EFFECT OF DOMESTIC SAVINGS, FOREIGN AID AND DIRECT INTERNATIONAL INVESTMENTS ON GROSS CAPITAL FORMATION IN KENYA

BY

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DECLARATION

Declaration by the Candidate

I hereby declare that this thesis is my original work and has not been previously presented for examination in any other university.

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Sign …… Date……..

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DEDICATION

To the Most Wise God.

ABSTRACT

Gross capital formation average of 20.13 per cent of GDP over the sub-sample period 2006-2017 for Kenya is low by Sub-Saharan Africa's standards. It does not meet the target of at least 25 per cent of GDP that is necessary for sustainable growth. The situation has adversely affected the welfare of majority of Kenyans. Therefore, there is urgent need for enhancing gross capital formation in order alleviate people's suffering. However, policy intervention effort is hampered by the gaps in knowledge about domestic saving-multilateral aid-bilateral aid-foreign direct investment-diaspora remittance-gross capital formation link. The principal objective of this study was to assess the effect of domestic savings, foreign aid and direct international investments on gross capital formation in Kenya. Specifically, the study sought to: examine the effect of domestic saving on gross capital formation in Kenya; assess whether multilateral aid and bilateral aid differently affect gross capital formation in Kenya or not; investigate the effect of foreign direct investment on gross capital formation in Kenya; assess the effect of diaspora remittance on gross capital formation in Kenya. A correlational studies research design was adopted.The study was anchored by Solow's neoclassical growth model. Autoregressive distributed lag (ARDL) econometric model was specified for long-run effects since the dependent variable was integrated of order (1) while independent variables were either integrated of order (0) or (1) but not (2). Error correction mechanism (ECM) model was specified for short-run effects. Time series data was sourced from the World Bank over period 1974-2017 because of observed surges and downturns in the study's variables of interest. At 5 percent level of significance, ARDL estimation found domestic saving to be statistically insignificant. The elasticity for multilateral aid was negative (-1.2075) and significant in the short-run and long-run during current year. However, it becomes positive (0.8541) and significant in the long-run a year later. The elasticity for bilateral aid was found to be negative (-0.1005) and significant in the long-run after one year. FDI had a positive elasticity of 0.0617 in the short-run and long-run during the current year and a positive significant elasticity of 0.0460 a year later. The elasticity for diaspora remittance was positive (0.1429) and significant in the long-run after 1 lag. The study concluded that in the short-run, Kenya's capital formation depends on FDI. But in the long-run, it will rely on multilateral aid, FDI and diaspora remittance. It also concluded that bilateral aid reduces capital formation in Kenya over the long-run horizon. The results are consistent with evidence and passed all validity and reliability tests. Therefore, to achieve sustainable capital formation in the long-runand hence the SDG of creating productive employment and high economic growth in Kenya, the study prescribeda raft of policy measures attract more multilateral aid, FDI and diaspora remittance. Further, policies for enhancing the effectiveness of bilateral aid were proposed for consideration by the Government of Kenya.

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ABBREVIATIONS AND ACRONYMS

2SLS	Two Stage Least Squares
ADF	Augmented Dickey Fuller
AECI	Spanish Agency for International Cooperation
AfDB	Africa Development Bank
AIC	Akaike Information Criteria
ARCH	Autoregressive Conditional Heteroskedasticity
ARDL	Autoregressive Distributed Lag
BA	Bilateral Aid
BRIC	Brazil, Russia, India and China
CEC	Conditional Error Correction
CPI	Consumer Price Index
CSID	Convention on the Settlement of Investment Disputes
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum Squared
DAC	Development Assistance Committee
DCs	Developing countries
DEG	Germany Investment Corporation
DFID	Department of International Development
DFIs	Development Finance Institutions
EAC	East African Community
ECM	Error Correction Mechanism
EFF	Extended Fund Facility
EIB	European Investment Bank
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FE	Fixed Effect
FPE	Final Predictor Error
GDP	Gross Domestic Product
GDS	Gross Domestic Saving
GEE	Generalized Evaluation Estimator
GFCF	Gross Fixed Capital Formation
GFRID	Global Forum on Remittances, Investment and Development

GMM	Generalized Method of Moments
GNI	Gross National Income
GNS	Gross National Saving
G8	United States, United Kingdom, France, Italy, Russia, Canada, Germany and Japan
GoK	Government of Kenya
HQC	Hannan-Quinn Criterion
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IMF	International Monetary Fund
IRFs	Impulse Response Functions
JAICA	Japan International Cooperation Agency
JB	Jarque-Bera
JBIC	Japan Bank for International Cooperation
KJAS	Kenya Joint Assistance Strategy
KNBS	Kenya National Bureau of Statistics
LDCs	Less Developed Countries
LICs	Low Income Countries
LLMICs	Lower Middle Income Countries
LM	Lagrangian Multiplier
MA	Multilateral Aid
MDGs	Millennium Development Goals
MENA	Middle East and North Africa
MFIs	Multilateral Financial Institutions
MICs	Middle Income Countries
MIGA	Multilateral Investment Guarantee Agency
ML	Maximum Likelihood
NEM	New Economics of Migration
NICs	Newly Industrializing Countries
NNP	Net National Product
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development

OLS	Ordinary Least Squares
OPEC	Organization of Petroleum Exporting Countries
OPIC	Overseas Private Investment Corporation
PPP	Public-Private Partnerships
PRSP	Poverty Reduction Strategy Paper
PSS	Pesaran, Shin and Smith
RESET	Ramsey's regression Specification Error Test
SAL	Structural Adjustment Lending
SAPs	Structural Adjustment Programs
SBA	Standby Agreement
SBC	Schwartz-Bayesian Information Criteria
SDGs	Sustainable Development Goal
SIDA	Swedish International Development Agency
SSA	Sub-Saharan Africa
SUR	Seemingly Unrelated Regression
TFP	Total Factor Productivity
UMICs	Upper Middle Income Countries
UN	United Nations
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USSR	Union of Soviet Socialist Republics
UNCTAD	United Nations Conference on Trade and Development
VAR	Vector Auto-regression
VECM	Vector Error Correction Mechanism

OPERATIONAL DEFINATION OF TERMS

Bilateral aid: Was used in this study to refer to official development assistance in the form of concessional loans from other countries.

Direct International Investments: Was used in this study to refer to foreign private investment such as foreign direct investment and investment by diaspora remitters.

Diaspora Remittances: Was used to refer to transfers of money by migrants to relatives in home countries expressed in expenditure on investment.

Financing Gap: Was used to refer to the difference between capital formation requirement and domestic saving.

Foreign Aid: Was used in this study to refer to concessional loans to low- and middle-income countries by bilateral and multilateral communities.

Foreign Direct Investment: Was used in this study to refer to inward foreign direct investment.

Gross Capital Formation: Was used in this study refers to investment in fixed assets such as plant, machinery, and equipment; improvement on land; construction of railways and roads; building of hospitals, schools, offices, industrial and commercial buildings and private residential houses; plus changes in inventory.

Gross Domestic Savings: Was used to refer to the sum of fiscal balance, household saving and retained firm profits expressed in US$.

Multilateral aid: Was used to refer to official development assistance in the form of concessional loans from multilateral agencies of the United Nations such as IMF, International Bank for Reconstruction and Development (IBRD), International Development Association (IDA) and United Nations Development Programme (UNDP) or regional development banks such as Africa Development Bank (AfDB) and European Investment Bank (EIB).

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Low capital formation in developing countries and the search for its solution has been a dominant theme in academic and policy discussions since the inquiry into the sources of the wealth of nations by Smith (1776). Defined as the accumulation of production stock and inventories (Kuznets, 1955), capital formation is said to be the principal driver of growth. According to capital fundamentalists from the Classical Growth School (Smith, 1776; Malthus, 1836; Ricardo, 1817; Mill & Laughlin, 1848), Classical-Keynesian School (Harrod, 1939; Domar, 1946), Neoclassical Growth School (Solow-Swan, 1956) and New Endogenous Growth School (Lucas, 1988; Romer, 1990), capital formation imposes positive effect on gross domestic product (GDP) in the long run. Capital fundamentalists from The East Asian Miracle School (Krugman, 1994; Kim & Lau, 1994; Stiglitz, 1996) demonstrate that the surges in growth in China and Japan and the Newly Industrializing Countries (NICs) of East Asian Tiger economies of Singapore, Malaysia, South Korea, Hong Kong and Taiwan between 1960s and 1990s were the products of capital formation.

The Big-Push School holds that high capital formation is the necessary condition for breaking the poverty trap (Rosenstein-Rodan, 1943; Nurkse, 1953; Sachs, 2005; Collier, 2007; Sachs, 2008), economic take-off to self-sustainable development (Lewis, 1954; Rostow, 1960) and large-scale industrialization (Rosenstein-Rodan, 1961). These views resonate with the March 2005 Blair Commission for Africa report (Commission for Africa, 2005), the 2005 World Bank report (World Bank, 2005) and UN Millennium Project (2005) which argued that Africa needs a big-push in public capital formation in order for her to realize growth that breaks the poverty trap. The United Nations (2006) concurs with the big-push hypothesis, affirming that structural transformation towards high productivity in developing countries will not be possible without high capital formation.

In the light of the foregoing caveats, one can infer that capital formation enhancing strategies promote growth that eliminates poverty. It implies that any developing country that aspires to achieve the United Nation's Sustainable Development Goals (SDGs) of productive employment and economic growth and ending poverty in all forms by 2030 should prioritize enhancing capital formation process on her national development agenda.

Table 1.1: Evolution of Kenya's gross capital formation (% of GDP) within the context of Sub-Saharan Africa, 2006-2017.

	KEN	RWA	CMR	UGA	BFA	COR	GAB	TZA	BWA	NER
2006	18.63	16.07	20.95	21.13	20.71	21.63	24.05	26.04	25.90	23.58
2007	20.46	18.17	20.84	22.08	22.25	21.81	24.88	32.85	30.79	22.90
2008	19.61	23.25	24.11	22.98	25.41	18.30	25.09	32.08	36.19	32.24
2009	19.33	22.63	23.66	25.00	24.87	22.51	27.98	25.13	38.93	34.89
2010	20.84	22.25	23.21	25.56	26.93	20.52	29.70	27.30	41.41	39.95
2011	21.70	22.52	24.14	27.46	27.97	25.27	26.64	33.24	38.58	38.39
2012	21.48	24.80	22.77	27.30	32.45	26.00	26.97	28.50	38.84	36.18
2013	20.11	25.44	23.05	28.35	32.50	30.94	29.18	30.32	29.41	36.15
2014	22.43	24.38	24.06	27.28	25.85	41.3	35.14	30.13	27.86	37.43
2015	21.47	25.82	22.40	24.62	24.33	40.87	29.23	27.20	32.11	38.71
2016	17.29	25.33	22.61	25.46	20.78	27.76	26.98	25.05	28.57	31.90
2017	18.22	22.91	22.93	23.68	22.79	22.56	21.47	26.14	28.10	33.69
AVER	**20.13**	**22.80**	**22.89**	**25.07**	**25.57**	**26.62**	**27.28**	**28.66**	**33.06**	**33.83**

Source: World Development Indicators, January 2019

Key: BFA: Burkina Faso, BWA: Botswana, CMR: Cameroon, COR: Congo Republic, GAB: Gabon, KEN: Kenya, NER: Niger, RWA: Rwanda, TZA: Tanzania, UGA: Uganda

Trends in Table 1.1 shows that Kenya (20.13) substantially lags behind SSA low income countries such as Uganda (25.07), Burkina Faso (25.57), Tanzania (28.66) and Niger (33.83) in the region over the sub-sample period. It also compares poorly against fellow lower middle income country (LLMICs) such as Cameroon (22.89) and Congo Republic (26.62). Kenya's rate of capital formation falls short of the required 25 per cent of GDPfor developing countries to grow at self-sustainable rate (Babatunde, 2012). Kenya's average rate of capital formation of 20.13 per cent of GDP falls short of the government's investment target of 32 per cent over the period 2014-2030 required for the country to achieve the objectives of Kenya Vision 2030 long-term plan (Republic of Kenya, 2007). Inadequate capital formation implies that the rest of the other factors of production remain idle (Paun, C. V., Radu C. M., Viladimir M. T., & Dan, C. D., 2019).With Kenya's GDP averaging 5.6 per cent (less than 10 per cent target) over Vision 2030 first medium term plan period (2009-2015) (KNBS, 2014;

KNBS, 2015; KNBS, 2016) unemployment rate firmly entrenched above the 39 per cent line the highest in EAC (World Bank, 2016a; World Bank, 2016b) and the grim reality that Kenya's economy is among the poorest 25 per cent globally with more than 65 per cent of her population living on less than $ 2 a day (World Bank, 2016a; World Bank, 2016b), the need for investigating the drivers of capital formation in Kenya is real.

1.1.1 Domestic Saving and Capital Formation

During the period between 18th century and the first half of the 20th century, the search for the answer to the problem of low capital formation in developing countries revolved around mobilization of domestic savings. The principal architects of the inward-looking strategy were the neoclassical growth economists. They assumed that at steady state, domestic saving is equal to domestic capital formation, implying that a rise in capital formation needs is compensated for by increasing domestic saving. Motivated by the critical role of domestic saving in accelerating capital formation, The UN Millennium Project (2005) as cited by McCord *et al*, (2005) proposed that Tanzania, Uganda and Ghana raise $ 40 per capita domestically to finance MDGs-based capital formation. The Government of Kenya (GoK) on its part proposed accelerating gross national saving (GNS) to 26 per cent of GDP by 2012/13 and 29 per cent by 2030 on the basis of the rate of 15.6 per cent of GDP registered in 2006/07(Republic of Kenya, 2007).

But domestic saving in developing countries has not been large enough to finance the required capital formation and to keep up with burgeoning population growth in these countries (Elbadawi & Mwega, 2000; Sachs *et al*, 2004; Sachs, 2008). The situation has motivated economists' interest in wanting to understand its determinants and implications for macroeconomic variables. But majority of the studies that investigated the effect of domestic saving on macroeconomic variables limited themselves to growth-saving nexus (Aghion *et al*, 2009; Ciftcioglu & Begovic, 2010; Misztal, 2011; Seng, 2014). Those that attempted to investigate the effect of domestic saving on capital formation either restricted themselves to a bivariate framework (Feldstein & Horioka, 1980; Bordoloi, 2008) while others controlled for a few capital financing variables (Uremadu, 2006; Mbaluku, 2011; Lucky & Uzah, 2016). The caveats imply that the effect of domestic saving on capital formation is not clear. In bridging the knowledge gap, this study resonated with the work of Mbaluku (2011) in Kenya. That is, it retained gross national saving (proxied by gross domestic saving rate) and FDI. However, it distinguished itself from the work of Mbaluku (2011) in four important respects.

Firstly, it introduced the second disaggregate of direct investments done by the diaspora community (proxied by diaspora remittance). Secondly, it introduced foreign aid disaggregates of multilateral aid and bilateral aid which were not controlled by Mbaluku (2011). Thirdly, it updated the dataset in order to reflect the recent episodes of surges and downturns in domestic saving in Kenya. Lastly, within a multivariate framework, this study employed the dynamic ARDL approach which takes into account the current and lagged effects of domestic saving on gross capital formation.

