta} lns_k + \frac{\beta}{1-\alpha-\beta} lns_h$$

(3.7)

Furthermore, Mankiw *et al.* (1992) give the equation for the rate of convergence as;

$$lny_t - lny_0 = 1 - e^{-\lambda t}(lny^* - lny_0)$$

(3.8)

Where $\lambda = (n+g+\delta)$ and y_0 is income per effective labour at an earlier period. Inserting lny^* from equation (*3.7)* into the equation for the rate of convergence yields.

$$lny_t - lny_0 = \left[-\frac{\alpha+\beta}{1-\alpha-\beta} ln(n+g+\delta) + \frac{\alpha}{1-\alpha-\beta} lns_k + \frac{\beta}{1-\alpha-\beta} lns_h - lny_0\right](1 - e^{-\lambda t})$$

(3.9)

Equation (*3.9)* above expresses change in log income per effective labour as a function of income per effective labour at an initial period y_0, rate of population growth n, and rate of investment in physical capital s_k and human capital s_h.

Using discrete time approximations, equation *3.9* can be simplified into a general growth regression model of the form:

$$\Delta lny_t = \gamma lny_0 + X'_t\beta + \varepsilon_t \tag{3.10}$$

Where X'_t is a matrix of factors that affect growth and ε_t is a stochastic term capturing all omitted influence. Regression model specified in this form is widely used in empirical growth analysis. Its extensive use is attributed to the freedom it grants researchers in testing the effect of other variables of interest on growth.

Writing equation *3.10* to mirror the panel structure of our data and our research objective yields;

$$\Delta lny_{it} = \gamma lny_{it-1} + Inst_{it} + lnTrade_{it} + X'_{it}\beta + \varepsilon_{it}$$

$$\varepsilon_{it} = \mu_i + v_{it} \quad \text{and } \gamma < 1 \tag{3.11}$$

Where *t* represents time, *i* countries, $Inst$ and $lnTrade$ are our variables of interest denoting index of institutional quality and log of trade-GDP ratio respectively, X_{it} is the matrix of control variables, μ_i represents individual country effect and v_{it} is the idiosyncratic error term. Barro (1998, 2001, 2003) estimates a similar model with both rule of law and trade openness as explanatory variables.

3.3 Model for empirical estimation

Following the theoretical model presented in equation (*3.11)* above, the model for empirical estimation is specified as:

$$\Delta lnGDPPC_{it} = \alpha_0 + \alpha_1 lnGDPPC_{i,t-1} + \alpha_2 IQ_{it} + \alpha_3 lnTrade_{it} + \alpha_4 \ln HC_{it} + \alpha_5 lnInv_{it} + \alpha_6 lnPOPg_{it} + \varepsilon_{it} \quad (3.12)$$

$\Delta lnGDPPC_{i,t} = Change\ in \log of\ GDP\ per\ capita\ PPP$

$lnGDPPC_{i,t-1} = \log of\ lagged\ GDP\ per\ capita$

$IQ_{it} = Institutional\ quality$

$lnTrade = \log of\ trade - GDP\ ratio$

$lnHC_{i,t} = \log of\ human\ capital$

$lnInv_{it} = log\ of\ investment\ ratio$

$lnPOP_{it} = log\ of\ population\ growth\ rate$

3.4 Description of Variables and Data Sources

This section presents a discussion as well as justification for variables used in this study. Some a priori expectations of coefficient sign of variables are also discussed.

3.3.1 Dependent variable

GDP per capita PPP: It is estimated from GDP changed to international dollars by using PPP (purchasing power parity) rates. It accounts for relative living standards across countries, making it a better measure for comparing income levels across countries. Moreover, the change in log GDP per capita approximates economic growth. The data for GDP per capita PPP is sourced from the World Bank's WDI.

3.3.2 Explanatory variables

Institutional quality: Institutional quality along with trade is our variable of interest. Following seminal works by Dollar and Kraay (2003) and Rodrik et al (2004), this study adopts rule of law as the main measure of institutional quality. Rule of law captures important aspects of economic institutions such as law and order and the extent to which property rights and contractual agreements are enforced in a country. Other measures of institutional quality such as control of corruption, voice and accountability, political stability and absence of violence, regulatory quality, and government effectiveness are also introduced in this study. All measures of institutions are based on the work by Kaufmann, Kraay and Mastruzzi (2011) obtained from WGI database. The definitions of the various measures of institutions from the WGI database are as follows;

Rule of Law: Captures the perception that people have about the rules that govern them; such as the quality of law enforcement, property rights, contract enforcement, along with the prospect of crime and violence.

Regulatory Quality: This index captures government's ability to put together and carry out policies and regulations that encourages the development of private sector.

Control of corruption: The index captures perceptions of the degree to which public office is used for private benefit. It covers all forms of major and minor corruption, as well as the extent to which private interest influence decision-making to their own benefit.

Government Effectiveness: The index captures opinions about the quality of civil and public services, and how independent they are from political influence. It also covers the quality of policy formulation and implementation, and how committed government is to such policies.

Political Stability and Absence of Violence/Terrorism: This index captures perceptions of the possibility of politically-motivated violence and/or political instability.

Voice and Accountability: captures perceptions of the degree to which citizens are able to partake in choosing their government, and the extent to which they exercise their freedom of association and expression, as well as a free media.

All institutional variables are measured between an approximate maximum and minimum values of -2.5 and 2.5 respectively.

Trade; Trade-GDP ratio or trade openness ratio is the most commonly used measure of trade in growth analysis. It is calculated by dividing the sum of the value of exports and imports in a year by the GDP of the same year. Although referred to as a ratio, it is written as a percentage. It measures how open an economy is to international trade, and it is often viewed as a measure of the degree of globalisation of an economy (Harris, 2008). In a developing country context, trade openness is expected to lead to growth through technology transfer from advanced countries among other things. However, the link becomes obscure as one begins to consider the conditions and circumstances required for trade to lead to growth (Rodriguez and Rodrik, 2001). A positive coefficient for the Trade variable is expected. The data for trade-GDP ratio is obtained from the World Bank's WDI.

3.3.2.1 Controls

Initial GDP per capita PPP: Initial GDP per capita accounts for the fact that different countries have different levels of GDP per capita which may affect subsequent GDP per capita growth. Its inclusion allows us to account for subsequent persistence or decay of real GDP per capita over time. A negative coefficient for initial GDP per capita indicates evidence of convergence, that is, previously low-income countries are catching up to high-income countries. A positive coefficient on the other hand indicates that previously high-income countries are growing faster than low-income countries.

Investment ratio: Investment in physical capital is a vital source of economic growth, as identified by a long line of distinguished economists (Harrod, 1939; Solow 1957; Kaldor 1961). Studies such as Mankiw et al. (1992), Barro (2003), Barro and Sala-i-Martin (2004) all found a positive effect of capital accumulation in cross-country growth regressions. We expect a positive coefficient for the gross capital formation variable. The share of gross capital formation in GDP is extracted from the WDI database.

Population growth; the debate on the impact of population growth to economic growth is as old as economics itself (Tsen & Furuoka, 2005). Malthus (1798) argues that there is an inclination for population to outgrow productivity, and when this happens, countries will tumble into periods of intense poverty. Becker, Glaesar and Murphy (1999), demonstrated that the Malthusian predictions were inconsistent with available evidence. They argue that population growth could have either positive or negative impact on productivity. Essentially, a large population boosts the labour force, provides vast market for the domestic economy, and encourages competitive behaviour, which leads to innovation. Nonetheless, it may reduce productivity due to diminishing returns to the intensive use of resources and overburdening of

economic infrastructure. The data for population and population growth is extracted from the WDI database.

Human Capital; human capital basically refers to knowledge and skills embodied in individuals (Crawford, 1991). A steady rise in human capital development is essential for rapid transitional growth (Sachs & Warner, 1997). Average years of schooling or returns to education is widely used in the literature as a proxy for human capital. Barro (1991, 2001, 2003), Mulligan and Xavier (1997) and Barro and Lee (1993) used various measures of educational attainment as proxy for human capital and discovered that it positively relates to growth. Mankiw et al. (1992) proxy human capital using the percentage of secondary school students who fall within the working age population. We avoid using Secondary School Enrolment rates due to inconsistent enrolment data for most African countries. This study uses index of human capital per person from the PWT version 9.0 as proxy for human capital. The index is based on the average years of schooling by Barro and Lee (2012) and the returns to education by Psacharopoulos (1994). Following several studies on the subject, we expect a positive coefficient for the human capital variable.

3.5 Econometric Methodology

The Ordinary Least Squares (OLS) estimator gives the best liner unbiased estimator of coefficients according to the Gauss-Markov theorem, but that depends on meeting a set of conditions. Unfortunately, the model specified in equation (*3.11)* above and subsequently in equation *(3.12)* violates some of these known conditions. For instance, since the dependent variable depends on its own past value, it is necessarily correlated with the error term. This renders traditional OLS estimates biased and unreliable. Using a standard panel data technique

such as Fixed Effect (FE) estimator may be inappropriate too given the relatively short time period of our data due to "Nickell bias" (illustration below).

$$(y_{it} - \bar{y}_i) = \gamma(y_{it-1} - \bar{y}_{i-1}) + (x_{it} - \bar{x}_i)\beta + (\mu_i - \bar{\mu}_i) + (v_{it} - \bar{v}_i)$$

$$\bar{y}_i = \frac{1}{T}\sum_{t=1}^{T} y_{it}\,;\ \bar{y}_{i-1} = \frac{1}{T-1}\sum_{t=2}^{T} y_{it-1};\ \ \bar{x}_i = \frac{1}{T}\sum_{t=1}^{T} x_{it}\,;\ \bar{\mu}_i = \frac{1}{T}\sum_{t=1}^{T} \mu_i\,;\ \bar{v}_i = \frac{1}{T}\sum_{t=1}^{T} v_{it}$$

(3.13)

By subtracting the average of all observations from their respective current values, within transformation eliminates the unobserved country specific effect, μ_i; since μ_i is a constant, $\mu_i = \bar{\mu}_i$ and therefore gets expunged. However, the lagged dependent variable remains correlated with v_{it-1}, which is a component of $\bar{v}_i$. The correlation diminishes with panel length as the effect of v_{it-1} on $\bar{v}_i$ diminishes over time. So, for a dynamic panel model, FE generates biased coefficient estimates due to "Nickell bias". Nickell (1981) identifies that the bias is of order $1/T$ and thus disappears as $T \longrightarrow \infty$.

Alternatively, we could use a first-difference (FD) estimator to expunge the country specific effect as shown below.

$$\Delta y_{it} = \gamma \Delta y_{it-1} + \Delta x'_{it}\beta + \Delta v_{it}$$

(3.14)

Since μ_i is time invariant it gets eliminated. With μ_i expunged an Instrumental Variable (IV) method can be used, provided valid instruments can be found. For an instrument set z_i, the conditions necessary to qualify as a valid instrument is;

- Relevance $\quad corr\,(z_i, y_{it-1}) \neq 0$
- Exogeneity $\quad corr\,(z_i,\ v_{it}) = 0$

(3.15)

Another major concern is the issue of potential endogeneity arising from the relationship between trade and institution and the dependent variable (economic growth). This could as well be resolved using an IV approach, and again on condition that valid instruments could be found. For a given explanatory variable X and its instrument θ, the conditions below must be satisfied.

- Relevance $corr\ (\theta_i,\ x_{it})\ \neq 0$
- Exogeneity $corr\ (\theta_i,\ v_{it})\ = 0$

(3.16)

Given the strict conditions in equations *(3.15)* and *(3.16)* above, valid instruments are in reality very difficult to find. Anderson and Hsiao (1982) propose a method that uses variables generated within the model as instruments. They propose using y_{it-2} or Δy_{it-2} $(y_{it-2} - y_{it-3})$ as instrument for $\Delta y_{it-1}(y_{it-1} - y_{it-2})$. This is because although y_{it-2} or Δy_{it-2} is correlated with Δy_{it-1}, it is however uncorrelated with Δv_{it} $(v_{it} - v_{it-1})$, thereby satisfying conditions for both relevance and exogeneity respectively. Following the same argument, for any endogenous variable X, x_{it-1} or Δx_{it-1} $(x_{it-1} - x_{it-2})$ can be used as instrument for $\Delta x_{it}(x_{it} - x_{it-1})$.

Despite the novelty of the Anderson-Hsiao (AH) method, it has been criticized for not making use of all the information made available by the structure of the panel. Arellano and Bond (1991), by making an extra assumption about the nature of the error terms, were able to develop a technique that exploits all available instruments in the model. Arellano and Bond (1991) made an explicit assumption that the error terms are not serially correlated, thus;

$$E[y_{it-s}, \Delta v_{it}] = 0$$

$$E[x_{it-s}, \Delta v_{it}] = 0$$

$$for\ t = 3, \dots, T; s \geq 2$$

(3.17)

Equation (*3.17)* above implies that variables from time $t-2$ and those prior to that, can be employed as instruments in first difference equations. This method is known as the difference Generalized Method of Moments (difference GMM). Arellano and Bond (1991) performed some experiments which affirmed that their method outperforms OLS, within-groups and the AH method. Nevertheless, difference GMM has some known limitations. By construction, it cannot estimate time invariant variables since they get eliminated in differenced equations. Also, it tends to magnify gaps in unbalanced panels since for every missing observation, both the first difference and the lagged first-difference will be missing from the transformed data. Moreover, it has been proven to perform poorly in estimating persistent models (Blundell & Bond, 1998).