1.1.2 Multilateral Aid, Bilateral Aid and Capital Formation

Inspired by lessons from the success story of the Marshall Plan (America's European recovery Plan after the Second World War), calls for doubling official development assistance (ODA) to developing countries dominated the United Nations (UN) declarations on development, world/regional economic summits and think-tank platforms for academic and policy discussions. The March 2002 Monterrey Consensus of the International Conference on Financing of Development appealed for increased ODA to finance capital formation in low-income countries (United Nations, 2003). Specifically, it called on the Organization for Economic Cooperation and Development (OECD) countries to raise their ODA to 0.7 per cent of their gross national income (Sachs, 2008). The March 2005 Blair Commission for Africa report (Commission for Africa, 2005) and the 2005 World Bank report (World Bank, 2005) called for scaling up ODA in order to end poverty in Africa. Heads of the governments of the United States (US) and United Kingdom (UK) called for doubling of aid to Africa with development economists such as Sachs *et al* (2004) and UN Millennium Project (2005) arguing that Africa needs a big-push in public capital formation in order for her to realize growth that breaks the poverty trap. The July 2015 Third International Conference on Financing for Development held in Addis Ababa called for scaling up ODA/GNI to LDCs to 0.15 over the period 2016 to 2030 in order to finance capital formation in new and emerging areas (United Nations, 2015)

The above initiatives started to produce fruits when in July, 2005 at Gleneagles the group of G8 (United States, United Kingdom, France, Italy, Russia, Canada, Germany and Japan) accepted to double aid to Africa from $ 25 billion a year to $ 50 billion a year by 2010 to finance the new big-push and clear previous years big-push concessional loans (Easterly, 2005; Collier, 2007). This was followed by the BRICs (Brazil, Russia, India and China) increasing development funding to Low-Income Countries (LICs). The United States (US)

increased gross bilateral development aid through USAID and the State Department to SSA from $1.94 billion in fiscal year 2002 to $7.08 billion in fiscal year 2012 representing 265 percentage increase with Kenya being among the top five beneficiaries from the region. ODA from Development Assistance Committee (DAC) to developing countries (DCs) rose to US$137.2 billion in 2014; 31 per cent of which was distributed multilaterally while 69 per cent distributed bilaterally. Total net ODA from DAC member countries increased by 10.7 per cent to reach US$144.96 billion in 2016 (OECD, 2016). The total net ODA growth was attributed among others to increases in ODA by Germany (US$ 6.6 billion), USA (US$ 3 billion), Spain (US$ 2.9 billion), UK (US$ 1.4 billion) and Italy (US $ 1 billion). In terms of regional distribution, SSA remained the largest total net ODA recipient in 2016 after receiving US$ 44159 billion in 2016 up from US$ 43967 billion in 2015 representing 0.4 per cent increase (OECD, 2016). Ethiopia topped the list of top 10 largest recipients of total net ODA with US$ 4113 billion followed by Afghanistan (US$ 3950 billion), Turkey (US$ 3612 billion), Pakistan (US$ 2961 billion), Syria (US$ 2896 billion), Viet Nam (US$ 2773 billion), India (US$ 2582 billion), Nigeria (US$ 2548 billion), Bangladesh (US$ 2429 billion) and Tanzania (US$ 2330 billion). But total net ODA to Kenya dropped by 11 per cent in 2016 pushing Kenya from the list of top ten recipients (OECD, 2016).

But contrary to the expectations of the Monterrey Consensus, the Paris Declaration on Aid Effectiveness and the Accra and Addis Ababa Agenda for Action, capital formation and growth within the Tropics (Sub-Saharan Africa, Latin America, the Middle East, South Asia and East Asia) have remained low despite the region receiving huge junks of aid. The situation has made it fashionable for aid critics to argue that foreign aid is not effective in achieving development objectives (Easterly, 2001; Easterly, 2002; Easterly, 2003; Easterly, Levine, & Roodman, 2004; Easterly, 2006; McGillivray, Feeny, Hermes, & Lensink, 2005; World Vision, 2006; Easterly & Pfutze, 2008; Moyo, 2009; Riddell, 2014). But empirical studies that address the question of whether the effectiveness of foreign aid in achieving intended objectives is contingent on donor practice of allocating aid via bilateral or multilateral channels have focused on growth outcome (Wako, 2011; Jeffrey, 2015; Biscaye, Reynolds & Anderson, 2017). Studies that considered capital formation variable focused on the effect of bilateral aid and multilateral on private international investment inflow to developing countries (Rodrick, 1995; Ratha, 2001; Harms & Lutz, 2006; Bandyopadhyay, Sandler & Younas, 2013; Quazi *et al*, 2019). Such a specification best addresses the question of whether there is 'vanguard effect' in developing countries or not. That is, whether bilateral

and multilateral donors are the ones who carry out foreign private investment. It does not provide information about the effect of bilateral and multilateral aids on capital formation. Though Ozturk (2011) tries to focus on gross capital formation and Uneze (2012) on investment, the researchers use cross-country data which mask country-specific differences. Like Ozturk (2011) and Uneze (2012), Massa *et al*, (2016) tried to address the question of the effect of bilateral aid and multilateral aid on capital formation using country-specific data. However, they limited themselves to gross fixed capital formation in Uganda and private gross fixed capital formation in Ghana. This study noted that the gross fixed capital formation and private gross fixed capital formation variables scope failed to capture inventories component. Thus whether bilateral aid and multilateral aid differently affect gross capital formation in Kenya or not is still not clear. This study followed the footsteps of Massa *et al*, (2016) by adopting the country-specific approach. However, it distinguished itself by focusing on gross capital formation which takes into account changes in the level of inventories.

1.1.3 Foreign Direct Investment and Capital Formation

Despite increased ODA, low capital formation and depressed economic growth in developing countries (DCs) has remained an issue of policy concern in the 21th century. Thus, the search for the solution to the problem of low capital formation in developing countries has extended to direct international private investment frontier. The initiative witnessed the March 2002 UN International Conference on Financing for Development held in Monterrey appealing for increased FDI to finance capital formation in developing (middle-income) countries. At the same time, the 2005 Paris Declaration on Aid Effectiveness and 2008 Accra Agenda for Africa (OECD, 2008) and the 2011 Busan Partnership Agreement for Effective Development Cooperation (OECD, 2012) called for more accountability in aid utilization. But economists such as Moyo (2009) appealed to African governments to substitute aid with FDI. They blame aid's inability to enhance capital formation to aid fungibility and corruption Moyo, 2009) and conditionalities that tailor aid to parallel donors' interest (Rena, 2008). They support FDI, arguing that it fills the saving gap (Smith, 1997) and technology and skill gaps (Borensztein *et al*, 1998; Quazi, 2007) in developing countries.

In order to attract more FDI inflows, many African countries adopted an open policy, and became party to Multilateral Investment Guarantee Agency (MIGA) and the Convention on

the Settlement of Investment Disputes (CSID). The mission of MIGA, a member of the World Bank Group is to promote foreign direct investment in developing countries in order to enhance economic growth and hence poverty reduction. Coupled with the above initiatives, FDI inflows topped foreign capital inflows to developing countries in 2012 (World Bank, 2014) with US$ 684 billion, out of which US$ 42.7 went to Africa (representing 2.3 of Africa's GDP), US$ 217 billion went to Latin America (representing 3.9 per cent of Latin America's GDP) and US$ 423 billion went to Asia (representing 2.6 per cent of Asian GDP) (UNCTAD, 2015). In 2012, 22 countries in SSA excluding South Africa had FDI exceeding ODA compared to only two countries (Nigeria and Liberia) that had FDI exceed ODA in 1990 (Amadou & Rakotondrazaka, 2015) implying that SSA's endemic dependency on foreign aid was weaning. Liberia was the largest FDI recipient in SSA over 2002-2012 period with Kenya taking the 35th position. Tanzania led the EAC FDI uptake list followed by Uganda, Rwanda, Kenya and Burundi (Amadou *et al*, 2015). In 2014, FDI inflow to DCs reached the all-time high of US$ 681 (UNCTAD, 2015). However, recent years have witnessed some decline in FDI to developing countries. For instance, FDI flows to developing countries declined by 14 per cent to settle at $646 billion in 2016 on the basis of 2015 figures; FDI flows to developing Asia dropped by 15 per cent to $443 billion in 2016; FDI flows to Africa reduced to $59 billion in 2016, a 3 per cent decline on the basis of 2015 figures; FDI flows to Latin America and the Caribbean declined by 14 per cent to $142 billion in 2016 due to economic depression, poor prices and export compression; FDI flows to the LDCs shrank by 13 per cent to $38 billion in 2016 (UNCTAD, 2017). But despite the decline, FDI remained the largest source of external finance for developing countries (UNCTAD, 2017).

The dynamics in FDI flow to developing countries has motivated researchers' interest in studying its effect on macroeconomic variables of destination countries. However, literature shows that most studies have focused on the effect of FDI on economic growth. The few studies that assess the effect of FDI on capital formation have focused on transition economies and use cross-country data which mask country-specific details (Krkoska, 2001; Miguel, 2006). Country-specific studies from SSA countries focused on Nigeria (Uremadu, 2006; Akujuobi, 2008; Orji & Mba, 2010; Ugwuegbe, Modebe & Onyeanu, 2014). But findings based on Nigerian experience cannot be generalized for Kenya given the difference in natural resource endowment between the two countries. Though Langat (2009) and Mbaluku (2011) try to fill the country-specific gap, their proxy of capital formation using

fixed assets stock implies that the effect of FDI on gross capital accumulation in Kenya is not clear. Therefore the policy question of what is the effect of low FDI inflow on gross capital formation in Kenya begs the answer. Though this study is consistent with the works of Langat (2009) and Mbaluku (2011) in the search for the answer to the policy question, it distinguishes itself by considering gross capital formation which captures both fixed capital and inventories.

1.1.4 Diaspora Remittance and Capital Formation

Critics of foreign direct investment (FDI) from the new economics of labour migration opine that most developing countries are unable to offer incentives for it; and where incentives exist, FDI inflow has the propensity of overheating the recipient economies, making them susceptible to financial crises and occasionally leading to unexpected reversals (Lucas 1993; Mckinnon & Huw 1997; Bhattacharya, Montiel, & Sharma, 1996; Shibuya, 2001). Orozco (2004) and a legion of supporters of diaspora remittance argue that diaspora remittance is stable, redistributive and countercyclical. Like FDI, investment-motivated remittances are usually spent on capital formation in the receiving country. But unlike FDIs, diaspora investors are always ready to take political and economic risks in order to invest back at home (Gillespie, Riddle, Sayre, & Sturges; 1999). Thus, unlike FDI which tends to be procyclical in nature, diaspora remittance is stable during global financial crisis (Amadou & Rakotondrazaka, 2015).

The stable behavior of diaspora remittance has led to mounting of several international fora in order to showcase the role of diaspora remittance in the realization of the United Nation's SDGs and the Addis Ababa's Action Agenda. This goal was captured by the sub-themes for the July 2009 International Conference on Diaspora and Development in Washington DC were: diaspora's contributions to development through trade, investment, skills and technology transfer and institutional capacity building; and policies that enhance the diaspora's role in their home country's development. Similarly, one of the objectives of The May 2018 Global Forum on Remittances, Investment and Development (GFRID) in Kuala Lumpur was to highlight the contribution of diaspora remittances and diaspora investment in Asia-Pacific to achieve sustainable development goals (IFAD, 2019). In recognition of the role of diaspora remittances in development, the United Nations made reducing the cost of diaspora remittance one of the SDGs specific objectives. The stakeholders' initiatives coupled with the sharp decline in FDI due the recession in high income countries led to a

boom in diaspora remittance. By 2002, diaspora remittances hit US$ 149.4 billion target with Israel (US$ 583), Tonga (US$ 563), Barbados US$ 512), Jamaica (US$ 510) and Jordan (US$ 431) leading the developing countries list of the top five recipients of remittance per capita (SOPEMI, 2006). According to World Bank (2010), by 2007 diaspora remittances through formal channels stood at $251 billion, which translates to more than twice official development assistance ($104 billion), more than a half of foreign direct investment ($460 billion) and nearly 46 per cent of portfolio investment. The performance positioned diaspora remittances as the third largest foreign source of financing for developing countries, with private debt plus portfolio equity ($543 billion) and foreign direct investment ($460 billion) taking position one and two respectively. The same report demonstrates that India ($27 billion), China ($26 billion), Mexico ($25 billion) and Philippines ($17 billion) were principal receiving countries. In 2010, diaspora remittances excluding those transferred through informal channels stood at US$ 334 billion (World Bank, 2010). The amount of diaspora remittance to Africa rose to $30 billion in 2012 up from $20 billion in 2005 with Nigeria being the largest recipient between 1990 and 2012 in terms of volume (Amadou et al, 2015). As a percentage of GDP, the volume of diaspora remittance to SSA was 3 per cent in 2012, with Lesotho taking the lead with 41 per cent and Kenya in position 14 out 38 SSA countries and second to Uganda in EAC (Amadou et al, 2015). A report by IFAD (2019) indicated that diaspora remittance were three times more than ODA with 25 per cent going towards saving and investment and the rest being devoted to consumption needs of the relatives back at home. The report further shows that in 2017, diaspora remittance contributed 9 per cent of the world's GDP (IFAD, 2019). In Kenya, the volume of diaspora remittance increased by 25 per cent to post a record $2.5 billion in 2018. The amount represents 3.7 per cent of GDP, making diaspora remittances the largest foreign exchange earner in Kenya (KNBS, 2018).

But despite the boom in diaspora remittances to developing countries, most studies have focused on understanding the causes of migration rather than the macroeconomic effect of the diaspora remittance in the countries of origin. The few studies that attempted to study the macroeconomic effect have focused on growth-diaspora remittance nexus. Though Adams (1998), Osili (2004), Haas (2007) and Cuecuecha (2013) tried to investigate capital formation-diaspora remittance link, they limited themselves to household-level data while Woodruff (2007) focused on firm-level data. Findings based on household and firm level data are have limited relevance guiding macroeconomic policy. Though Muiruri (2015) makes a

distinguished contribution by employing aggregate-level data, his proxy for capital formation has a narrow scope. Thus the question of whether diaspora remittance affects gross capital formation in Kenya or not is yet to be settled. Therefore, this study departed from Muiruri's work by considering gross capital formation proxy which is broad in scope. It further distinguished itself from the work of Muiruri (2015) by specifying a dynamic model instead of a static model in order to capture lagged effects of diaspora remittance on capital formation

1.2 Statement of the Problem

Kenya's average rate of gross capital formation of 20.13 per cent of GDP over the sub-sample period of 2006-2017 is low. The rate falls short of at least 25 per cent threshold necessary for developing countries to grow at self-sustainable rates. The attendant effects of low capital formation have entrenched unemployment rate above 39 per cent line and consigned more than 65 per cent of the country's population to living on less than $ 2 a day. The statistics suggest the need for an urgent policy intervention aimed at jump-starting capital formation process. But whether the government should respond by deploying policies that favour the mobilization of domestic saving, or appeal for bilateral/multilateral aid or provide incentives for more FDI inflow or engage the diaspora community is not clear.This is because previous studies on the effect of domestic saving on capital formation assumed a closed economy scenario. Therefore how domestic savings affect capital formation in the presence of foreign aid such as multilateral aid and bilateral aid and direct international investment by such as FDI and diaspora remittance (under open economy assumption) is a question that begs the answer.

Furthermore, though most of the studies that analyzed the macroeconomic effect of bilateral aid and multilateral aid are quite recent, they focused on private international investment inflow (proxied by FDI) to developing countries. Interestingly, such studies best address the question of whether multilateral and bilateral agencies are the ones that conduct foreign direct investment at the same time or not. However, studies that investigated the effect of multilateral aid and bilateral aid on capital formation (albeit few) used cross-country data which mask country-specific information. Thus, whether the effect of foreign aid on capital formation is contingent on aid being delivered via multilateral channel or bilateral channel remains unresolved.

Concerning the effect of foreign direct investment on capital formation, literature shows mixed results. Moreover, literature indicates that previous studies focused on transition economies. Yet inference cannot be drawn from transition economies for developing countries due to structural differences. Hence, the question of whether FDI enhances capital formation in Kenya or not remains unsettled.

Additionally, evidence on gross capital formation-diaspora nexus is scanty and focuses on cross-sectional data and static analysis. As such, the question of whether results for dynamic specifications at aggregate level over time are robust is unresolved.

The foregoing gaps in knowledge are major impediments to policy intervention effort aimed at stimulating capital formation in Kenya. And given recent dynamics in domestic and international capital landscape, the purpose of this study therefore was to investigate the effect of domestic savings, multilateral aid, bilateral aid, foreign direct investment and diaspora remittance on capital formation in Kenya with a view of finding empirical answers to the unresolved policy questions.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of this study was to assess the effect of domestic savings, foreign aid and direct international investments on gross capital formation in Kenya.

1.3.2 Specific Objectives

Specific objectives were to:

i. Examine the effect of gross domestic saving on gross capital formation in Kenya.
ii. Assess whether multilateral aid and bilateral aid differently affect gross capital formation in Kenya or not.
iii. Investigate the effect of foreign direct investment on gross capital formation in Kenya.
iv. Assess the effect of diaspora remittance on gross capital formation in Kenya.

1.4 Research Hypotheses

i. $H_{01}: \beta_1 = 0$: Gross domestic saving does not affect gross capital formation in Kenya.

ii. $H_{02}: \beta_2 = 0$: Multilateral aid and bilateral aid do not differently affect gross capital formation in Kenya.

iii. $H_{03}: \beta_3 = 0$: Foreign direct investment does not affect gross capital formation in Kenya.

iv. $H_{04}: \beta_4 = 0$: Diaspora remittance does not affect gross capital formation in Kenya.

1.5 Scope of the Study

The study limited itself to the period 1974 to 2017 because the period represents a horizon over which Kenya experienced depressed FDI inflow and sharp downturns in gross domestic savings and bilateral aid occasioned by internal and external shocks. This period also witnessed a boom in diaspora remittance and a steady surge in multilateral aid flow. The study was interested in establishing the effect of the dynamics on gross capital formation in Kenya.