Blundell and Bond (1998), recommend a method known as system GMM that treats the model as a system of equations, the first in transformed form and the other in levels. They achieve this by making extra assumptions about the nature of the model. They assumed that the deviations of y_{it} from its long-run average are not correlated to the individual specific effect. Thus;

$$E[(y_{i1}-\bar{y}_i),\mu_i] = 0 \quad for\ i = 1,\dots,N. \tag{3.18}$$

Combining the above with the assumption that the country-specific effects are uncorrelated with the disturbance term ($E(v_{it,}\,\mu_i) = 0$), implies;

$$E[\Delta y_{it-1},(\mu_i + v_{it})] = 0$$

$$E[\Delta x_{it-1},(\mu_i + v_{it})] = 0$$

For $i = 1,2,\dots,N\ and\ t = 3,4,5,\dots,T$

(3.19)

These conditions combined with those specified under the Arellano-Bond (AB) method permits the model to be treated as a system of equations.

$$\Delta y_{it} = \gamma \Delta y_{it-1} + \Delta x'_{it}\beta + \Delta v_{it}$$

$$y_{it} = \gamma y_{it-1} + x'_{it}\beta + \mu_i + v_{it}$$

(3.20)

Blundell and Bond (1998) suggest using lagged first-difference as instruments in levels equation in addition to using lags of levels as instruments for transformed equation. Blundell and Bond (1998) reveal that their method outperforms difference GMM estimator in samples where the time period is relatively small and the autoregressive parameter (γ) is high.

The major strength of the system GMM approach is its ability to obtain consistent and less controversial estimates in the presence of endogeneity. By using internally generated instruments, it eliminates the weak instrument problem associated with the use of external instruments. Moreover, the model accommodates time invariant variables, making it possible to estimate their coefficients. Furthermore, it has been shown to consistently outperform other class of estimators in estimating dynamic panel models (see Blundell & Bond, 1998; and Bond, Hoeffler & Temple, 2001).

The credibility of system GMM estimates depends largely on the validity of its assumptions. The Arellano Bond (AB) test for autocorrelation and the Sargan (1958)/Hansen (1982) test for over-identifying restrictions are employed to examine the validity of the underlying assumptions. The AB test for autocorrelation of order two (AR *(2)*) tests for autocorrelation in the levels equation whilst the Sargan/Hansen test identifies whether the instruments are collectively uncorrelated with the error term, thus it tests for instrument exogeneity.

4.7 Conclusion

In this chapter we presented a detailed discussion of the theoretical framework based on the human capital augmented Solow model. An empirical model was proposed to estimate the impact of the variables of interest on economic growth. Under econometric methodology an argument was made why OLS and other traditional panel data techniques such as FE will lead to biased and inconsistent estimates. We further looked at the strengths and weaknesses of some other estimation techniques. Our choice of system GMM was based on some specific features of the empirical model to be estimated. We finally propose using AB test for AR *(2)* and Sargan (1958)/Hansen (1982) test for over-identifying restriction to test the validity of the system GMM estimates.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents estimation results and discussion based on the empirical model proposed in chapter 3 above. The statistical software package Stata 14 by StataCorp LP is used for the estimations.

The chapter is arranged as follows; Section 4.2 presents descriptive statistics of all variables used. Section 4.3 presents the estimation results.

4.2 Descriptive Statistics

For the period 2000-2016, the average GDP per capita PPP in SSA was $4,478.8, which is equivalent to the GNI per capita of upper-middle income economies per the World Bank's classification. However, income distribution within the region is far from equal as evidenced by a huge standard deviation of $6,071. The highest GDP per capita over the period is $40,015.8 recorded in Equatorial Guinea in 2008 whilst the lowest recorded is $503.8 in Democratic Republic of Congo in 2002. GDP per capita PPP growth averaged 1.9% with a standard deviation of 4.9% maximum of 45% and a minimum of -45.9%.

The share of Trade in GDP averaged 76.6% which is huge compared to the world average of 30% in 2014 (WTO, 2015). However, by construction, trade-to-GDP ratio will be high for countries with low GDPs. Regardless, it is a very good indicator of the relative importance of trade to the economies of countries in the region. The maximum trade-to-GDP ratio for the period is 351% in Equatorial Guinea in 2001. Between 2000 and 2004, Equatorial Guinea

consistently achieved trade-to-GDP ratio in excess of 240%. On the contrary, Sudan persistently registered the lowest trade-to-GDP ratio with the least being 19.5% in 2014.

Population growth in the region is relatively high, the average over the period is 2.5% compared to the world average of 1.2%. The maximum recorded is 5.5% in Rwanda in 2000. Equatorial Guinea attained the highest population growth rate for consecutive years between 2006 and 2014. Seychelles reports some of the lowest population growth rate with the minimum of -2.6% in 2011.

The average investment-GDP ratio over the period is 21.6% with a standard deviation of 11.9%. Some notable highs of 125.5%, 145.8% and 114.7% were achieved in Equatorial Guinea in 2000, 2001 and 2003 respectively. The lowest over the period was 2.0% recorded in Zimbabwe in 2005.

The human capital index from the PWT version 9.0 is available for only 34 SSA countries and a shorter period between 2000 – 2014. The maximum value of the index recorded over the period is 2.8, a minimum of 1.07, an average of 1.7, and a standard deviation of 0.4. Botswana consistently achieved the highest index between 2000 and 2014 whilst Burkina Faso registered some of the lowest values over the period including minimum of 1.07 in 2000.

The measures of institutional quality fall within an approximate theoretical minimum of -2.5 and maximum of 2.5. By construction, the world average for each index at any particular period is zero. The fact that the average values recorded are all negative is indicative of the poor quality of institutions in the region. Mauritius achieved the highest value for both rule of law and regulatory quality over the years whilst Somalia, on the other hand, recorded the lowest values for both measures over the same period.

Table *4. 1* Summary Statistics for all variables

Variables	*N*	*Mean*	*Std. Dev.*	*Maximum*	*Minimum*
GDP per capita, PPP (constant 2011 international $)	743	4,478.8	6,070.9	40,015.8	503.8
GDP per capita PPP growth (annual %)	742	1.9	4.9	45.0	-45.9
Trade (% of GDP)	700	76.6	38.9	351.1	19.1
Population (total, million)	760	18.3	27.0	186	.08
Population growth (annual %)	760	2.5	0.85	5.5	-2.6
Investment (% of GDP)	683	21.6	11.9	145.7	2.0
Human capital (index per person)	510	1.71	0.41	2.81	1.07
Institutional quality					
Rule of Law	675	-0.71	0.67	1.06	-2.67
Political Stability and Violence	675	-0.54	0.95	1.19`	-3.32
Regulatory quality	675	-0.69	0.65	1.12	-2.66
Voice and accountability	675	-0.60	0.75	1.02	-2.23
Control of corruption	675	-0.63	0.63	1.22	-1.87
Government effectiveness	675	-0.77	0.63	1.05	-2.45

Source: Author's own calculation

4.3 Estimation Results and Discussion

Estimation results for this study are illustrated in four different tables below. Some relevant diagnostic tests are presented in the lower part of the tables as well.

Table *4.2* below shows results from regression of change in log GDP per capita on lagged GDP per capita, trade and institutions. Three estimation techniques are employed in estimating Table 1. Column *(1)* reports results using a Fixed Effect (FE) estimator, column *(2)* shows IV-2SLS regression results and column *(3)* shows system GMM results. Other variables are omitted in Table *4.2* so as to ascertain the true impact of institutions and trade on growth without leaving out any of their effects operating through other variables. Given that both trade and institutions are instrumented properly, and the instruments are not correlated with other determinants of

income growth, we can safely assume all other omitted variables are in the error term without any bias. In any event the preceding conditions are violated, results from Table *4.2* might not necessarily imply true causal effect although it still gives a very good account of the relationship between institutions, trade and economic growth in SSA.