1.6 Theoretical Framework

The neoclassical growth model (Solow, 1956) was used to underpin this study. The preference of Solow's model over others was motivated by its specification that domestic saving is the source of capital formation. This model has been approved by Romer (1990), Barro (1991), Mankiv (1995) and Sachs, *et al* (2004) making it a dictum for underpinning capital formation studies in the 21st century. According to Solow's model, physical capital formation evolves according to the following equation:

$$\dot{k} = \frac{\partial \dot{K}}{\partial t} = Asf(k_t) - (\mathrm{n} + \delta)k_t \qquad (1.1)$$

Where $\dot{k}$ refers to capital deepening; k_t is capital stock per capita at time t; A refers to exogenously determined technology; n refers to the growth rate of population; s refers to the saving rate; δ refers to the rate of depreciation of reproducible capital; $sf(k_t)$refers to saving rate as an exogenous function of capital stock per capita at time t that is necessary to keep capital-labour ratio constant (steady-state); $(\mathrm{n} + \delta)k_t$ refers to effective depreciation per capita. It thus follows from equation 1.1 that capital formation rises when part of household income or corporate profit or public enterprise surplus is saved or taxed to provide public investment. It however declines as a result of depreciation. Overall, capital stock increases when saving exceeds depreciation. Equation 1.1 also indicates that net capital stock (saving

less depreciation) should grow fast enough to keep up with population growth in order for per capita income to increase. It implies that high population growth and depreciation of reproducible capital retard capital formation while higher rates of saving spur it. The inclusion of technology in the capital formation model was based on Solow's conviction that in the long run, it is not the investment in the machinery that determines capital formation but technological advancement.

Model 1.1 excludes foreign capital, suggesting that it assumes a closed economy. It implies that other variables such as multilateral aid, bilateral aid, foreign direct investment and diaspora remittance can additively enter the model under open economy assumption.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews mainstream theories of capital formation such as the classical theory, Classical-Keynesian theory, new endogenous theory, the two-gap model, the big-push theory, globalization theory and the new economics of migration. This chapter also reviews empirical evidence related to the study's hypotheses.

2.2 Theoretical Literature Review

2.2.1 Capital Formation and Saving in the Classical Theory

According to Smith (1776), capital formation is a function of domestic saving. The author observes that saving is driven by 'parsimony' or frugality behaviour. Smith (1776) in 'An inquiry into the nature and causes of the wealth of nations' considers capital formation as critical in increasing the society's wealth. The author opines that in the event that capital formation needs exceed domestic saving, trade (exports) should be increased in order to generate more revenue and allow for more savings. This study acknowledges Smith's pioneering work on the role of savings in capital accumulation. His emphasis on voluntary saving suggests the author's acknowledgement of the role of household saving in capital formation. The study applauds the author for candidly acknowledging that saving may not meet capital formation needs in some developing countries. However, Smiths' theory has limited relevance for application to capital formation in the modern economy because of his assumption that saving should be voluntary. This is because voluntary saving in developing countries is limited by low income. Moreover, his assumption that trade profits directly finance public capital formation requirements in social sectors such as education, health and development of marginalized areas is not realistic. In addition, developing countries are price takers in the export market whose prices are quite volatile. The unfavourable terms of trade also militate against exports as an option for enhancing capital formation in developing countries.

Ricardo (1817) identifies economic surplus as the source of saving and saving as the driver of capital formation. According to the author, economic surplus arise because labour, natural resources and fixed capital are able to produce more than what is required to maintain the labour force. In his view, it is the capitalist class who save part of their income or profit for capital formation. He holds that labourers and landlords use their entire income on

consumption, implying that they do not save for investment and capital accumulation. This study acknowledges Ricardo's view that saving is critical in capital formation and that profit is the chief driver of saving. However, this study does not agree with Ricardo's suggestion that labourers and landlords spend their entire income on consumption. This is because some labourers in developing countries earn exceedingly above their consumption expenditure budget lines. Moreover, real estates are some of the most lucrative investments in developing countries with high profit margins. Thus, Ricardo's theory has limited scope for application in developing countries.

2.2.2 Capital Formation and Domestic Saving in Classical-Keynesian Theory

The Classical-Keynesian school of thought associated by Harrod (1939) and Domar (1946) popularly known as the financing gap model argues that capital formation in less developed countries is constraint by the shortage of domestic saving. It implies that an increase in domestic saving would lead to a rise in capital formation. The Harrod-Domar model assumes a closed economy (implying that there is no foreign capital inflow) and no government sector (which ignores the role of government savings). These assumptions are not tenable in the modern economy. Thus, its application has very limited relevance for resource-scarce countries like Kenya that heavily rely on foreign aid for financing their capital formation.

2.2.3Capital Formation and Domestic Saving in the New Endogenous Theory

The new endogenous growth theory extends the neo-classical model by emphasizing that capital formation is not only constraint by the physical resource gap but also by knowledge (human resource) gap in developing countries. According to the new endogenous growth model (Lucas, 1988; Romer, 1990) physical and human capital accumulation grow according to the following laws of motion:

$$\dot{f_t} = s_f f(k_t) - (\eta + \rho + \delta) f_t \qquad (2.1)$$

$$\dot{h_t} = s_h f(k_t) - (\eta + \rho + \delta) h_t \qquad (2.2)$$

Where f=F/L and h=H/L are quantities per effective unit of labour; s_f represents the fraction of income that is saved and invested in physical capital formation and s_h is the fraction of income that is saved and invested in human capital formation; δ is the depreciation rate of physical and human capital. This study acknowledges the endogenous growth economists' improvement on the neoclassical growth model especially the introduction of human capital formation component. It however disagrees with the new endogenous growth theorists'

assumption that both physical and human capital depreciate at the same rate. This study notes that contrary to the new endogenous assumption, human capital appreciates with time due experience. Moreover, the models' assumption that growth is not dependent on external factors implies that foreign aid and direct investments are not important for physical and human capital formation. Thus, this assumption cannot hold for most developing countries such as Kenya which rely on foreign aids and direct international investments to finance physical and human capital formation. Thus, the relevance of the new endogenous growth theory for application to capital formation studies in developing countries is subject to the relaxation of these assumptions.

2.2.4 Capital Formation and Foreign Aid in the Two-Gap Model

Chenery and Strout (1966) extended the one-gap model by Harrod (1939) and Domar (1946) by introducing the foreign exchange gap. Chenery et al (1966) were of the view that growth in most developing countries is constraint either by shortage of domestic savings or inadequate foreign exchange to import needed capital goods to finance the desired level of capital formation. Thus, foreign aid is used to finance the saving gap or the foreign exchange gap depending on which one is binding. However, the two-gap model which continues to underpin the Revised Minimum Standard Model (RMSM) and Financial Programming Model (FPM), the World Bank and IMF aid models respectively has failed empirical tests such as one conducted by Easterly (2001), yet no other model has been developed to replace it.

2.2.5 Capital Formation and Foreign Aid in the Big-Push Theory

2.2.5.1 Capital Formation and Foreign Aid in Rosenstein-Rodan Hypothesis

The central theme of the big-push doctrine is that there is a minimum level of resources that must be committed to a development programme for it to succeed. The big push theory was conceptualized by Rosenstein-Rodan (1943) within the context of Eastern and South-Eastern Europe with the goal of rapidly industrializing the countries within these regions. The rationale of the big push strategy is to make large scale investment and over a short period in order to achieve the targeted impact on the economy. According to Rosenstein-Rodan (1943), low income countries are caught in a poverty trap out of which requires increased foreign aid and investment necessary for take-off in income per capita. Eight years later, Rosenstein-Rodan (1961) stated that the principal role of foreign capital inflow is to enhance the rate of domestic capital formation up to a threshold that realizes sufficient income per capita which could be sustained without further aid. In this later work, the author opines that large-scale

industrialization cannot be achieved without sufficient capital. The author rejects the doctrine of self-sufficiency or inward-looking strategy of industrialization. Instead, he proposes the idea of industrialization with the help of international investment (outward-looking strategy). As a result of Rosenstein-Rodan's doctrine, foreign aid was immortalized as an indispensable panacea for developing countries' shortage of capital formation before the market driven policies of 1980s and 1990s.

The main weakness of Rosenstein-Rodan (1943) and Rosenstein-Rodan (1961) big-push ideas is the lack of a mathematical model that links capital formation and foreign aid. Despite this drawback, Rosenstein-Rodan's ideas provide an important starting point for formal analysis of the effects of foreign aid on capital formation as demonstrated by Murphy, Shleifer & Vishny (1989).

2.2.5.2 Capital Formation and Foreign Aid in Rostow's Economic Take-off Hypothesis

Rostow (1960) followed the footsteps of earlier supporters of the big-push doctrine such as Rosenstein-Rodan (1943) and Nurkse (1953). The author subscribes to the doctrine of the big-push by arguing that the transition from economic stagnation to economic take-off given certain population conditions requires the proportion of net national product (NNP) spend on capital formation to be increased to more than 10 per cent. Further, the author identifies the rise in the manufacturing sectors with a high rate of growth; and the development of a political, social and institutional framework as other important drivers of growth.

But while the 'growth miracles' experience of China and Japan and the Newly Industrializing Countries (NICs) of East Asian Tiger economies of Singapore, Malaysia, South Korea, Hong Kong and Taiwan between 1960s and 1990s are said to be the product of capital accumulation (Krugman, 1994; Kim & Lau, 1994; and Stiglitz, 1996) some countries such as Kenya that spent more than 10 per cent of their GDP on capital formation did not take off. The failure of Rostow's big-push hypothesis to work in some developing countries can be attributed to investments in unproductive projects, poor implementation, and inappropriate pricing policies. Rostow's model is helpful in indicating that developing countries should step up the process of capital formation to facilitate economic take-off to self-sustainable path. However, it does not have an answer to the question of why some countries with high capital stock have failed to take off.

2.2.5.3 Capital Formation and Foreign Aid in Sachs' Doctrine

According to the vicious circle of poverty model, poverty trap mechanism runs from extreme poverty (low income) to low rates of domestic saving and capital formation, to low or negative rates of productivity growth (Nurkse, 1953). Sachs, *et al* (2004) use the modified standard Solow's model to demonstrate the role of foreign aid in boosting capital formation and breaking the vicious circle. Sachs *et al* (2004) demonstrate that foreign aid relaxes the saving constraint, thus accelerating capital formation process. Using the concept of multiple equilibria, Sachs *et al* (2004) demonstrate how foreign aid breaks the low capital and poverty traps in poor countries. The authors use an economy with three steady state equilibria, low (stable), mid (unstable) and high state (stable) to demonstrate the role of foreign aid in breaking capital formation constraint and poverty trap. They show that in the case of a country with low income and without foreign aid, savings are low such that capital formation fails to match with Solow's depreciation and population growth rate line. Thus, the Solow's model breaks at the low end of capital. In the case of a country with low income and with foreign aid, Solow's depreciation and population growth rate line does not touch the saving curve at the lower end of the capital axis. It implies that when foreign aid is invested in new productive capital, it raises savings and temporarily removes low stable equilibrium. Sachs *et al* (2004) echo the views of Nurkse (1953) and Rosenstein-Rodan (1961) that the role of foreign aid is to boost public capital formation over a period that is long enough till the economy passes the unstable state. Specifically, Sachs et al (2004) argue that SSA needs a temporary big-push in public capital formation in order to realise growth that breaks the poverty trap.

In his book, 'The End of Poverty: Economic Possibilities of Our Time', Sachs (2005) states that economic growth cannot take place without investment in capital formation. Using the Nurksean vicious circle of poverty, Sachs (2005) argues that investment cannot happen without saving; and saving can only happen if the income of an individual/country exceeds the consumption needs. Sachs (2005) argues that the extreme poor individuals/countries cannot save and invest, hence they never grow. The author concludes that poor countries need a big push in order to free them from the poverty trap. He suggests that the rich countries can end extreme poverty in the world by donating 0.7 per cent of their gross national income to the poor countries.

From an aggregate point view, Sachs (2005) indicates that official development assistance (ODA) is effective in enhancing physical infrastructure and human capital formation. Sector-wise, Sachs (2005) observes that the government's investment in roads, schools and clinics among others is a necessary condition for growth. He suggests that governments should determine the cost of their capital formation needs and compare them with domestic saving. The financing gap should then be filled by foreign aid. Specifically, Sachs (2005) indicates that achieving the Millennium Development Goals (MDGs), now SDGs would require $135-$195 billion of foreign aid over the period 2005-2015.

Sachs' doctrine has been supported by aid reformers such as Collier (2007) and Kraay & Mckenzie (2014) who demonstrate that foreign aid enhances capital formation and hence economic growth. In his book, 'The Bottom Billion' Collier (2007) argues that the world's poor are victims of bad governance, civil war, landlockedness, bad neighbours and natural resource curse traps. He opines that globalization may not be the right panacea for lifting the bottom billion out of these traps since these people are usually victims of peripheralization in the world economy. He proposes (among others) that aid can lead to human capital formation and strengthen institutions that promote the rule of law and democracy which in turn provide incentives to non-aid financial inflows such as FDI.

On their part, Kraay & Mckenzie (2014) argue that the big-push from foreign aid is supposed to accelerate the rate of saving and investment, leading to take-off in per capita income that is critical for reducing poverty. These views are shared by the United Nations Conference on Trade and Development (UNCTAD, 2006).

But aid critics led by Easterly (2001) and a legion of his academic comrades such as Lensink & White (2001), Rena (2008), Moyo (2009), Riddell (2014) and Gulrajani (2015) argue that foreign aid is not effective in achieving intended development objectives. In his book, 'The elusive quest for growth: economists' adventure and misadventures in the tropics', Easterly (2001) contends that ODA has not been helpful. He opines that ODA has been counterproductive in many developing countries since it reduces motivations to innovate in these countries. Two years later, Easterly (2003) affirms that foreign aid does not stimulate growth. In his book, 'White Man's Burden: Why the West's Efforts to Aid the Rest Have Done So Much ill and So Little Good', Easterly (2006) argues that the implementation of aid financed projects is not accountable and promotes corruption. Easterly (2006) makes serious

academic attacks on Sachs (2005) and the members of his camp. He rejects Sachs' concept of poverty trap, arguing that it lacks empirical support. He provides evidence that support the hypothesis that aid does not enhance growth; and that growth is not constraint by poverty traps. Easterly (2006) also rejects the view by Sachs (2005) and his academic comrades that poor countries experience low growth because of the poverty traps. He demonstrates that low growth in poor countries is as a result of bad governance (corruption and inadequate democratic space) (Easterly & Pfutze, 2008). By making reference to the seminal paper by Boone (1996), Easterly (2006) argues that aid finances consumption and not capital formation. Lensink & White (2001) blame aid ineffective to achieve growth objective to misallocation (aid for strategic purposes given to wrong recipients) and misuse (recipients pursue non-developmental agendas). Rena (2008) attributes aid's failure to impact development in developing countries to conditionalities that tailor aid to parallel donors' interest. Moyo (2009) demonstrates that raising foreign aid leads to decline in private capital inflow and investment. Moyo (2009) attributes aid ineffectiveness to aid fungibility and corruption and calls for its substitution with FDI. According to fungibility hypothesis, aid meant for investment leaks into consumption while according corruption hypothesis, aid meant for investment is stolen by those in authority. Like Moyo (2009), Riddell (2014) attributes aid ineffectiveness to fungibility. In addition, the author cites Dutch disease and limited absorptive capacity as major impediments to aid effectiveness. Echoing the views of Easterly (2006), Rena (2008) and Moyo (2009), Gulrajani (2015) blames aid for promoting inflation, enslavement, corruption and lucrative tax-exempted employment with bonuses.

Critics of aid also cite the moral hazard problem popularly known as 'Samaritans dilemma' which refers to a situation where governments spend extravagantly knowing that donors will give them bailouts in case of financial crises. Other critics base their argument on the 'Resource Curse' of foreign aid, arguing that grants are like any other natural resource and may end up being a curse and not a blessing to the economy. According to the resource curse, or the curse of oil theory, countries with abundant natural resource grow more slowly than those that are resource scarce due to the rise in exchange rates that leads to 'Dutch disease'. They argue that the big push does not reduce poverty since access to foreign aid that is aimed at poverty reduction involves compliance with policy conditionalities that lead to greater inequality.

This study finds Sachs' big-push doctrine that developing countries need foreign aid quite relevant for Kenya which experiences chronic financing gap problem. It finds Moyo's call for aid substitution with FDI rather naïve since the two have different objectives. That is, while foreign aid fills the public investment-public saving gap FDI fills the private investment-private saving gap. Despite the criticism, Sachs' ideas have a lot of relevance for application in developing and transition economies due the existence of low capital formation, financing gaps and many poverty traps in these economies.

2.2.5.4 Capital Formation and Foreign Aid in Aid Effectiveness School

GDP stagnation and high poverty incidence within the Tropics (Sub-Saharan Africa, Latin America, the Middle East, South Asia and East Asia) despite having received huge junks of aid has raised concern among development economists about the effectiveness of foreign aid in achieving intended development objectives. The first generation of aid effectiveness economists led by Burnside & Dollar (2000) sought to know whether the policy environment played some role. By incorporating the interaction term of aid and policy derived from proxies of monetary policy (inflation), fiscal policy (budget balance) and trade policy (Sachs-Warner index) into the growth model, Burnside & Dollar (2000) concluded that aid has positive effect on growth in developing countries that have good monetary, fiscal and trade policies but insignificant effect in a poor policy environment. Their findings suggested that aid should be extended to developing countries with good fiscal, monetary and trade policies only. The landmark findings revolutionized the policy thinking within the multilateral donor community, especially the World Bank and the International Monetary Fund (IMF). It provided impetus to the implementation of policies that were set by the Washington Consensus. It served as a vehicle for the donor community to export policy reforms to aid recipient countries. This was despite lamentations from economic development experts such as Stiglitz (2002). Stiglitz (2002) criticized the Washington consensus policies arguing that they benefited a few at the expense of the majority, the haves at the expense of the have-nots.

But the new remedy for aid ineffectiveness did last for long before aid opponents started to discredit it and to challenge its legitimacy. Using an updated dataset, additional countries and the same model, Easterly, Roodman, & Levine (2004) retested Burnside & Dollar (2000)'s hypothesis. Their findings contradicted the earlier ones by Burnside & Dollar (2000). Their findings suggested that aid effectiveness does not dependent on policy environment. This was

a major setback to the new philosophy among the donor community of 'no policy reforms no aid'.

Easterly, Roodman, & Levine (2004)'s successful contestation implied that Burnside & Dollar (2000)'s hypothesis was no longer plausible. Consequently, a new generation of aid effectiveness economists evolved. Their focus revolves around the question of whether the effectiveness of foreign aid in impacting development indicators is contingent on the donor practice of allocating aid via multilateral or bilateral channels (Wako, 2011;Wamboye, Adekola, & Sergi, 2013; Gulrajani, 2015; Findley & Milner, 2017; Biscaye, Reynolds & Anderson, 2017). The debate, which is still on-going, and the one which informed the need for this study is motivated by the fact that the decision to allocate aid either via bilateral or multilateral aid channels uses effectiveness and efficiency parameters. Specifically, the decision to allocate donor aid either through bilateral or multilateral channel is guided on the one hand by the desire for regulating and answerability over how aid resources are utilized against the broader benefits of merging resources, expertise and donor presence on the other hand. If the former motivation dominates then aid would be channelled through the bilateral door, but if the later dominates then aid would be delivered through multilateral door. In the recent past, the principal-agent model has been used to inform decision on whether to choose multilateral channel for allocating aid or not. In this model, the donor (principal) and the multilateral agency (agent) are divided between the loss of regulatory authority over use of aid and the advantage of sharing the burden. How well the inclinations of the agent parallel those of the principal will often decide the degree to which the loss of regulatory power is the worry of the donor.

Though the general consensus suggests that the effects of foreign aid on the domestic economy are contingent on whether aid is distributed via multilateral or bilateral channel some contestation have been raised. For instance, this hypothesis was contested by Biscaye, Reynolds & Anderson (2017) who analyzed 45 empirical evidence for whether disbursing aid via multilateral or bilateral channels is more effective in achieving the desired development results. Biscaye et al (2017) failed to find consistent evidence that either multilateral or bilateral aid is more effective, but find strong evidence that aid effectiveness depend on study period, country and region. This study acknowledges that finding an answer to the question of aid effectiveness is critical for developing countries such as Kenya that dependent on aid to

augment their meagre savings. This is necessary if developing countries have to avoid the scenario where the prescription is worse than the disease.

2.2.6 Capital Formation and Foreign Direct Investment in the School of Globalization

The last two decades of the 20th century and the first decade of the 21st century witnessed many developing countries lifting restrictions on private foreign capital inflow, thus creating space for FDI. The globalization (open economy) school believes that under perfect capital mobility, domestic saving need not equal domestic capital formation requirement. Supporters of the optimum portfolio model within the school of globalization argue that foreign direct investors (FDIs) transfer ownership of surviving productive assets from one set of holders to others who are willing to offer them more returns, probably from less efficient to more efficient proprietors (Lipsey, 2000; Shibuya, 2001). Theoretically, capital-abundant countries would experience huge FDI outflows but less FDI inflows; while capital-poor countries will experience huge FDI inflows but less FDI outflows (Lipsey, 2000). Massa, Mendez-Parra & Velde (2016) observe that though aid is important for funding foundational infrastructure in the early stages of development, it may not meet the country's capital formation needs as the economy expands. The authors note that FDI is critical if SSA has to achieve MDGs (now SDGs).

Collier (2007), in his book, 'The Bottom Billion: Why the Poorest Countries are Failing and What Can Be Done About It' observes that while foreign aid provides additional public capital, FDI provide additional capital to the private sector. Instead, the author calls for improvement in aid delivery and proper utilization. Though Rena (2008) admits that aid is important, the author warns that it is not a panacea for Africa's development but FDI. Moyo (2009) in her book, 'Dead Aid' declares that aid is dead in Africa. Reinforcing the views of Rena (2008), Moyo (2009) proposes to African governments to consider FDI in infrastructure and trade with China (under Sino-African cooperation) and the rest of the world. The author blames foreign aid for perpetuating low growth, unemployment and poverty on the continent.

Calls by Moyo (2009) and her academic comrades for aid substitution with FDI in Africa has received overwhelming positive response, making FDI the single-largest out-sourcing for SSA (Amadou & Rakotondrazaka, 2015). Amadou et al (2015) provide statistics which show that in 1990 only two countries (Nigeria and Liberia) had FDI exceed ODA, but in 2012, 22 countries in SSA excluding South Africa had FDI exceeding ODA; implying that SSA is

becoming less aid dependent. Others support FDI, arguing that it fills the saving gap (Smith, 1997) and technology and skill gaps (Borensztein, De Gregoria & Jong-Wha, 1998; Quazi, 2007) in developing countries.

But critics of FDI argue that that poor infrastructure, high rates of corruption, and political instability in developing countries lower the adjusted rate of returns to capital thus discouraging FDI inflow (Lucas, 1990; Kant, 1996). other economists opine that where incentives exist, FDI inflow may hinder economic take-off through capital flights (Kant, 1996; Shibuya, 2001; Akinola, 2004) or overheat recipient economies, making them vulnerable to financial crises and sudden reversals (Lucas 1993; Mckinnon & Huw 1997; Bhattacharya, Montiel, & Sharma, 1996; Shibuya, 2001). Sachs et al (2004) dismiss the argument that FDI brings technology with it stating that diffusion of technology from foreign countries to Africa is low. Amadou et al (2015) use the case of 197-1998 Asian financial crisis to demonstrate the risk that is associated with FDI volatility. The authors dismiss Moyo's assertion that aid is 'dead' in Africa, terming the claim as a false demise.

This study agrees with calls for increased FDI to developing countries given that aid flow to these countries is inadequate compared to their financing deficit. However, it fails to agree with those who call for Africa to substitute foreign aid with FDI (and trade with China). This is because in theory, FDI substitutes foreign aid if and only if foreign aid inflow leads to significant Dutch disease effects which may discourage FDI in tradable sectors; or if foreign aid in the form of physical capital transfers crowds-out private capital formation. This is something which critics of aid have not proved for Africa. Moreover, experience has shown that trade profits do not directly finance public capital formation in social sectors such as education, health and development of marginalized rural areas. Additionally, substituting foreign aid with trade may be risky for Africa given that SSA is a price taker in the export market whose prices are quite volatile. Furthermore, China's trade policies have been unambiguously unorthodox. Therefore, the views of the school of globalization have a lot of relevance for developing countries. But policy makers should be prudent in their adoption given that some of them are unrealistic.

2.2.7 Capital Formation and Diaspora Remittance in the School of New Economics of Migration

The evolution of the new economics of migration (NEM) model was motivated by the weaknesses in the assumptions of the neoclassical economic model. In contrast to the neoclassical economics which takes an individual as the unit of analysis and wage differences across countries as the motivation for migration, the principal argument of NEM is that migration decisions are collectively undertaken by families with the aim of maximizing expected income and overcoming constraints in other markets other than the labour markets (Stark & Levhari, 1982; Stark, 1984; Stark, 1986; Katz & Stark, 1986; Lauby & Stark, 1988; Stark & Taylor, 1991). NEM identifies the need by poor households to diversify their sources of income (diaspora remittance) and insurance against risks as the motives of migration (Taylor *et al*, 1996; Taylor, 1999). The use of diaspora remittance to purchase capital assets and to provide insurance against risks signify altruistic motive (self-interest) and investment motive of the . Altruistically motivated remittance include transfers whereby the remitterdoes not expect to gain any profit or interest. They include remittances sent to relatives during crises with the principal purpose of smoothening consumption. As such altruistically motivated remittances tend to be countercyclical in nature. That is, they increase when the diaspora's home country is experiencing economic downturns (Supriyo & Seyed, 2018). Investment-driven remittances are usually spent on capital formation in the receiving country. But unlike other private international direct investments such as FDIs, diaspora investors are always ready to take political and economic risks in order to invest back at home (Gillespie, Riddle, Sayre, & Sturges; 1999). Thus, unlike FDI which tends to be procyclical in nature, diaspora remittance is stable during global financial crisis (Amadou & Rakotondrazaka, 2015).

The 21st century economists view diaspora remittance as a tool for overcoming constraints of landlockedness (Collier, 2007). The author argues that diaspora remittance finances capital formation for landlocked countries with bad neighbours by providing additional capital to the private sector.

NEM sidesteps the neoclassical model by considering both the causes and effects of migration. Nevertheless, NEM has been criticized for sending-side bias and its limited applicability due to problems in separating the effects of market imperfections and risks from other incomes and employment variables.

2.3 Empirical Literature

2.3.1 Capital Formation and Domestic Saving Nexus

Feldstein & Horioka (1980) specify a linear relationship between domestic investment to GDP and national saving to GDP in their empirical investigation of capital mobility, where the coefficient of national saving was used as a proxy for the degree of capital mobility. That is, a coefficient close to zero implies high capital mobility whereby domestic investment can be financed by foreign savings (aid); a coefficient close to one implies that domestic investment is largely determined by domestic saving. Using data from sixteen OECD countries for the period 1960 to 1974, the two-stage least squares (2SLS) estimation finds positive coefficient of national saving which is significantly different from one for both gross and net values for the entire sample period. Consequently, the study failed to accept the null hypothesis that the coefficient of national saving is one. The authors concluded that the existing substantial international capital flows do not respond to international differences in saving rates. This study appreciates the authors' effort in analyzing the long-run relationship between domestic investment and domestic saving. But the long-run specification implies that the coefficient of domestic saving only captured long run solvency constraint in the F-H model. Yet domestic saving and domestic investment (capital formation) can diverge from the long run equilibrium path in the short-run for open economies. Moreover, this study notes that Feldstein et al (1980) used OECD data, and therefore their findings cannot be generalized for non-OECD countries such as Kenya due to differences in their saving behaviour.

Mwega, Mwangi & Oleww-Ochilo (1994) investigated the effect of the saving gap, trade gap and fiscal gap on economic growth in Kenya. The purpose of the study was to establish whether it is the saving gap or trade gap or fiscal gap that constrains growth in Kenya. Data for the period 1967 to 1990 was used. After controlling for time trend, OLS estimation found the trade gap to be the binding constraint to growth in Kenya. This study appreciated the innovations by Mwega et al (1994) of conducting the three-gap analysis in the context of Kenya. Though the findings represent a landmark development in macroeconomic analysis based on Kenya's experience, it remains unclear whether the binding constraint would be the same if the gaps were allowed to enter the growth equation via the capital formation channel.

Narayan (2005) investigated the saving-investment nexus in China using data covering the fixed exchange regime for 1952 to 1994 period and fixed plus flexible exchange regime for

1952 to 1998 period. The study found a statistically significant positive correlation between saving and investment in China over the two sample periods. The cointegrating test found the existence of long-run relationship between saving and investment. This study acknowledges the author's effort, especially in testing Feldstein & Horioka (1980)'s puzzle for China, anon-OECD country. But like Feldstein & Horioka (1980), Narayan's bivariate analysis results may not offer precise inference due to omitted variables bias. Moreover, findings based on China cannot be generalized for Kenya due to structural and institutional differences.

Bordoloi (2008) examined the relationship between gross domestic saving (GDS) at current prices as a percentage of GDP and gross fixed capital formation (GFCF) at current prices as a percentage of GDP in India over four phases in the evolution of India's economy. These phases were: Phase I (1950/51 to 1964/65); Phase II (1965/66 to 1975/76); Phase III (1976/77 to 1990/91) and Phase IV (1991/92 to 2005/06). He specified a simple linear regression model with GFCF at current prices as the target and GDS as the explanatory variables. He employed Engle-Granger (1987) Two-Step method to test for the existence of cointegrating relationship between GFCF and GDS in India. The analysis found evidence of long-run equilibrium relationship between GFCF and GDS in India. The coefficient of ECM shows that the short-run adjustment process to long-run equilibrium following a shock to the system corrects 50 per cent of the errors in one year. This study was impressed by the author's focus on both short-run and long-run relationships, unlike earlier studies that focused on long-run relationship only. However, this study notes that findings based on India's economy cannot be generalized for Kenya due to structural and institutional differences.

Aghion, Comin, & Howitt (2009) investigated the effect of domestic saving on productivity in 118 countries over the period 1960 to 2000. Using a cross-country panel regression, the study found significant positive effect of lagged domestic saving on future growth in poor countries. However, the effect was statistically insignificant in rich countries. They also found that the effect does not work through capital formation channel but through total factor productivity (TFP) channel. They concluded that the effect of domestic saving on growth is important. This study appreciates the authors' innovativeness in their analysis of the macroeconomic effects of domestic saving. Specifically, this study observes that the introduction of lags to the model represents a marked improvement to earlier studies such as the one done by Feldstein & Horioka (1980). However, this study notes that the employment

of cross-country data masks country-specific information which is important for providing inference for countries such as Kenya.

Ciftcioglu, & Begovic (2010) tested the neoclassical hypothesis that higher savings lead to higher economic growth. Using data collected over a period of 1995 to 2003, classical pooled regression results revealed that the rate of domestic saving has a positive and significant effect on economic growth of East and Central European countries over the sample period. The study concluded that domestic saving has positive significant effect on growth. To avert declines in investment due global crisis, the study recommended that policies that enhance total factor productivity and the rate of human capital formation be put into place. This study lauds the researchers for focusing their study on the macroeconomic effects of domestic saving in East and Central European region. However, Aghion et al (2009) focused on direct effect of domestic saving on growth. Yet neoclassical and endogenous growth theories demonstrate that saving enters growth through the capital formation channel. Thus the authors' work may not adequately address the question of whether domestic saving impacts capital formation in Kenya or not.

Misztal (2011) studied the relationship between gross domestic saving (GDS) and gross domestic product (GDP) in advanced, emerging and developing economies over the period 1980 to 2010. The Granger causality results indicated that GDS Granger causes GDP in advanced economies. The same test indicated that GDP does not Granger cause GDS in the advanced economies. Similarly, Granger causality results indicated that GDS Granger causes GDP in emerging and developing economies; but GDP does not Granger cause GDS in the same economies. The study concluded that there is one-way long run causality between GDS and GDP in advanced economies, emerging and developing economies. This study appreciates the effort by Misztal (2011) in bringing to the fore the underlying relationship between domestic saving and economic growth across economies at different stages of development. However, like Aghion, Comin, & Howitt (2009) and Ciftcioglu, & Begovic (2010), the authors' direct approach fails to provide an answer to this study's question of whether domestic saving enhance capital formation or not.

Mbaluku (2011) investigated the effect of gross national savings (GNS) on gross fixed capital formation (GFCF) in Kenya over the period 1970 to 2009. Other variables were inward FDI, degree of openness of the economy, real effective exchange rates (REER), inflation and GDP

growth rate. The Granger causality test found a bidirectional relationship between inward FDI and GFCF with the impact of GFCF on FDI being stronger than the reverse. OLS estimates of linear regression equation found positive and significant effect of gross national savings, inward FDI, degree of openness of the economy and GDP growth rate. Inflation had negative but insignificant effect at all conventional levels of significance. Outward FDI and REER had negative effects with the former being statistically significant at 5 per cent while the latter at 10 per cent level of significance. This study lauds Mbaluku for adopting a multivariate framework which minimizes omitted variables bias. However, specification of a static linear regression model failed to account for lagged effects that are common in financial variables. Furthermore, Mbaluku considered only two sources of finance.That is, national savings and FDI. In other words, the study failed to acknowledge the role of foreign aid and diaspora remittance in capital formation despite the endorsement by the schools of globalization and the new economics of labour migration respectively.