Table 4. 2 *Growth Regression with Institution and Trade*

Dependent Variable:	*Change in log GDP per capita income PPP*		
	(1) FE	*(2) IV-2SLS*	*(3) Sys- GMM*
Lagged GDP per capita	-0.134***	-0.025*	0.0191***
	(0.023)	(0.014)	(0.00229)
Institution (RL)	0.054***	0.072**	0.0489***
	(0.018)	(0.030)	(0.00501)
Trade	0.040***	0.022	0.0802***
	(0.013)	(0.030)	(0.00725)
Constant	0.929***	0.166**	-0.435***
	(0.193)	(0.075)	(0.0402)
Observations	644	305	568
No. of countries	45	25	45
AR(2) p-value			0.164
Hansen J-statistic		0.00	0.777
Instruments			
Predicted Trade		✓	
Settler Mortality		✓	

Note: robust standard errors in parenthesis All variables except Institution are in logs.

**** Significant at 1%, ** significant at 5% and * significant at 10%.*

Source: Author's own calculation

Column *(1)* shows a positive and highly significant coefficient for both trade and institution variables. The point estimates for institution and trade are 0.05 and 0.04 respectively implying a positive correlation between both variables and income growth. This however does not imply causality due to some econometric issues as already stated. We try resolving this by following several similar studies in using an instrumental variable (IV) approach in column *(2)*.

Adhering to a long line of tradition in the literature, we instrument institutions using log of European settler mortality from Acemoglu et al. (2001), also following Frankel and Romer (1999) we construct fitted trade values from a modified gravity equation to instrument trade. Data for settler mortality is available for only 27 out of 47 SSA countries, and bilateral trade data for estimating fitted trade values is available for a consistent sample of 37 countries. This effectively reduces the sample to 25 countries. The IV estimates from column *(2)* shows that institution remains significant with a slightly larger coefficient whereas trade loses its significance despite remaining positive. This outcome is similar to that obtained by Dollar and Kraay (2003) and Rodrik et al. (2004) using IV regression. We are however confronted with a multicollinearity problem as specified by Dollar and Kraay (2003). Results from the first-stage (*see* appendix III) indicates that both the fitted values of trade and settler mortality variable are highly correlated with both trade and institution. Indeed, the p-value of the Hansen *J* statistic in column (2) implies that our instruments are not valid. Therefore, results from Table *4.2* column *(2)* may be uninformative about the causal relationship between trade, institutions, and economic growth.

In column *(3)*, a system GMM estimator is used in a bid to circumvent some of these problems. All three explanatory variables are treated as endogenous. The results show both trade and institution are positive and highly significant with point estimates of 0.08 and 0.05 respectively. This implies a percentage increase in trade is expected to produce a 0.08% increase in income growth whereas a unit increase in index of institutional quality (rule of law) is associated with a 5% increase in income growth. The validity of instruments used are confirmed by the AB test for AR *(2)* and the Hansen *J*-statistic in the lower part of the table.

Before making any general conclusion about the relationship between institutions, trade and growth, we specify our full empirical model in Table *4.3* to further analyze the behavior of the variables. Thus, we introduce investment ratio, population growth and human capital as

additional variables. Table *4.3* columns *(1)* and *(2)* report results for 34 SSA countries for which data on human capital is available from the PWT. Columns *(3)* and *(4)* displays results for a larger sample of 45 countries without the human capital variable.

Table *4. 3* Growth Regression with Additional Controls

Dependent Variable	*Change in log GDP per capita income PPP*			
	(1) FE	(2) GMM	(3) FE	(4) GMM
Lagged GDP per capita	-0.143***	0.010	-0.141***	-0.006
	(0.024)	(0.011)	(0.016)	(0.006)
Institutions (RL)	0.0499***	0.040***	0.038***	0.030***
	(0.014)	(0.015)	(0.013)	(0.005)
Trade-GDP ratio	0.026**	0.045***	0.021*	0.073***
	(0.012)	(0.015)	(0.011)	(0.006)
Controls				
Population Growth	0.026***	0.043***	0.034***	0.031***
	(0.009)	(0.006)	(0.009)	(0.005)
Human Capital	0.171***	0.006		
	(0.062)	(0.008)		
Investment Ratio	0.011	0.005	0.028***	0.008***
	(0.009)	(0.015)	(0.008)	(0.003)
Constant	0.915***	-0.276**	0.949***	-0.275***
	(0.181)	(0.112)	(0.140)	(0.068)
Observation	421	421	529	627
Adj. R-squared	0.16		0.22	
Countries	34	34	45	45
AR(2)		0.600		0.345
Hansen J		0.997		0.939

Note: All variables except Institutions are in logs. Robust standard errors in parentheses.
**** Significant at 1%, ** significant at 5% and * significant at 10%.*

Source: Author's own calculation

Results from Table *4.3* indicates both trade and institution retain their significance despite the addition of control variables. The point estimate for rule of law is 0.04 in column *(2)* and 0.03 in column *(4)* whilst that of trade is 0.05 and 0.07 in columns *(2)* and *(4)* respectively. The

results do not differ significantly between the two samples. Moreover, investment and human capital variable have their expected signs. Interestingly, population growth is consistently positive and significant in all specifications. In fact, the correlation matrix (*see* appendix II) indicates the two variables move together.

In Table *4.4* we add measures of geography, regional dummies and FDI to account for other sources of economic growth variations among countries in the region and also to test robustness of our results. Column *(1)* introduces latitude (distance from the equator) and landlock dummy. Studies such as, Dollar and Kraay (2003) and Rodrick et al. (2004) employ latitude in estimating the relationship between institutions, trade and growth. Dollar and Kraay (2003) also add a landlock dummy. Acemoglu et al. (2001) employ latitude to estimate the relationship between institutions and growth. In column *(2)*, regional dummies corresponding to the four main economic blocs in the sub-region are included. The economic blocs are the Economic Community of West African States (ECOWAS), Southern African Development Community (SADC), East African Community (EAC), and Economic Community of Central African States (ECCAS). In column (3), we include the ratio of FDI to GDP to observe and compare the relative importance of FDI and trade to economic growth. FDI, like trade is an important source of foreign technology and skills to developing countries and as such contributes to growth.