Akinola & Omolade (2013) studied the relationship among saving, gross capital formation and economic growth in Nigeria over a sample period of 1975 to 2008. The authors employed cointegration and vector error correction mechanism (VECM) estimation techniques in their analysis of long run relationships. The findings based on cointegration test indicated the presence of cointegrating relationship among gross national saving, gross capital formation and gross domestic product. Granger causality test showed that gross domestic product has a bigger effect on gross national saving and gross capital formation than the effect of gross national saving and gross capital formation on gross domestic product. The study concluded that there exist two-way causality among the study's variables. Consequently, the study recommended that speeding up capital formation process and mobilization of saving would enhance economic growth in Nigeria. This study acknowledges the effort by Akinola & Omolade (2013), especially for departing from earlier studies such as the one conducted by Uremadu (2006) within the same country context by employing vector autorgressive (VAR) and vector error correction mechanism (VECM) that allows for reverse causality, hence minimizing endogeneity problem. Nevertheless, Akinola & Omolade (2013) failed to recognize the role of outsourcing in Nigeria. Therefore, their findings provide limited feedback to the question of what is the effect of domestic saving on capital formation in the presence of multilateral/bilateral aid, FDI and diaspora remittance.

Seng (2014) studied the relationship between domestic saving and economic growth in Cambodia over the period 1989 to 2012. The author deployed the Granger causality test. The test results indicated that neither domestic saving Granger causes economic growth nor does economic growth Granger cause domestic saving. The study concluded that domestic saving and economic growth do dependent on each other in Cambodia. This study lauded Seng (2014) for adopting a country-specific analysis for Cambodian case. However, it failed to consider the link between capital formation and domestic saving despite the endorsement of the channel by the classical, neoclassical and new endogenous growth theories.

Elias & Worku (2015) investigated the causal relationship between gross domestic saving and economic growth in Kenya, Uganda and Ethiopia over the period 1981-2014.Using Johansen's test for cointegration, the study found the existence of long-run relationship between domestic saving and growth in Uganda and Ethiopia but not in Kenya. The study recommended policies that the governments of Uganda and Ethiopia should implement in order to enhance domestic saving and hence sustainable growth in these countries. This study lauds the work of Elias &Worku (2015) for adopting a comparative approach. However, like Seng (2014), it failed to consider the link between capital formation and domestic saving despite the commendation of the link by the classical, neoclassical and new endogenous growth theories.

Recently, Lucky & Uzah (2016) investigated the effect of gross national savings (GNS/GDP) on gross fixed capital formation (GFCF) in Nigeria over the period 1981 to 2014. To test the workability of Jhingan's propositions for Nigeria, broad money supply (M2/GDP), credit to private sector (CPS/GDP), commercial banks' lending rate (LR), exchange rate (EXR), inflation rate (INFR), external debt (EXTD/GDP), public expenditure (PEX/GDP), government revenue (GR/GDP), terms of trade (TT/GDP) and operating surplus (OPS/GDP) were also included in the model. Cointegration test and vector error correction mechanism (VECM) techniques were used to estimate the relationships among the variables. The findings reveal that OPS/GDP, CPS/GDP, PEX/GDP, GR/GDP, IFR and LR have insignificant positive impact on GFCF. On the other hand, results for GNS/GDP, EXTD/GDP, M2/GDP, TT/GDP and EXR reveal negative but insignificant impact on GFCF. Jointly, explanatory variables accounted for 86 per cent of changes in the target variable. The study concluded that the model had a good fit, confirming Jhingan's propositions. This study appreciates the authors' effort in subjecting Jhingan's propositions to empirical tests for

validation under a completely different context. But what is not clear is whether the effect of gross national savings on Nigeria's gross fixed capital formation would have been positive and statistically significant in the presence of foreign aid such as multilateral aid and bilateral aid and direct international investment such as FDI and diaspora remittance.

2.3.2 Capital Formation and Multilateral and Bilateral Aids Nexus

Rodrick (1995) investigated the effectiveness of multilateral aid and bilateral aids in enhancing private investment flow in developing countries. The author hypothesized that multilateral aid is more effective in enhancing private investment flow than bilateral aid. A dynamic model was specified with current year private capital to developing countries assumed to depend on its own lag and multilateral and bilateral concessional/non-concessional loans and their lags. A sample of net ODA multilateral and bilateral aids approximated as a ratio of GDP were collected over the period 23 years (1970 to 1993) and analyzed on a six year interval basis. OLS estimation found bilateral aid to have statistically significant effect on private capital flows. On the other hand, multilateral aid was found to have negative significant effect. The author concluded that aid is more effective in enhancing private capital flow if delivered via bilateral channel. This study noted that linking private capital flow with bilateral and multilateral aids best addresses the question of whether there is 'vanguard effect' in developing countries or not. That is, whether bilateral and multilateral donors are the ones who carry out foreign direct investment or not. As such, findings based on this study would best explain whether or not public-private partnership is the right vehicle for driving capital formation. Thus, these findings do not provide adequate information to the question of whether the effect of foreign aid on capital formation is contingent on aid being delivered via multilateral channel or bilateral channel.

Ratha (2001) analyzed the effectiveness of multilateral and bilateral aids in promoting investment in 137 developing countries. The author specified a dynamic model in which private capital flow to a developing country was dependent on multilateral loans, International Monetary Fund loans, bilateral loans, and grants. The study controlled for fixed effects, population size, per capital gross national product and gross domestic product. Panel data of Gross ODA Multilateral and bilateral aids approximated as a ratio of GDP were collected at an interval of 4 years over the period 1970 to 1998. Using OLS estimation just like Rodrick (1995), Ratha (2001) found mixed results across low-income countries and lower middle-income countries in SSA. For instance IMF loans did not affect private flows to

lower middle-income countries but had positive and significant effect on private flow in low income countries during the program year and beyond. Multilateral loans were found to have lagged effect on private flows. On the other hand, bilateral loans and grants yielded positive significant effects on private flow during the program year and after lags. This study acknowledges the effort by the author especially in trying to the address the question of lagged effects of aids on investment (capital formation). But like Rodrick (1995), linking private capital flow with bilateral and multilateral aids best explains the question of whether there is 'vanguard effect' in developing countries or not. As such, findings based on this study have limited relevance in answering the question of whether the effect of foreign aid on capital formation is contingent on aid being delivered via multilateral channel or bilateral channel.

Harms & Lutz (2006) assessed the effectiveness of multilateral aid and bilateral aid in accelerating investment in 92 countries. They specified a static model in which private foreign investment to population was assumed to be determined by Net ODA Multilateral and bilateral aids and collected data over a period of 11 years (1988-1999). OLS estimation found multilateral aid to be more effective than bilateral aid influencing capital formation. But like Rodrik (1995) and Ratha (2001), Harms & Lutz (2006) use private international capital flow to proxy capital formation in developing countries. Therefore, results from this study may have limited relevance in addressing the question of whether the effect of foreign aid on capital formation is dependent on aid being delivered via multilateral channel or bilateral channel.

Ozturk (2011) analyzed the effect of IMF concessional loans under Standby Agreement (SBA) and Extended Fund Facility (EFF) on gross capital formation, gross domestic saving, foreign direct investment, inflation, imports, exports, current account balance, GDP growth and GDP per capita in six Middle East and North African (MENA) countries over a period of 1975 to 2005. The six MENA countries were Yemen, Jordan, Tunisia, Algeria, Morocco and Egypt. Using the before and after approach and generalized evaluation estimator (GEE), the study found that IMF program has negative effect on gross capital formation during the program year but not in the post-program period. The authors concluded that IMF supported programs have worsened domestic investment (domestic capital formation) in MENA countries. This study appreciates the effort by Ozturk (2011) in focusing on individual multilateral aid/lending institutions like IMF. But the weakness with the cross-country

approach used by the study is that it hides country-specific details which makes specific inference difficult. Again, the four sample countries from North Africa may not provide precise inference for Sub-Saharan countries such as Kenya due to differences in resource endowment between MENA and SSA. Thus, this study's results have limited relevance in resolving the question of whether the impact of foreign aid on capital formation is dependent on aid being transmitted through multilateral channel or bilateral channel.

Uneze (2012) investigated whether multilateral aid and bilateral aid affect private investment differently in 14 West African countries. Eight countries WAEMU and six non-WAEMU member countries were included. The study hypothesized that multilateral aid is more effective in enhancing private investment than bilateral aid. The author specified unobserved panel model in the tradition of Wooldridge (2003). A dynamic model was specified with private investment as a percentage of GDP as the dependent variable. Independent variables were multilateral aid as a percentage of GDP and bilateral aid as a percentage of GDP. The study controlled for unobserved effects, real gross domestic product, real interest rate, broad money supply as a percentage of GDP, inflation rate, debt service as a percentage of exports and export growth. Data on these variables was collected over 33 years (1975-2008). Fixed effect (FE) estimation found multilateral aid to be more effective than bilateral aid. The results of this study have some relevance (albeit little) for addressing the question of whether the effect of foreign aid on capital formation is dependent on aid being delivered via multilateral channel or bilateral channel. This is because most WAEMU and non-WAEMU countries included in this study come from SSA region and therefore share a lot of structural and institutional characteristics with Kenya. However, like Rodrick (1995), Ratha (2001) and Harm & Lutz (2006), this study is that it limited to private (direct) international investment and ignored public domestic/international investment.

Ojiambo (2013) investigated the effect of foreign aid on investment and economic growth in Kenya. The author used time series data for the period 1966 to 2010. The explanatory variables were real per capita income, private investment, foreign aid, tax revenue, policy index, index of aid predictability, foreign debt, interaction of aid and policy index and the interaction of policy index and aid predictability index. Using ARDL estimation procedure, the results indicated that foreign aid has positive but insignificant effect on investment in Kenya. However, the effect of foreign aid on growth was positive and statistically significant at 5 per cent level of significance. This study acknowledges the effort by Ojiambo (2013) for

focusing on Kenya and for shifting for addressing capital formation variable. However, the aggregate foreign aid data masked the effect of bilateral and multilateral aids. This makes it difficult for policy makers to establish whether the ineffectiveness of foreign aid to impact capital formation depends on the channel of delivery.

Jiranyakul (2014) studied the determinants of capital formation in Thailand. The study employed annual time series data for the period 1979 to 2012. The study specified ARDL and ECM models. The findings indicated that import to GDP ratio had positive but statistically insignificant impact on capital formation. Market capitalization had positive and significant effect on capital formation. The study concluded that market capitalization plays an important role in Thai's capital formation. Though the study did quite well by acknowledging foreign private capital flow (FDI) as one of the sources of financing capital formation, it however failed to consider diaspora remittance, another foreign private capital flow despite its recent surge. It also failed to disaggregate foreign aid into its components of multilateral aid and bilateral aid. This makes it hard for policy makers to determine whether the ineffectiveness of foreign aid to enhance capital formation is influenced by the channel of delivery.

Quaglia (2016) evaluated the impact of IMF loan participation on real GDP, gross capital formation and unemployment using difference-in-differences regression of panel data for 1980-2014 from a sample of 177 countries. Within a framework of game theory, he finds a negligible overall impact on growth of real GDP and gross capital formation in countries that have taken IMF loans. In high-growth countries, IMF loan has an average positive effect on real GDP growth and gross capital formation. In low-growth countries, IMF loan assistance has a smaller average positive effect on real GDP growth and gross capital formation over sample period. This study appreciates Quaglia (2016) for focusing on institutions that deliver multilateral aid. While such an approach has the advantage of providing sourcing-specific policies, this study notes that the author's failure to consider data from institutions that deliver bilateral aid simultaneously makes it difficult for the findings to adequately answer the question of whether the effect of foreign aid on capital formation is dependent on aid being transmitted through multilateral channel or bilateral channel.

Massa, Mendez-Parra, & Willem te Velde (2016) analyzed macroeconomic effects of multilateral and bilateral Development Finance Institutions (DFIs) in SSA over the period 1994-2012. Using simple correlation graphs, they demonstrate how an increase in

development finance by bilateral and multilateral institutions leads to increase in gross fixed capital formation in Uganda and private gross fixed capital formation in Ghana. They also apply simple regression model and the Generalized Method of Moments (GMM) to the panel data. After controlling for aid for humanitarian assistance and FDI, the study finds significant positive effects of multilateral institution finance from IFC and EIB on gross fixed capital formation. It also finds positive significant effects of bilateral development finance from Overseas Private Investment Corporation (OPIC) and Norfund on gross fixed capital formation. The effect is however not significant when DFIs finance is pooled. This study recognizes the immense contribution of Massa*et al* (2016) especially by focusing on multilateral and bilateral aid on gross fixed capital formation in Uganda. Thus, the findings have a lot of relevance in answering the question of whether the effect of foreign aid on capital formation is hinged on aid being delivered via multilateral channel or bilateral channel. But the weakness with this study is that it employed simple correlation graphical analysis which cannot provide information on statistical significance of the estimated coefficients and their precision for short run and long run predictions.

Recently, Quazi, Balentine, Bindu, & Blyden (2019) investigated the effectiveness of multilateral aid and bilateral aid in stimulating investment in 14 sample countries. They specified a static model. Gross official development assistance (ODA) multilateral aid and bilateral aid approximated as a ratio of GDP were collected over the sample period 1996-2017. Fixed generalized least squares (FGLS) estimation revealed that multilateral foreign significantly improves FDI in Latin America. Their findings suggest bilateral foreign aid does not have statistically significant effect on FDI in Latin America. This study notes that multilateral aid-bilateral aid-FDI specification best answers the question of whether there is 'vanguard effect' in Latin America or not. That is, whether bilateral and multilateral donors are the ones who carry out foreign private investment in Latin America. It does not provide evidence for resolving the question of whether the effect of foreign aid on capital formation is pegged on aid being transmitted through multilateral channel or bilateral channel.

2.3.3 Capital Formation and Foreign Direct Investment Nexus

Lipsey (2000) analyzed the effect of inward FDI and outward FDI on total capital formation in developed countries using data for the period 1975-1995. Outward FDI was found to have negative significant effect on capital formation in both static and lagged models. On the other hand, inward FDI had negative insignificant effect on capital formation. The study concluded that financing capital formation in developed countries is not a principal role of FDI. This study hails Lipsey (2000) for contributing to the literature on capital formation by using data from advanced economies. However, the results have limited relevance for addressing the question of the nature and magnitude of the effect of inward FDI on gross capital formation on Kenya. The limitation is attributed to the fact that developed and developing economies such as that of Kenya have structural and institutional differences. These differences do not allow one to draw inferences from results for advanced economies for Kenya.

Krkoska (2001) studied the effect of foreign direct investment on gross fixed capital formation in central and eastern European countries using data for 1989-2000 period. The study controlled for the effect of debt finance, capital market capitalization and subsidies in a lagged linear model. Using Seemingly Unrelated Regression (SUR) technique, FDI was found to have a positive significant effect on fixed capital formation in central and eastern European countries. The study proposed improvement in the investment climate in order to attract more FDI in central and eastern European countries. This study notes that Krkoska (2001) makes an important contribution to the literature on capital formation as far as the experience of transitional economies is concerned. The lagged specification of the model implies that the study acknowledges the dynamic nature of financial variables. However, the cross-country scope masks country-specific details. Moreover, inference cannot be drawn from these results for Kenya due to institutional and structural differences between transitional and developing countries.

Miguel (2006) analyzed the effect of foreign direct investment on private capital formation in Latin America using data for the period 1981 to 2000. The pooled model results indicate that lagged FDI has a positive and significant effect on private capital formation in Latin America. Other variables that had positive and significant effect were real credit to the private sector and public spending. Lagged changes in real exchange rate had a negative effect. This study notes that Miguel (2006) makes a significant contribution to the literature on capital formation financing within the context of Latin America. The lagging of the

variables indicates that the study appreciates the dynamic nature of financial variables. However, like Krkoska (2001), the cross-country scope conceals country-specific details. Another limitation of the work of Miguel (2006) is that it focuses on private capital formation. Although the disaggregated data has the advantage of informing micro-policy formulation, it cannot provide a precise answer to the macro question involving both private and public capital formation.