Table *4. 4* Growth Regression with Geography variables and FDI

Dependent Variable	Change in log GDP per capita income PPP		
	(1)	*(2)*	*(3)*
	Sys GMM	*System GMM*	*System GMM*
Lagged GDP per capita	-0.005	-0.007	-0.016**
	(0.005)	(0.006)	(0.007)
Institutions (Rule of Law)	0.037**	0.041**	0.063***
	(0.015)	(0.019)	(0.019)
Trade	0.039***	0.035**	0.039*
	(0.015)	(0.014)	(0.024)
Investment Ratio	0.021	0.020	-0.004
	(0.013)	(0.014)	(0.018)
Population Growth	0.020***	0.023***	0.033***
	(0.008)	(0.008)	(0.009)
Latitude (Distance from the equator)	0.000		
	(0.000)		
Landlock	0.006		
	(0.009)		
FDI			0.001
			(0.003)
Constant	0.000	-0.130	-0.008
	(0.000)	(0.113)	(0.154)
Year dummies	✓	✓	✓
Regional dummies		✓	
Observations	627	627	567
No. of countries	45	45	45
AR(2) p-value	0.121	0.126	0.257
Hansen J-statistic p-value	0.292	0.321	0.428

All variables except rule of law, latitude, and landlocked are in logs.
**** significant at 1%, **significant at 5% and *significant at 10%*

Source: Author's own calculation

Results from Table *4.4* indicates that both trade and institution are stable and significant in all specifications. The inclusion of geography variables in column *(1)* does not change the established relationship between institutions, trade and growth, neither does regional dummies and FDI in columns *(2)* and *(3)* respectively. Both geography variables fail to attain significance at any conventional level. This finding is similar to studies such as Acemoglu et al. (2001), Dollar and Kraay (2003), and Rodrik et al. (2004) which established the supremacy of institutions over geography in determining cross-country differences in income.

Furthermore, FDI although positive is not significant. It's inclusion however reduces the significance of trade.

Given the above results and the corresponding diagnostic tests, we can reliably conclude that our finding of a positive impact of trade and institution on growth in SSA is robust and can therefore be reliably inferred as true causal effect.

4.3.1 Other measures of institutions

Five other measures of institution – namely regulatory quality, government effectiveness, voice and accountability, control of corruption, and political stability and absence of violence/terrorism – are introduced in Table *4.5*. The results are divided into two parts like before. Columns *(1)* to *(6)* show results from a sample of 34 countries between 2000 and 2014 whilst column *(7)* to *(12)* shows results for a larger sample of 45 SSA countries and a relatively longer time period, 2000 to 2016.

Results from columns *(1)* to *(6)* indicates that human capital index appears insignificant in all specifications although mostly positive. All measures of institutions are positive except regulatory quality which appears negative in column *(2)* although insignificant.

For columns *(7)* to *(12)* trade is positive and significant at 1% in all specifications. The point estimates range from 0.06 to 0.08. Moreover, all institutional variables save regulatory quality are positive and significant at 1%. Regulatory quality although positive is not significant at any acceptable level. Of all the measures of institution, political stability has the highest point estimate of 0.043, followed by control of corruption at 0.035, government effectiveness at 0.033, Rule of law at 0.030 and voice and accountability at 0.019. Furthermore, population growth and investment ratio are positive and highly significant in all specifications. Lagged income is negative although hardly significant indicating some form of conditional

convergence in the sub-region. Our findings indicate that trade has a positive effect on economic growth in SSA and whilst institutions in all its forms matter for economic growth, political stability has the greatest impact.

Table *4.5* System GMM Estimations: Dependent Variable: Change in log GDP per capita income PPP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged GDP per capita	0.010 (0.011)	0.007 (0.007)	0.026** (0.012)	0.021* (0.011)	-0.001 (0.010)	0.038*** (0.012)	-0.006 (0.006)	-0.003 (0.005)	-0.011* (0.006)	-0.007 (0.006)	-0.000 (0.006)	-0.001 (0.005)
Trade-GDP	0.045*** (0.015)	0.022 (0.014)	0.015 (0.013)	0.037*** (0.012)	0.026* (0.014)	0.048*** (0.012)	0.073*** (0.006)	0.058*** (0.006)	0.062*** (0.006)	0.067*** (0.005)	0.060*** (0.007)	0.079*** (0.005)
Investment ratio	0.005 (0.007)	0.032*** (0.006)	0.015*** (0.006)	0.004 (0.005)	0.001 (0.011)	0.002 (0.005)	0.008*** (0.003)	0.024*** (0.004)	0.013*** (0.004)	0.012*** (0.004)	0.012*** (0.004)	0.014*** (0.003)
Population growth	0.043*** (0.006)	0.011* (0.006)	0.038*** (0.009)	0.044*** (0.010)	0.030*** (0.010)	0.050*** (0.007)	0.031*** (0.005)	0.018*** (0.005)	0.026*** (0.004)	0.033*** (0.005)	0.026*** (0.003)	0.038*** (0.004)
Human capital index	0.006 (0.008)	0.008 (0.009)	-0.003 (0.008)	0.003 (0.007)	0.007 (0.006)	0.008 (0.012)						
Rule of law	0.040***						0.030***					
	(0.015)						(0.005)					
Regulatory quality		-0.008						0.010				
		(0.013)						(0.009)				
Political Stability			0.016***						0.043***			
			(0.005)						(0.005)			
Government Effectiveness				0.025***						0.033***		
				(0.009)						(0.008)		
Voice and Accountability					0.054***						0.019***	
					(0.010)						(0.005)	
Control of corruption						0.010						0.035***
						(0.012)						(0.005)
Constant	-0.28** (0.112)	-0.24*** (0.063)	-0.31*** (0.078)	-0.33*** (0.098)	-0.081 (0.092)	-0.53*** (0.086)	-0.28*** (0.068)	-0.28*** (0.048)	-0.20*** (0.061)	-0.25*** (0.063)	-0.28*** (0.050)	-0.36*** (0.059)
Observations	421	421	421	421	421	421	627	627	627	627	627	627
No. of Countries	34	34	34	34	34	34	45	45	45	45	45	45
AR(2)	0.60	0.971	0.480	0.567	0.384	0.556	0.128	0.100	0.268	0.142	0.157	0.124
Hansen J statistic	0.997	0.999	0.995	0.994	0.992	0.996	0.992	0.989	0.975	0.982	0.986	0.985

*Note: All variables except measures of Institutions are in logs. Robust standard errors in parentheses. *** Significant at 1%, ** significant at 5% and * significant at 10%.*

CHAPTER FIVE

CONCLUDING REMARKS AND POLICY RECOMMENDATION

5.1 Concluding Remarks

This study sought out to determine the partial effect of trade and institution on economic growth in Sub-Saharan Africa (SSA). Due to potential endogeneity between trade and growth, as well as measures of institution and growth, we follow several studies by using an IV approach. However, as shown by our first stage regression results, widely used instruments of trade and institution in the literature are themselves correlated with both endogenous variables. This renders IV estimates uninformative about the true impact of institutions and trade on economic growth.

This study addresses the problem by using a system GMM estimator. Two features of system GMM makes it appealing for estimating our baseline mode. First, the estimator uses internally generated instruments to control for endogeneity. Also, it is more efficient and outperforms other class of estimators in estimating dynamic panel models (see Blundell & Bond, 1998; and Bond, Hoeffler &Temple, 2001).