Uremadu (2006) examined the effect of cumulative foreign private investment (CFPI) on gross fixed capital formation in Nigeria over the period 1980 to 2004. Other explanatory variables were debt service ratio (DSR), maximum lending rate (MLR), foreign exchange rate (FXR), domestic inflation rate (INF), total banking system credit (TBC) to the domestic economy, gross national saving (GNS) and the index of energy consumption (IEC). Using OLS technique, the study finds that CFPI has a positive effect on capital formation in Nigeria. Other variables that positively impacted capital formation are total banking system credit to the domestic economy and the index of energy consumption. However, debt service ratio, maximum lending rate, gross national saving, foreign exchange rate and domestic inflation rate were found to have a negative impact on capital formation. This study acknowledges the author's effort of focusing on the developing country from SSA. Nigeria and Kenya have a lot in common in terms of structural and institutional arrangements. But the use of cumulative foreign private investment variable masks the effect of components such as FDI. Thus, the study's results do not sufficiently resolve the question of how FD affects gross capital formation.

Langat (2009) analyzed the effect of FDI on gross fixed capital formation (GFCF) in Kenya over a period of 1973 to 2007. Other explanatory variables were external debt (ED), nominal exchange rates (NXR), nominal interest rates (NIR) and risks of investment (RI). MLE procedure developed by Johansen & Juselius (1990) was used to prove the existence of co-integrating equations in the model. The Johansen co-integration test found the existence of five co-integrating equations and stationarity at I(1) in the model. All explanatory variables had positive but insignificant effect on GFCF before lagging. But after lagging, NIR and ED became significant while the impact of government expenditure became negative but remained insignificant. The coefficient of ECM term showed that the short-run adjustment process to long-run equilibrium following a shock to the system corrects 48 per cent of the errors in one year. This study lauds the author's effort in search of the solution to Kenya's

problem of low capital formation. However, the data does not capture the recent dynamicsin capital formation in the country. As such, the results do not provide up to date answer to the question what is the effect of FDI on gross capital formation in Kenya. Furthermore, GFCF proxy excludes the effect of inventory on capital formation.

Orji & Mba (2010) studied the relationship between foreign private investment, gross fixed capital formation (GFCF) and economic growth in Nigeria. Annual data for the period 1970-2007 was used. In the first model, GFCF was specified as the dependent variable with foreign private investment (FPI), gross national saving (GNS), inflation rate (IFR), interest rate (INTR), exchange rate (EXR) and financial intermediation proxied by total banking system credit to the economy (TBSC) as independent variables. In the second model, gross domestic product (GDP) was specified as the dependent variable while GFCF, FPI, GNS and INTR were independent variables. OLS estimation suggested that FPI has significant negative effect on GFCF in Nigeria in the long run. OLS estimation also indicted that GNS had negative significant effect on GFCF in the long run. The results were robust for the two stage least square (2SLS) regression. The ECM term was negative and statistically significant, correcting 57 per cent of short-run deviations between GFCF and its drivers. The study concluded that foreign private investment crowds out domestic investment in Nigeria. This study applauds the authors' contribution to the study of capital formation financing at aggregate level. Especially, the work of Orji & Mba (2010) improves on the earlier by Uremadu (2006) by study using a larger sample. Again, the inclusion of both domestic saving and international investment suggests that the authors recognize the gaps theory's view that domestic savings do not meet investment needs in developing countries. But the aggregate foreign private investment masks components of FDI. Therefore, these results provide limited information for the question, what is the effect of FDI on gross capital formation in Kenya.

Mbaluku (2011) investigated the effect of inward FDI on gross fixed capital formation (GFCF) in Kenya over the period 1970 to 2009. The study controlled for the effect of outward FDI, degree of openness of the economy, gross national savings (GNS), real effective exchange rates (REER), inflation and GDP growth rate. The Granger causality test found a bidirectional relationship between inward FDI and GFCF with the impact of GFCF on FDI being stronger than the reverse. OLS estimates of linear regression equation finds positive and significant effect of inward FDI, degree of openness of the economy, gross national savings and GDP growth rate. Inflation had negative but insignificant effect at all

conventional levels of significance. Outward FDI and REER had negative effects with the former being statistically significant at 5 per cent while the latter at 10 per cent level of significance. This study appreciate Mbaluku (2011)for improving on the work of Langat (2009) on Kenya, especially by increasing the sample size. It also notes that Mbaluku (2011) added to the literature of capital formation by focusing on one direction relationship unlike Langat who focused on bidirectional relationship. However, Mbaluku (2011) specified a static linear regression model which may not account for dynamic effects that are common in financial variables. Thus, these results do provide adequate information on the effect of FDI on gross capital formation under dynamic conditions.

Ugwuegbe, Modebe & Onyeanu (2014) investigated the effect of FDI on capital formation in Nigeria over a period of 1986 to 2012. They controlled for the effect of government expenditure (GE), interest rates (IR) and total credit to the private sector (TCR). MLE procedure developed by Johansen & Juselius (1990) and Johansen (1991) was used to prove the existence of co-integrating equations in the model. The pairwise Granger causality test was conducted on a VAR specification. OLS estimation technique was applied to the static data. The Johansen co-integration test found the existence of at most two co-integrating equations in the model. The ECM showed that 73.24 per cent of the disequilibrium in the model would be corrected on annual basis. The OLS results show that FDI, TCR and IR have a positive effect on capital formation in the short-run albeit insignificant. GE was found to have a negative effect on GFCF. Moreover, all explanatory variables were found to exert some positive impact on GFCF in the long-run, although only FDI's and TCR's impacts were statistically significant at 5 per cent level of significance. A two-way causality was found between FDI and GFCF. This study observes that the work of Ugwuegbe, Modebe & Onyeanu (2014) was an improvement on the earlier work by Orji & Mba (2010). It notes that Modebe & Onyeanu (2014) used a bigger sample size for same country scope. Additionally, the study of Modebe & Onyeanu (2014) is more specific in terms which direct international investment are the authors interested in unlike Orji & Mba (2010). However, the work of Modebe & Onyeanu (2014) focused on gross fixed capital formation which does not capture inventory stock. Therefore, the effect of FDI on gross capital formation (which captures inventory stock) is not clear.

2.3.4 Capital Formation and Diaspora Remittance Nexus

Adams (1998) investigated the effect of remittance from internal migrants and remittance from external migrants on fixed capital formation in rural Pakistan. Applying 3-Stage least square (3SLS) estimation method to a three-year panel data collected from 277 households, results demonstrated that remittances from external sources had positive significant effect on fixed capital formation in rural Pakistan while remittance from internal migrants had no effect. This study acknowledges the study's rigour whereby it assesses different types of diaspora remittance, local and international. But the study's focus on rural households as beneficiaries of remittance limits the results' capacity to offering a comprehensive answer to the question of what is the effect of diaspora remittance from external migrants on gross capital formation for the aggregate economy.

Osili (2004) uses a small household survey of Nigeria's migrants in the United States in 1997 and migrant households in Nigeria to investigate the effect of diaspora remittances on investment in housing in Nigeria. The study finds that migrants with more income are more likely to invest in housing in Nigeria. This study recognizes Osili (2004)'s effort in employing highly disaggregated data on capital formation by focusing on housing which has the benefit of informing more target-specific policies. However, this study notes that Osili (2004) uses secondary data which limits the effect of time trend on the capital formation. Thus, the results of the analysis by Osili (2004) do not provide sufficient answer to the question of what is the effect of diaspora remittance on capital formation in developing countries such as Nigeria and Kenya.

Woodruff & Zenteno (2007) investigated whether access to capital lead to stronger investment in small scale enterprises in developing countries. They examined the effect of capital limitations on investment levels of microenterprises in Mexico. They surveyed over 6000 small firms located in 44 urban areas of Mexico. They found that diaspora remittance provides almost 20% of capital formation in microenterprises in urban Mexico. This noted that the authors contribute to the literature of capital formation-diaspora remittance nexus at firm level. However, the descriptive approach employed limits the application of the findings for policy. Moreover, the cross-sectional data limits the effect of time trend on capital formation. Hence, the results of the investigation by Woodruff & Zenteno (2007) do not

render enough solution to the question of what is the effect of diaspora remittance on gross capital formation in developing countries Kenya included.

Adams (1998) investigated the effect of remittance from internal migrants and remittance from external migrants on fixed capital formation in rural Pakistan. Applying 3-Stage least square (3SLS) estimation method to a three-year panel data collected from 277 households, results demonstrated that remittances from external sources had positive significant effect on fixed capital formation in rural Pakistan while remittance from internal migrants had no effect. This study acknowledges the study's rigour whereby it assesses different types of diaspora remittance, local and international. But the study's focus on rural households as beneficiaries of remittance limits the results' capacity to offering a comprehensive answer to the question of what is the effect of diaspora remittance from external migrants on gross capital formation for the aggregate economy.

Haas (2007) surveyed a sample of households in Southern Morocco to determine the effect of internal and international migrant remittances on economic development. The study finds that internal migrant remittances did not impact incomes of recipient households while international migrant remittances impacted investment in housing and agriculture by recipient households. The study observes that international migrant households spent more than three times on construction than non-migrant and internal migrants on construction. Like Adams' (1998) study of rural Pakistan, Haas (2007) assesses economic effect of local and international diaspora remittance by region. But the study's focus on housing and agriculture and the regional scope, though good for informing target-specific policies limits the results' capacity to offering a sufficient solution to the question of how diaspora remittance affects gross capital formation. Yet, the aggregate aggregate results are critical for guiding macro-policy formulation.

Cuecuecha (2013) uses Ghana Living Standards Survey 2005/006 to analyse the effect of internal and diaspora remittances on household consumption and investment expenditure behaviour in Ghana. Using OLS technique and controlling for endogeneity and selection, the study fails to find any difference on expenditure on consumption and investment goods between households that receive remittances and those that do not. This appreciates the author's application of regression analysis, but notes that Cuecuecha (2013) did not control for the effect of domestic savings and other sources of development finance sourced from

within and without. Thus, the study could not provide information on the net effect of diaspora remittance on household investment in the presence of household saving and other sources of finance. Moreover, the cross-section data used by the researcher could not account for dynamics in diaspora remittances over time. Therefore, though the findings have a lot of relevance for Kenya, they do not adequately address the question of how diaspora remittance impacts capital formation in the presence of other sources of development finance under dynamic conditions scenario.

Muiruri (2015) investigated the effect of diaspora remittances on real estate growth in Kenya over the period 2004 to 2013. The study controlled for GDP growth, unemployment, inflation and interest rates. Using OLS, the study found that diaspora remittances negatively affected real estate growth in Kenya. This study acknowledges the author for the disaggregated approach, especially on the dependent variable. However, though disaggregated approach is important in offering target-specific policy solutions, the narrow scope does not facilitate broad-based policy guidance which is important for aggregate planning. Therefore, the findings of Muiruri (2015) do not sufficiently resolve the question of how diaspora remittance influence gross capital formation in Kenya.

2.4 Summary of Literature

A plethora of theories from classical, neoclassical, new endogenous, big-push, globalization and new economics of labour migration schools try to link capital formation and its determinants. Literature suggest preference by most studies for neoclassical theory in providing the framework for underpinning extended models. Most of the empirical studies are recent. Generally, empirical studies which investigated capital formation-domestic saving nexus were premised on a closed economy assumption, therefore ignoring the role of foreign savings. On the other hand, most of multilateral/bilateral aid empirical studies focused on FDI as the target variable. Empirical studies which assessed the effect of FDI on capital formation yielded mixed results and focused on transition economies. Evidence on capital formation-FDI link from developing countries (Kenya included) is scanty. Similarly, evidence on capital formation-diaspora link is meagre and focuses on cross-sectional data and micro approach. The foregoing gaps in knowledgemotivated the need for this study.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the study's research design and econometric models, data type and source, pre-estimation procedures, estimation techniques and post-estimation procedures. In addition, it scrutinizes the study area in order to determine whether it had the right profile. It also considers variables definition, their measurement and a priori expected signs of coefficients of independent variables.

3.2 Research Design

This study adopted a correlational research design because auto-regression analysis was to be done. Sims (1980) recommends a correlational design for studies on long-term macroeconomic analysis of variables with auto-regressive effects. The purpose of regression analysis whose basic form is correlation analysis is to allow the researcher to measure the effect of independent variable(s) on dependent variable(s) in the study. It also allows the researcher to measure the effect of control variables on the dependent variable(s) of the model instead of holding them constant. Thus correlation design facilitates multiple regression analysis which enables the researcher to determine the effect of changes in the independent variable(s) on the dependent variable(s). The correlational design was therefore appropriate for this study which examined the effect of domestic savings, multilateral aid, bilateral aid, foreign direct investment and diaspora remittance on gross capital formation in Kenya after controlling for other possible determinants. The design was mounted in a non-experimental set up which does not allow the researcher to manipulate the variables. To guarantee validity and reliability of the estimates, pre-estimation procedures and post-estimation procedures were included in the research design. Pre-estimation procedures such as correlation analysis, unit root tests, cointegration tests, lag selection criteria were planned for during the design stage. How auto-regression analysis was going to be implemented using auto-regressive distributed lag method was also considered. Post-estimation procedures such as auto-correlation tests, Heteroskedasticity tests and model stability tests were arranged for during this stage. Time schedule of anticipated progress and cost involved were part of research design.

3.3 The Study Area Profile

This study focused on Kenya. The country is found on latitude 0.1769^{o}N and longitude 37.9083^{0}E (Appendix J) and covers 380370 square kilometres with a population of 38.6 million in 2009 and 28.7 million in 1999 (Republic of Kenya, 2010), representing a growth rate of 34.5 percentage over the 10 year period. The arid and very arid areas form 65 per cent of Kenya's 380370 square kilometres. The modified equatorial and tropical climates have made agriculture to be the main driver of Kenya's GDP with 26 per cent contributed directly and 27 per cent via linkages with other sectors. With the sector accounting for 65 per cent of the country's export revenue, the government has invested in physical infrastructure variables such as airports, railway, roads, bridges and sea ports to facilitate movement of agricultural products to the international market. According to World Bank (2016a) and World Bank (2016b) Kenya's economy is among the poorest 25 per cent globally with more than 65 per cent of her population living on less than $ 2 a day. UNDP Kenya (2017) reveals that unemployment rate in Kenya is firmly entrenched above the 39 per cent line compared to Tanzania's 24 per cent and Uganda's 18 per cent. World Bank (2019) development indicators reveal that Kenya's gross capital formation as a percentage of GDP remained below the 25 per cent line for over the sample period (1974-2017) except for 1974, 1985 and 1988 when it posted 25.76, 25.32 and 25.45 per cent of GDP respectively. Some signs of growth between 2010 and 2015 were just but recovery of the ground lost during 1990s and the first decade of the second Millennium. World Bank (2019) development indicators report on gross capital formation ranks Kenya (20.13), a lower-middle-income country behind SSA low income countries such as Uganda (25.07), Burkina Faso (25.57), Tanzania (28.66) and Niger (33.83) in the region over the period 2006 to 2017. The recent dynamics in domestic savings, multilateral aid, bilateral aid, FDI and diaspora remittance in Kenya makes her economy an interesting context for studying the implications of the development for gross capital formation.

3.4 Data Type and Source

Annual time series data for the period 1974-2017 were used for this study. The data on gross capital formation, gross domestic saving, multilateral aid, bilateral aid, FDI population and technology proxied by (Patent Application) were obtained from the World Bank's open (unrestricted) access online National accounts data files and OECD National accounts data files (see the link, below table A1, Appendix A). Data on political dummy was collected from

various accounts of Kenya's history. Obtaining most of the data from one source was aimed at ensuring consistency.

3.5 Econometric Models

3.5.1 Auto-Regression Distributed Lag (ARDL) Model

Domestic savings are supposed to increase capital formation according to the neoclassical theory (model 1.1). Apart from domestic saving, foreign aid components of multilateral aid and bilateral aid, foreign direct investment and diaspora remittance identified from the literature were allowed to additively enter the study's econometric model. The political dummy was additively introduced to capture the effect of political uncertainty around electioneering period on gross capital formation in Kenya. Consequently, the extended model for empirical analysis was specified in the tradition of Pesaran & Shin (1995) and Pesaran & Shin (1999) auto-regressive distributed lag form ARDL(v, v_1, v_2, v_3,v_4, v_5, v_6, v_7, v_8) as

$$\begin{aligned}\mathrm{LNGCF_t} = \pi_0 &+ \sum_{\mathrm{i=1}}^{\mathrm{v}} \mathfrak{X}_{1\mathrm{i}}\,\mathrm{LNGCF_{t-i}} + \sum_{\mathrm{i=1}}^{v_1} \mathfrak{X}_{2\mathrm{i}}\,\mathrm{GDS_{t-i}} + \sum_{\mathrm{i=1}}^{v_2} \mathfrak{X}_{3\mathrm{i}}\,\mathrm{LNMAID_{t-i}} \\ &+ \sum_{\mathrm{i=0}}^{v_3} \mathfrak{X}_{4\mathrm{i}}\,\mathrm{LNBAID_{t-i}} + \sum_{\mathrm{i=0}}^{v_4} \mathfrak{X}_{5\mathrm{i}}\,\mathrm{LNFDI_{t-i}} + \sum_{\mathrm{i=1}}^{v_5} \mathfrak{X}_{6\mathrm{i}}\,\mathrm{LNDR_{t-i}} \\ &+ \sum_{\mathrm{i=1}}^{v_6} \mathfrak{X}_{7\mathrm{i}}\,\mathrm{LNPOP_{t-i}} + \sum_{\mathrm{i=1}}^{v_7} \mathfrak{X}_{8\mathrm{i}}\,\mathrm{LNTECH_{t-i}} + \sum_{\mathrm{i=0}}^{v_8} \mathfrak{X}_{9\mathrm{i}}\mathrm{POL_{t-i}} \\ &+ \varepsilon_{\mathrm{t}} \qquad (3.1)\end{aligned}$$

Where: $\mathbf{LNGCF_t}$Denotes natural logarithm of gross capital formation over time t;

$\mathbf{LNGCF_{t-i}}$Denotes lagged natural logarithm of gross capital formation to i[th] value;

$\mathbf{GDS_{t-i}}$Denotes lagged gross domestic saving rate to i[th] value;

$\mathbf{LNMAID_{t-i}}$Denotes lagged natural log of multilateral aid to i[th] value;

$\mathbf{LNBAID_{t-i}}$Denotes lagged natural log of bilateral aid to i[th] value;

$\mathbf{LNFDI_{t-i}}$ Denotes lagged natural log of foreign direct investment to i[th] value;

$\mathbf{LNDR_{t-i}}$Denotes lagged natural log of diaspora remittance to i[th] value;

$\mathbf{LNPOP_{t-i}}$Denotes lagged natural log of population growth to i[th] value;

$\mathbf{LNTECH_{t-i}}$Denotes lagged natural log of technology to i[th] value;

$\mathbf{POL_{t-i}}$ Denotes lagged political dummy to i[th] value;

$\boldsymbol{\pi_0}$Denotes the drift component;

$\boldsymbol{\varepsilon_t}$ Denotes the random error over time t;

χ_{li} Denotes long run elasticities and slopes for$l = 1, 2, \ldots, 9$

vsDenotes lag lengths such that the random error is normally distributed homoscedastic and serially uncorrelated and stable elasticities.

The study's preference of the dynamic ARDL model specification over the static models was motivated by the fact that in practice, current capital formation are caused by past capital stocks. The decision was also guided by the fact that there is always a time lag between saving/transfer of capital finance and actual capital formation (Krkoska, 2001). Therefore, in the spirit of Koyck (1954) and Almon (1965)distributed lag modelling procedure, the auto-regressive term represented by lagged gross capital formation (GCF_{t-1}) was introduced in order to account for inertia (own effect). Econometrically, the choice of auto-regressive model was motivated by the time series behaviour of the study's variables. That is, the fact that the dependent variable for the model was integrated of order I(1), while the explanatory variables were either I(0) or I(1) but not I(2).

3.5.2 Error Correction Mechanism (ECM) Model

Since cointegrating relationship was found to exist among the study's variables, the error correction mechanism (ECM) model was specified in order to determine the speed of error correction. The ECM model is a specification that expresses the first difference of the dependent variable as a function of first difference(s) of dependent variable(s), lagged error term and the white noise process. Narayan (2004) observes that the uniqueness of the ECM model lies in its ability to guide the system back to equilibrium after some shock. Consequently, the ECM model was specified as follows

$$\begin{aligned}\Delta\mathrm{LNGCF}_t = \sigma_0 &+ \sum_{i=1}^{p} \Theta_{1i}\,\Delta\mathrm{LNGCF}_{t-i} + \sum_{i=1}^{p_1} \Theta_{2i}\,\Delta\mathrm{GDS}_{t-i} + \sum_{i=1}^{p_2} \Theta_{3i}\Delta\,\mathrm{LNMAID}_{t-i} \\ &+ \sum_{i=0}^{p_3} \Theta_{4i}\,\Delta\mathrm{LNBAID}_{t-i} + \sum_{i=1}^{p_4} \Theta_{5i}\,\Delta\mathrm{LNFDI}_{t-i} + \sum_{i=1}^{p_5} \Theta_{6i}\,\Delta\mathrm{LNDR}_{t-i} \\ &+ \sum_{i=1}^{p_6} \Theta_{7i}\,\Delta\mathrm{LNPOP}_{t-i} + \sum_{i=1}^{p_7} \Theta_{8i}\,\Delta\mathrm{LNTECH}_{t-i} + \sum_{i=1}^{p_8} \Theta_{9i}\,\Delta\mathrm{POL}_{t-i} - \varkappa\mathrm{ECM}_{t-1} \\ &+ u_t \qquad (3.2)\end{aligned}$$

Where:

ΔRepresents the first difference operator;

$\boldsymbol{\sigma_0}$ Is the drift component;

$\Delta\mathbf{LNGCF_t}$Denotes first difference of the natural logarithm of gross capital formation over a period of time t;

$\Delta\mathbf{GDS_{t-i}}$Symbolizes the first difference of the gross domestic saving rate lagged to the ith value;

$\Delta\mathbf{LNMAID_{t-i}}$Stands for the first difference of the natural logarithm of multilateral aid lagged to the ith value;

$\Delta\mathbf{LNBAID_{t-i}}$ Represents the first difference of the natural logarithm of bilateral aid lagged to the ith value;

$\Delta\mathbf{LNFDI_{t-i}}$Denotes the first difference of the natural logarithm of foreign direct investment lagged to the ith value;

$\Delta\mathbf{LNDR_{t-i}}$Symbolizes the first difference of the natural logarithm of diaspora remittance lagged to the ith value;

$\Delta\mathbf{LNPOP_{t-i}}$Represents the first difference of the natural logarithm of population growth lagged to the ith value;

$\Delta\mathbf{LNTEC_{t-i}}$Represents the first difference of the natural logarithm technology growth lagged to the ith value;

$\Delta\mathbf{POL_{t-i}}$ Denotes the first difference of the political dummy lagged to the ith value;

$\mathbf{ECMT_{t-1}}$Refers to error correction mechanism term lagged one period;

$\boldsymbol{\sigma_0}$ Constant;

$\boldsymbol{\theta_{li}}$Denotes short-run elasticities and slopes for $l = 1, 2, \ldots, 9$

$\boldsymbol{u_t}$ Stands for the random error over time t;

$\boldsymbol{p}$s Denote lag lengths;

$\boldsymbol{\varkappa}$ Coefficient of the error correction mechanism term.

$\varkappa$ Measures the speed of short-run adjustment to equilibrium following a shock to the system. It shows how quickly variables adjust to a shock and return to equilibrium. As a rule of the thumb, the coefficient should take a value between -1 and 0 in order to avoid nonsensical correction speed.According to Engle&Granger (1987) representation theory and Narayan (2005), negative and significant coefficient of $ECMT_{t-i}$ is a necessary condition for the variables under investigation to converge to a long run equilibrium (cointegration). The

higher the coefficient of $ECMT_{t-i}$ term the better the correction speed following short-run shocks to the system (Coakley, Fuertes, & Spagnolo, 2004).

3.6 Definition of Variables, Measurement and A priori Expected Signs

Table 3.1: Definition of variables, measurement and a priori expected signs

Variable Name	Variable Definition	Variable Measurement	Expected Sign
Gross Capital Formation (GCF)	Investment in fixed assets such as plant, machinery, and equipment; improvement on land; construction of railways and roads; building of hospitals, schools, offices, industrial and commercial buildings and private residential houses; plus changes in inventory.	Current US $	N/A
Gross Domestic Savings (GDS)	Rate of growth in the sum of fiscal balance, household saving and retained firm profits.	Per cent	+
Multilateral Aid (MAID)	Public and Publicly guaranteed concessional loans from multilateral agencies of the United Nations such as IMF and the World Bank.	Current US $	+/-
Bilateral Aid (BAID)	Public and Publicly guaranteed concessional loans from bilateral agencies of the United Nations such as IMF and the World Bank.	Current US $	+/-
Foreign Direct Investment (FDI)	Investment in fixed assets by foreign nationals living in Kenya.	Current US $	+
Diaspora Remittance (DR)	Transfers of money by migrants to their relatives in Kenya.	Current US $	+
Population (POP)	Growth in population size.	Number of Kenyans	+
Technology (TECH)	Growth in invention of solutions to problems.	Proxied by patent applications	+
Political Dummy (POL)	Measure of presence or absence of political uncertainty	Political uncertainty present =1, Otherwise =0	+/-

3.7 Data Analysis

3.7.1 Pre-Estimation Procedures

3.7.1.1 Correlational Analysis

This study conducted a correlation analysis in order to determine the magnitude of the correlationship among the variables. Determining the magnitude of correlationship was useful in establishing the degree of multicollinearity in the data. This was important given that under severe multicollinearity, the coefficient estimates cannot be determined. In addition, the standard errors of the estimates become infinitely large, leading to small t-values even when the goodness of fit of the model is high. In worst scenarios, severe multicollinearity can lead to the signs that are inconsistent with economic theory and wrong policy advice.According to Gujarati (2005), multicollinearity is severe if the correlation coefficient exceeds 0.8.

Furthermore, correlation analysis provided information on the direction of correlationship between gross capital formation on the one hand and international capital (multilateral aid, bilateral aid, foreign direct investment and diaspora remittance) on the other hand. Information about the nature of the direction and the significance of the coefficient of correlationship was useful in establishing the cyclicality or pro-cyclicality or counter-cyclicality of multilateral aid, bilateral aid, foreign direct investment and diaspora remittance. Theoretically, if the coefficient of correlation was found to be negative and statistically significant then the relationship between gross capital formation and the international capitalis countercyclical. On the other hand, if the coefficient of correlationship was positive and statistically significant then the relationship between gross capital formation and the international capitalis procyclical. The relationship would be cyclical if the coefficient of correlationship failed to attain statistical significance the direction notwithstanding. The implication of countercyclical relationship is that international capital can be used as a tool for capital formation stabilization during crisis. Procyclical relationship would suggest that international capital cannot be used in the stabilization of capital formation during downturns.

Correlation analysis could also provide information on whether the sources of financing capital formation are substitutes or complementaries. Negative and significant correlationship between sources of financing would imply that the two are substitutes. On the other hand, positive and significant correlationship would suggest that the two sources of financing are complementaries.

3.7.1.2 Logarithmic Transformation

This study carried out logarithmic transformation of data. This decision was motivated by the fact that various economic time series data display a robust trend. Therefore, logarithmic transformation of the time series variable linearizes the exponential trend that may be present (Asteriou & Price, 2007). This is because the logarithm function is the inverse of an exponential function. That is, the exponent is multiplied by the base, thus detrending the series. Such transformations enable the study to interpret the model's slopes as elasticities. In this regard, gross capital formation, multilateral aid, bilateral aid, foreign direct investment, diaspora remittance, population and technology were log transformed. However, gross domestic saving rate was not log transformed since it had some negative observations in some instances. Similarly, the political dummy was not log transformed because one of the binary values was taken to be zero. As such, log transformation of zeros would yield negative infinity results which have no economic meaning.

In addition to enhancing the linearity of the model, log transformed data offers precise statistics for inference (Tsay, 2014). Log transformation was also meant for improving normality and elimination of Heteroskedasticity from the residuals (Orji & Mba, 2011).

3.7.1.3 Unit Root Tests

These are tests conducted in order to determine whether the time series are stationary or non-stationary in their evolution process. Stationarity or non-stationarity of a series determines its behaviour. For example, a shock to the series does not die with non-stationarity but with Stationarity. It implies that the application of non-stationary time series data to analysis could produce spurious test statistics because of non-constant means and variances (Granger & Paul, 1974). Spurious statistics are those that are significant even when the relationship among variables is not supported by economic theory. Thus, it was important for this study to verify whether the series had constant means and variances before conducting the auto-regression analysis in order to avoid generating meaningless results. Although ARDL estimation technique does not require pre-testing for unit roots, to ensure that ARDL model did not collapse in the presence of integrated series of order I(2), Augmented Dickey-Fuller (ADF) was used to test for unit roots. Even though both ADF and Phillips Peron (PP) tests incorporate automatic correction to Dickey-Fuller (DF) procedures in order to accommodate serially correlated residuals, ADF test was preferred over PP test because of the parametric

nature of the data. Thus, the Augmented Dickey-Fuller (ADF) equations for unit root tests were specified as follows:

$$\Delta LNGCF_1 = \lambda_0 + \lambda_1 LNGCF_{t-1} + \sum_{j=1}^{n} a_j \Delta LNGCF_{t-1} + \mathfrak{T}_{1t} + u_{1t} \quad (3.3)$$

$$\Delta GDS_1 = \phi_0 + \phi_1 GDS_{t-1} + \sum_{j=1}^{p} c_j \Delta GDS_{t-1} + \mathfrak{T}_{2t} + u_{2t} \quad (3.4)$$

$$\Delta LNMAID_1 = \pi_0 + \pi_1 LNMA_{t-1} + \sum_{j=1}^{q} d_j \Delta LNMA_{t-1} + \mathfrak{T}_{3t} + u_{3t} \quad (3.5)$$

$$\Delta LNBAID_1 = \psi_0 + \psi_1 LNBA_{t-1} + \sum_{j=1}^{r} e_j \Delta LNBA_{t-1} + \mathfrak{T}_{4t} + u_{4t} \quad (3.6)$$

$$\Delta LNFDI_1 = \partial_0 + \partial_1 LNFDI_{t-1} + \sum_{j=1}^{s} f_j \Delta\, LNFDI_{t-1} + \mathfrak{T}_{5t} + u_{5t} \quad (3.7)$$

$$\Delta LNDR_1 = \mu_0 + \mu_1 LNDR_{t-1} + \sum_{j=1}^{v} g_j \Delta LNDR_{t-1} + \mathfrak{T}_{6t} + u_{6t} \quad (3.8)$$

$$\Delta LNPOP_1 = \omega_0 + \omega_1 LNPOP_{t-1} + \sum_{j=1}^{w} h_j \Delta\, LNPOP_{t-1} + \mathfrak{T}_{7t} + u_{7t} \quad (3.9)$$

$$\Delta LNTECH_1 = \eta_0 + \eta_1 LNTECH_{t-1} + \sum_{j=1}^{x} i_j \Delta\, LNTECH_{t-1} + \mathfrak{T}_8 + u_{8t} \quad (3.10)$$

Where Δ is the first difference operator; λ_0, ϕ_0, π_0, ψ_0, ∂_0, μ_0, ω_0, and η_0 are intercepts while $\mathfrak{T}_{1t}$, ……, $\mathfrak{T}_{8t}$ are trend components; $u_{1t}\ldots u_{8t}$ are pure white noise disturbances (random terms that are i id); n, p, q, r, s, v, w and x represent number of ld differences (to control for higher-order correlation assuming that the series follow AP (ρ)). The null hypotheses of no unit roots, $H_0=\lambda_0=\phi_0=\pi_0=\psi_0=\partial_0=\mu_0=\omega_0=\eta_0=0$ were tested against the alternative hypotheses of unit roots, $H_1 \neq \lambda_1 \neq \phi_1 \neq \pi_1 \neq \psi_1 \neq \partial_1 \neq \mu_1 \neq \omega_1 \neq \eta_1 < 1$. When ADF test failed to reject the null hypothesis in levels, then the series was first differenced. If the ADF test failed to reject the null hypothesis in levels and first difference, then the series was assumed to contain more than one unit root (integrated of order two or more). The inclusion of the intercept and trend was aimed at capturing the random walk that exhibit drift and linear time trend characteristics of the series.

Specification of the equation for testing of Stationarity for the dummy representing political uncertainty was not necessary. This is because a dummy is a binary variable, as such it tends to evolve stably over time. Therefore, the unit root test will always find it stationary (singular matrix).