The estimation results are overwhelmingly supportive of the positive impact of institutions and trade on economic growth in SSA. The findings are robust over different specifications. Interestingly, population growth has a positive impact on economic growth once we control for initial GDP, institutions, trade, investment ratio and human capital. This outcome is supportive of the findings by Kremer (1993), who proved empirically that high population growth rate is associated with technological advancement which in turn improves labor productivity, per capita income and overall standards of living. Furthermore, the study found no significant effect for measures of geography. Lastly, we reveal that all other measures of institutional

quality save regulatory quality are significant for economic growth in SSA. Of the measures of institutional quality, political stability and absence of violence/terrorism and control of corruption are the most influential followed by government effectiveness, rule of law and voice and accountability in that order.

Nevertheless, there are two important caveats to our findings. First, the measures of institution used in this study are based on perception measures rather than fact based verifiable measures. The conclusion from this study holds as far as people's perceptions reflect reality on the ground. Otherwise our findings might not be very informative about the true causal relationship between institutions and economic performance. Secondly, the nature of the measures of institution make it difficult to recommend a specific policy measure. For instance, rule of law index captures quality of contract enforcement, property rights, courts and the police. The index does not state the type of contract enforcement procedure, or property rights regime, or court structure that will enhance (perceptions of) the rule of law. Therefore, a country may know what to do to achieve growth but may not know exactly how to go about it.

Nevertheless, it is crucial for countries in SSA to understand that institutional quality is critical to the basic functioning of their economies. The type of policies to pursue however may differ from one country to another.

5.2 Policy Recommendation

Following from our findings above, it may be economically expedient to devote resources to building institutional structures first before anything else. As a matter of general recommendation, it will be essential for countries in SSA to pursue policies that promotes political stability, strengthens the fight against corruption, improves government effectiveness and promotes adherence to the rule of law. Indeed, it is very difficult to perceive how a country could encourage investment in human and physical capital in the absence of political stability

or property rights protection or general adherence to the rule of law. Likewise, endemic corruption and government ineffectiveness may render proven growth enhancing policies useless.

Nevertheless, it may be imprudent to entrust political leaders in SSA with the full responsibility of institutional reforms. This is because, political power in most countries in the region is in the hands of an elite few who may have exploited current institutional weaknesses to amass power and wealth. In this regard, development partners have a big role to play in ensuring compliance through foreign aid and loan conditionalities. This strategy might be very effective given that all countries in SSA are recipients of foreign aid.

Indeed, loan conditionalities have been used by both the IMF and the World Bank in implementing controversial structural adjustments programs in the region. Although the impact of the adjustment programs continues to be a heavily debated topic, the compliance strategy was largely successful. Moreover, unlike the SAPs the institutional reforms that these conditionalities seek to achieve resonates with the masses and may engender huge public support.

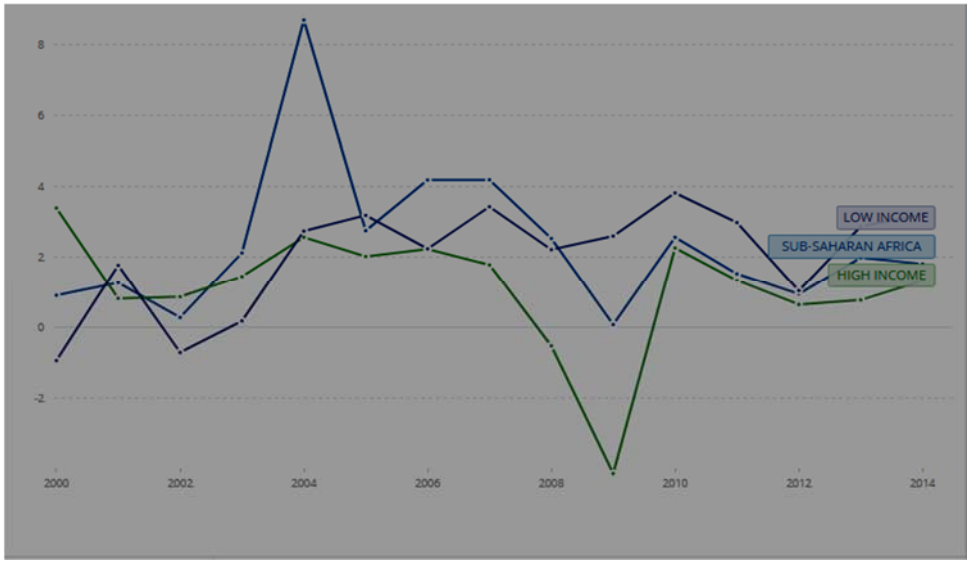
Promoting strong institutional structures in recipient country should also be in the interest of development partners. Transparency in the use of foreign aid will contribute to aid effectiveness and also accountability to donors themselves. Studies such as Alesina and Dollar (2000), Burnside and Dollar (2000) and Collier and Dollar (2002) demonstrate that the effectiveness of aid in promoting growth in recipient countries depends crucially on the quality of policy environment.

Furthermore, it should be emphasized that different countries may require different set of institutions at any point in time, so generic conditionalities might not work. Individual countries

should be engaged to determine which type of institutions are necessary given their level of development.

APPENDIX

Appendix I: Economic growth trends from 2000 to 2014



Source: World Bank – Worldwide Development Indicators

Appendix II: Simple correlation matrix of all variables

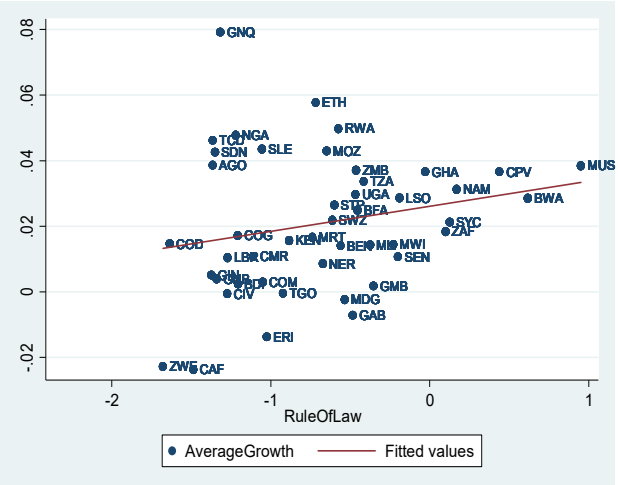
	Change in GDP per capita	*Trade-GDP ratio*	*Investment ratio*	*Population growth*	*Human capital index*	*Rule of law*	*Regulatory quality*	*Political Stability*	*Voice and account.*	*Corruption*	*Gov't Effect.*
Change in GDP per capita	1.000										
Trade-GDP ratio	0.128	1.000									
Investment ratio	0.230	0.370	1.000								
Population growth	0.074	-0.193	0.062	1.000							
Human capital index	0.073	0.012	0.076	0.199	1.000						
Rule of law	0.124	0.208	0.423	-0.401	-0.054	1.000					
Regulatory quality	0.120	0.092	0.364	-0.337	0.060	0.869	1.000				
Political Stability	0.084	0.396	0.346	-0.256	-0.025	0.785	0.638	1.000			
Voice and accountability	0.114	0.175	0.248	-0.344	-0.077	0.797	0.770	0.668	1.000		
Corruption	0.094	0.215	0.323	-0.466	-0.061	0.883	0.743	0.702	0.727	1.00	
Gov't Effectiveness	0.132	0.157	0.343	-0.454	-0.040	0.915	0.878	0.682	0.756	0.859	1.00

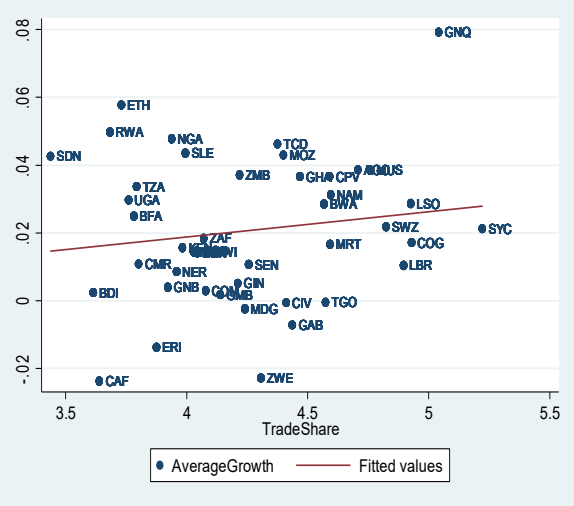
Appendix III: First-Stage results of IV-2SLS regression from Table *4.2*

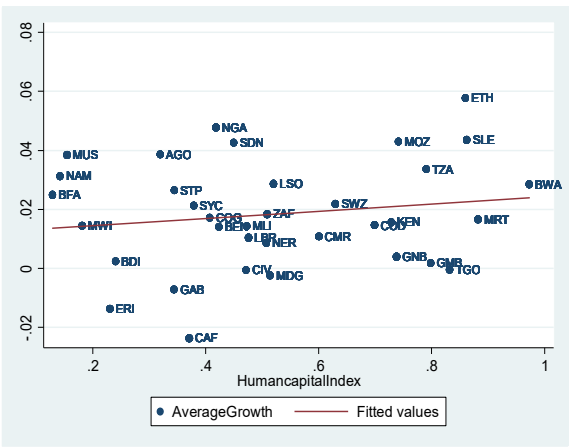
Dependent variable	*Rule of Law*	*Actual Trade*
Initial GDP per capita	0.193***	0.326***
	(0.0448)	(0.028)
Predicted Trade	0.026***	0.023***
	(0.008)	(0.004)
Settler Mortality	-0.118***	0.118****
	(0.028)	(0.18)
Constant	-1.658***	0.790***
	(0.422)	(0.274)
Adj. R -squared	0.218	0.367

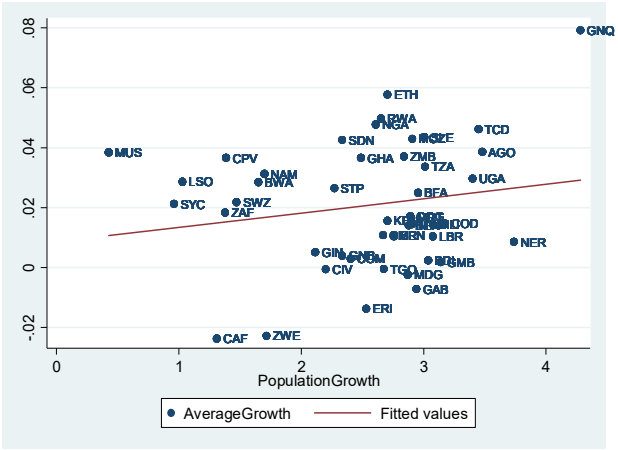
*Robust Standard errors in parenthesis. Significant at 1%***, 5%** and 10%**

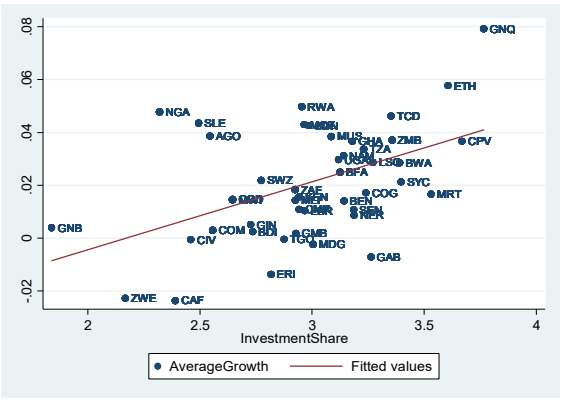
Appendix IV: Scatter diagram showing correlation between average growth rates and some explanatory variables

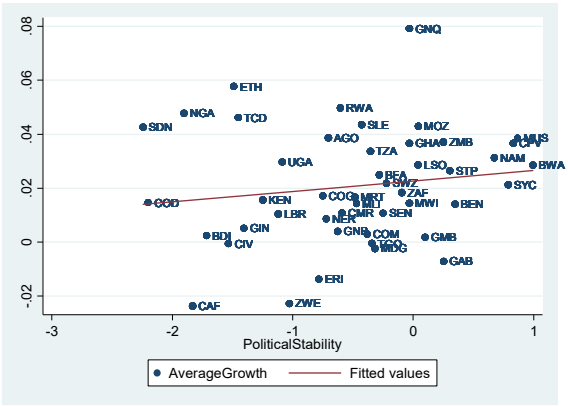


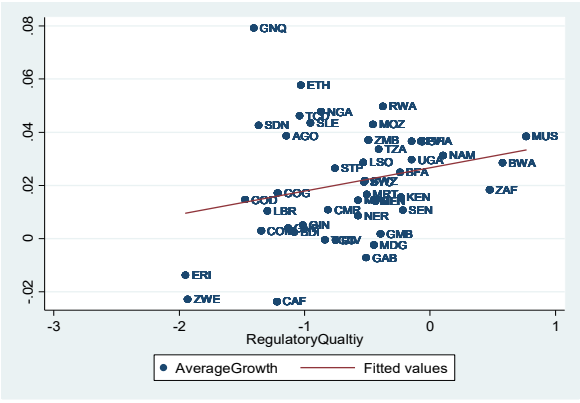



HumancapitalIndex
AverageGrowth
Fitted values

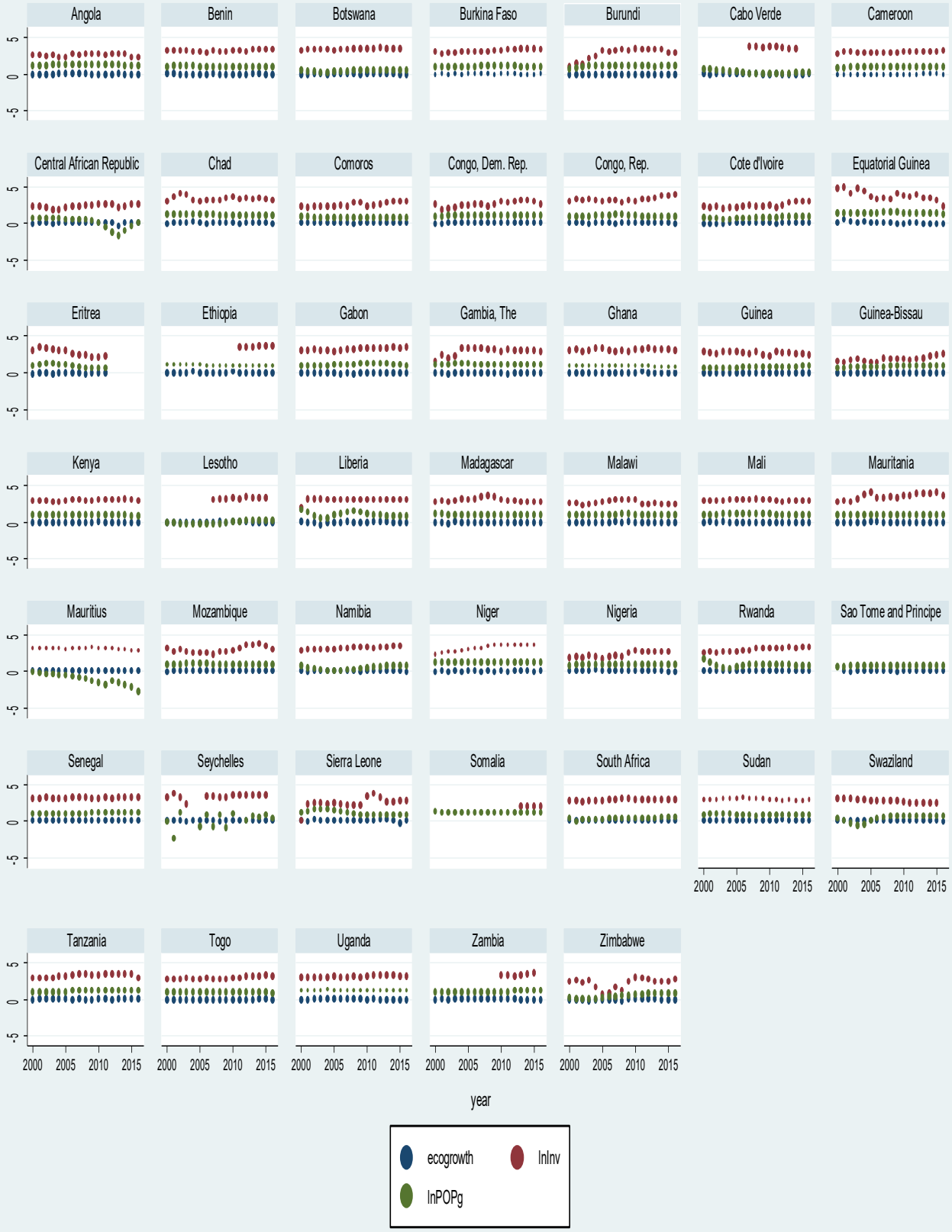

PopulationGrowth
AverageGrowth
Fitted values


InvestmentShare
AverageGrowth
Fitted values

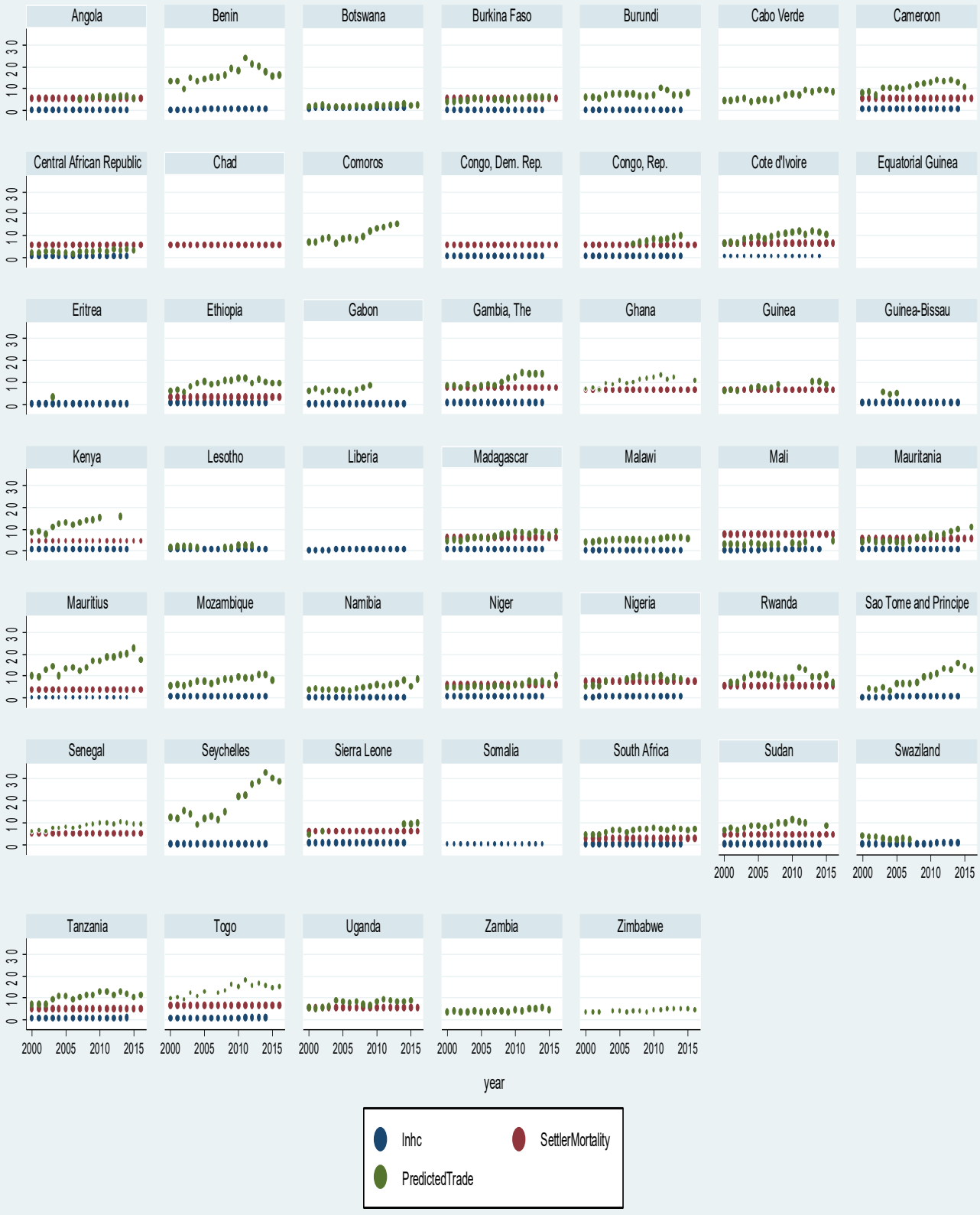

PoliticalStability
AverageGrowth
Fitted values


RegulatoryQualtiy
AverageGrowth
Fitted values

Appendix V: Graphs showing variable trends and availability by country (investment, population growth)



Appendix VI: Graphs showing variable trends and availability by country (human capital, fitted trade and settler mortality)



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