3.7.1.4 Test for Cointegrating Relationship

ARDL estimation does not require pre-testing for existence of cointegration. But to ensure that the study does not collapse due lag of cointegration, Johansen (1988) test for cointegration was conducted in order determine the number of cointegrating equations. Two series are said to be cointegrated if they do not drift too far apart over the long-run horizon. Johansen approach was preferred over Engle-Granger Two-Step approach because it does not limit the number of cointegrating equations to a maximum of one even if there are more cointegrating equations. Moreover, it is not subject to the restriction that the variables should be integrated of the same order. Johansen approach consists of two tests: trace test (3.11) and Maximum Eigenvalue test (3.12).

$$\lambda_{trace} = -T \sum_{i=r+1}^{q} ln(1 - \hat{\lambda}_i) \tag{3.11}$$

$$\lambda_{max}(r, r+1) = -Tln(1 - \hat{\lambda}_{r+1}) \tag{3.12}$$

Where T is the number of observations $\hat{\lambda}_i$ and $\hat{\lambda}_{r+1}$ represent the number of estimated trace value and eigenvalue in the matrix respectively. The trace statistic tests the null hypothesis that there is no cointegration (rank$r = 0$) against the alternative hypothesis that there is one or more cointegrating equations ($r > 0$). On the other hand, the Maximum Eigenvalue statistic tests the null hypothesis that the number of cointegrating equations is r against the alternative hypothesis that the number of cointegrating equations is $(r + 1)$. Cheung & Lai (1993) support cointegration test based on the trace statistic arguing that it is more robust to skewness and extreme kurtosis. Harris (1995) on the other hand prefer cointegration test based on the maximum eigenvalue statistic observing that it has a sharper alternative hypothesis which suppresses the number of cointegrating equations. Enders (2010) suggests that when the trace statistic and the maximum eigenvalue statistic provide conflicting results, then the trace statistic results are more reliable. Theoretically, if Y_t and X_t are cointegrated, then the residual (error term) derived from the regression of Y_t on X_t is stationary.

3.7.1.5 Optimum Lag Length Selection Criteria

The choice of an appropriate lag length is important in the estimation of the ARDL model since the use of long lags leads to over-parametization, serially correlated errors and unstable slopes/elasticities. On the other hand, short lags can lead to model under-fitting and biased estimates. An optimum lag length is one that ensures that the error term comes from a white noise process (serially uncorrelated errors) and ensures that slopes or elasticities are stable over time.

To determine an appropriate lag length, a number of methods were available. They included Log likelihood (LogL), Schwarz Bayesian Criterion (SBC), Hannan-Quinn Criterion (HQC) and Akaike Information Criterion (AIC). Though SBC, HQC and AIC are considerably effective in establishing the correct auto-regressive lag length even in the presence of auto-regressive conditional Heteroskedasticity (ARCH) error, AIC was preferred by the study since it yielded the least information. It confirmed the recommendation of Khim-Sen & Tai-leung Chong (2005) that for sample sizes of 60 and below like the case of this study, AIC selects optimal lengths without prejudicing parsimony.

For this study, a maximum lag of 2 was chosen according to the recommendation by Pesaran & Shin (1999) for annual data. But the optimum lag for each variable was determined through an automatic selection criteria. Unlike the fixed selection criteria which imposes untested restriction to the model before estimation, the automatic selection generates information about the model's lag structure from the data itself during estimation once the maximum lag is picked. According to Nwachukwu & Egwaikhide (2007), fixing the lag structure before estimation is the main cause of misspecification and wrong forecasts.

3.7.2 Estimation Procedure

This study employed the ARDL method developed by Pesaran & Shin (1995), Pesaran & Pesaran (1996) and Pesaran & Shin (1999) to estimate the ARDL model. The study's preference for ARDL method over others was motivated by its suitability for small sizes (Haug, 2002) such as the one for this study and the fact that it produces unbiased estimates and valid t-values even in the presence of endogeneity (Harris & Sollis, 2003; Jalil & Ma, 2008; Ojiambo, 2013) through appropriate lag lengths (Ali, Siong & Talha, 2016). Additionally, the method has the ability to integrate short-run adjustment and long-run equilibrium using ECM through linear transformation without losing long-run information

(Ali, Abdullah, & Azam, 2017). It also eliminates outliers using impulse dummies (Marques, Fuinhas & Marques, 2017; Marques, Fuinhas & Marques, 2019).

According to Pesaran & Pesaran (1997), ARDL procedure is implemented in two steps. The first step involves testing of the null hypotheses of no cointegrating relationship. This study employed the target-specific ARDL bounds testing approach to level relationship developed by Pesaran & Shin (2001). It used level elasticities in the conditional error correction (CEC) model (Appendix D) to test the null hypotheses of no cointegration betweengross capital formation and its determinants, $H_0 = \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7 = \eta_8 = 0$ against the alternative hypotheses of $H_1 \neq \eta_1 \neq \eta_2 \neq \eta_3 \neq \eta_4 \neq \eta_5 \neq \eta_6 \neq \eta_7 \neq \eta_8 \neq 0$. The calculated F-statistic from Wald test for cointegration were compared to two asymptotic critical values corresponding to polar cases of all variables being purely I(0) or purely I(1). The conclusions about the test results were based on thresholds provided by Narayan (2004). The study preferred Narayan's thresholds over those provided by Pesaran & Pesaran (1999) due their suitability for small samples (Boakye, 2008) such as the one for this study. According to Narayan (2004), if the calculated value of F-statistic falls below the I(0) critical value (lower bound value), the test fails to reject the null hypothesis and the study may conclude that there is no cointegration. If the calculated value of F-statistic exceeds the I(1) critical value (upper bound value), the test would reject the null hypothesis and conclude that cointegration exists. In both cases, knowledge of the cointegrating rank would not be mandatory. If the calculated value of F-statistic lied between I(0) and I(1) critical values, the test would be inconclusive, and knowledge of the cointegrating rank would be required to allow for further decisions.

This study's preference of the ARDL bounds testing approach over the traditional cointegration testing procedures was informed by the fact that unlike the traditional approaches to cointegration which require that series be integrated at the same order, Pesaran, Shin & Smith (2001) bounds test procedure can be applied to series that are not integrated at the same order provided the order does not exceed two. The choice was also motivated by the fact that Pesaran, Shin & Smith (2001) bounds test procedure does not require re-parametization of the model into corresponding vector error correction (VEC) model. The relaxation makes it easier for one to interpret the results.

The second step in the estimation process involved the estimation of long run elasticities (α_{1i}, α_{2i}, α_{3i},α_{4i},α_{5i}, α_{6i}, α_{7i}, α_{8i} and α_{9i}) and short run elasticities (θ_{1i}, θ_{2i}, θ_{3i}, θ_{4i}, θ_{5i},θ_{6i},θ_{7i},θ_{8i} andθ_{9i}) in model 3.1 and 3.2 respectively using ARDL method. This was after confirming that long-run cointegrating relationship exists. Statistical tests (t-tests and F-tests) were performed in order to establish statistical reliability of the parameter estimates and their precision. The t-statistic values (ratios of estimated coefficients and corresponding standard errors) were used to test the null hypotheses that the coefficients were equal to zero. The marginal significance values or probabilities of t-statistics were also calculated. These probabilities were compared against the theoretical p-value of 0.05 before making the decision of whether to accept or fail to accept the null hypotheses of the elasticities being equal to zero. R-squared was calculated in order to determine the fraction of variations in gross capital formation that was explained by the regressands. Theoretically, R-squared can equal to one if the model has a perfect fit and zero if the model has a poor fit. It can be negative if the model does not have a constant. The F-statistic was used to test the null hypothesis that all the model's coefficient excluding the constant were equal to zero. The probability of F-statistic represents the marginal significance level of the F-test.

3.7.3 Post-Estimation Econometric Diagnosis

Post-estimation diagnostic testing is an important component of the evaluation stage in research process. The purpose of conducting econometric diagnosis is to confirm whether the assumptions that underpin the estimation technique were observed or violated. In practice, passing of diagnostic tests is a vote of validity and reliability of the estimates for informing policy, forecasting and planning. This study cautions against the interpretation of the estimates that fail diagnostic tests since doing so is a recipe for wrong policy advice, imprecise forecasting and inaccurate plans by policy makers and planners.

Informed by these reasons, this study planned to conduct one data and a battery of eight residual tests. The data test involved the Ramsey's Regression Specification Error Test (RESET) of functional form. Residual tests included serial correlation test (Breusch-Godfrey LM Test), Heteroskedasticity test (Breusch-Pagan-Godfrey test and auto-regressive conditional Heteroskedasticity (ARCH) test), normality test (Jarque-Bera and histogram plus superimposed normal distribution density curve for residuals) and stability tests (CUSUM tests, CUSUM square tests and recursive coefficient tests).

3.7.3.1 Functional Form Test

The functional form of ARDL model was tested using Ramsey's Ramsey's Regression Specification Error Test (RESET). This was important because fitting a linear model to a non-linear relationship would lead to the failure by the regression analysis to capture the trend mathematically. The situation could lead to model inefficiency. Ramsey's RESET could reject the null hypothesis that the coefficients of the added variable(s) were jointly equal to zero. This was important given that the estimation of ECM model involved the addition of the residuals.

3.7.3.2 Serial Correlation Test

The presence of serial correlation undermines the model's accuracy by narrowing the confidence and prediction intervals. It can also reduce the standard errors which may lead to large t-values and wrong conclusions that the coefficients are statistically significant when they are not. The Breusch-Godfrey LM test was performed in order to detect the presence or absence of serial correlation in the study's econometric model. This was important because under serial correlation, a rise in the random error in one period of time affects the random error in the following period which can lead to biased estimates.

The study's preference of Breusch-Godfrey LM test over other tests was informed by the existence of lagged regressands among regressors. The test fails to reject the null hypothesis of no serial correlation if the F- or chi-square statistics are more than the alpha value of 0.05. But if the test rejects the null hypothesis of no serial correlation then the number of lags for both the explained and explanatory variables can be increased till the probabilities for F-and Chi-Square statistics are ≤ 0.05.

3.7.3.3 Heteroskedasticity Test

Heteroskedasticity is a condition where the variance of the disturbance term is not constant. Heteroskedasticity tests were conducted on the residuals because though its presence does not affect the biasedness of the estimates, it makes them inefficient. This is because in the presence of Heteroskedasticity, the confidence interval for extrapolated values become unrealistically too wide/narrow.

This study's preference of Breusch-Pagan-Godfrey Heteroskedasticity test over the traditional White Heteroskedasticity test was motivated by the study's moderate sample size.

The study would fail to reject the null hypothesis of no Heteroskedasticity if the F-statistic or chi-square statistic or scaled explained square (SS) were found to be more than the alpha value of 0.05. But if F-statistic or chi-square statistic or scaled explained square (SS) were less than the alpha value of 0.05, then HAC Covariance Matrix would have been used to adjust the disturbances in order to ensure that the standard errors are Breusch-Pagan-Godfrey Heteroskedasticity consistent. If the standard errors failed to become Breusch-Pagan-Godfrey Heteroskedasticity consistent then Auto-Regressive Conditional Heteroskedasticity (ARCH) model could have been used to specify the model and maximum likelihood (ML) method used to re-estimate the ARCH model.

3.7.3.4 Normality Test

ARDL estimation technique assumes that residuals are normally distributed around zero mean and constant variance. The Jarque-Bera statistic distributed with 2 degrees of freedom was used to test for normality of residuals. The study would accept the null hypothesis of a normal distribution if the Jarque-Bera statistic exceeded the absolute p-value or fail to accept the null hypothesis otherwise.

3.7.3.5 Stability Tests

CUSUM test, CUSUM square test and recursive coefficient tests were aimed at ensuring that the coefficients of gross capital formation model do not suffer from structural instability in the short-run and long-run. The cumulative sum (CUSUM) control chart developed by Brown, Durbin & Evans (1975) plots the cumulative sum of the recursive residuals and the 5 per cent critical lines against time. The study would conclude that there was parameter stability if the cumulative sum remained within the region defined by the 5 per cent bound lines. Theoretically, this would imply that the explanatory variables and the disturbance term were not positively correlated. That is, explanatory variables were truly exogenous.

The cumulative sum of the squares (CUSUMSQ) control chart developed by Brown, Durbin & Evans (1975) plots the cumulative sum of squares of residuals and the 5 per cent critical lines against time. The study would conclude that there was parameter or variance stability if the cumulative sum of squares of recursive residuals remained within the region defined by the 5 per cent bound lines. Theoretically, this would suggest that the explanatory variables and the disturbance term were not positively correlated. In other words, it would indicate that explanatory variables were truly exogenous.

The cumulative sum of the squares (CUSUMSQ)is the strictest diagnostic test after serial correlation test in ARDL estimation approach. According to Shrestha & Chowdhury (2005) an optimum lag is a function of residual sum of squares.

Recursive Coefficients Control Charts allow one to observe the evolution of coefficient estimates within two standard error boundaries as more data is included. Drawing these charts was important since it could enable the study to determine whether the estimated model would perform equally well outside the sample data. The study would conclude that there was parameter stability if the coefficients showed insignificant variations with the inclusion of more data. The preference of recursive coefficient control charts over the traditional F-statistic was motivated by the small sample size that could not allow the additional data to constitute a separate sample.

3.8 Summary of the Research Methodology

Generally, correlational research design was identified as the most appropriate design to guide this study due to its causal-effect nature. ADF test was preferred over the traditional unit root tests due the parametric nature of the data.ARDL bounds test approach to cointegration was preferred over Johansen approach because of its target-specific nature which makes it suitable for single equation ARDL model. AIC was preferred by the study over LogL, SBC and HQC for optimum auto-regressive lag length selection since it yielded the least information. ARDL model and ECM model were preferred for long-run and short-run specification due to the dynamic nature of the study's variables. ARDL method was adopted for estimation of the long-run and short-run models in view of ARDL specifications.Breusch-Godfrey LM test for residual correlation was preferred over other tests because of the existence of lagged regressands among regressors. Breusch-Pagan-Godfrey Heteroskedasticity test was preferred over the traditional White Heteroskedasticity test due to the study's modest sample size. Ramsey's Regression Specification Error Test (RESET) was selected due to its ability to account for the effect of ECM model's added residuals.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results for pre-estimation procedures, estimates of elasticities and slopes for ARDL and ECM models, there interpretation and discussion through the lenses of previous studies' findings. The chapter also presents results for post-estimation confirmatory tests of the estimates. Lastly, this chapter concludes by making a verdict on whether statistical, econometric and economic theory tests validate the reliability of the estimates for informing policy or not.

4.2 Pre-Estimation Procedures

4.2.1 Correlation Analysis

Table 4.1: Correlation Matrix

	GCF	GDS	MAID	BAID	FDI	DR	POP	TECH	POL
GCF	[1.0000]								

GDS	[0.0744]	[1.0000]							
	(0.3950)	-----							
	{0.6958}	-----							
MAID	[0.9528]	[0.1365]	[1.000]						
	(16.6120)	(0.7290)	-----						
	{0.0000}	{0.4720}	-----						
BAI	[0.5772]	[0.1996]	[0.6665]	[1.0000]					
	(3.7404)	(1.0778)	(4.7302)	-----					
	{0.0008}	{0.2903}	{0.0001}	-----					
FDI	[0.7472]	[−0.0154]	[0.7343]	[0.4290]	[1.0000]				
	(5.9493)	−0.0813	(5.7232)	(2.5132)	-----				
	{0.0000}	{0.9358}	{0.0000}	{0.0180}	-----				
DR	[0.9451]	[0.0565]	[0.8970]	[0.5488]	[0.6851]	[1.0000]			
	(15.3047)	(0.2993)	(10.7360)	(3.4742)	(4.9772)	-----			
	{0.0000}	{0.76669}	{0.0000}	{0.0017}	{0.0000}	-----			
POP	[0.9170]	[0.1514]	[0.9843]	[0.6533]	[0.6704]	[0.8879]	[1.0000]		
	(12.166)	(0.8106)	(29.5080)	(4.5664)	(4.7817)	(10.2114)	-----		
	{0.0000}	{0.4244}	{0.0000}	{0.0001}	{0.0001}	{0.0000}	-----		
TECH	[0.9617]	[0.0247]	[0.9493]	[0.5815]	[0.8116]	[0.9371]	[0.9207]	[1.000]	
	(18.5568)	(0.1307)	(15.9770)	(3.7821)	(7.3522)	(14.2120)	(12.4800)	-----	
	{0.0000}	{0.8969}	{0.0000}	{0.0008}	{0.0000}	{0.0000}	{0.0000}	-----	
POL	[0.1145]	[−0.09919]	[0.1109]	[0.0837]	[0.2359]	[0.1527]	[0.1226]	[0.0888]	[1.0000]
	(0.6096)	(−0.4883)	(0.5904)	(0.44)	(1.2846)	(0.8178)	(0.6537)	(0.4719)	-----
	{0.5470}	{0.6291}	{0.5597}	{0.6602}	{0.095}	{0.4204}	{0.5186}	{0.6406}	-----

KEY: Correlation coefficients are presented in square brackets [ ]; t-statistics are presented in parentheses ( ); the probabilities of the t-statistics are presented in curly brackets { }.

The results demonstrate that there is high multicollinearity in the study's data. For instance, the coefficient of correlationship between diaspora remittance and multilateral aid, population and multilateral aid, population and diaspora remittance, technology and multilateral aid, technology and foreign direct investment, technology and diaspora remittance and technology and population were in excess of the threshold of 0.8. Multicollinearity is said to be severe if the correlation coefficient exceeds 0.8 (Gujarati, 2005). The problem of high multicollinearity was circumvented by first differencing (see definitions of variables Table B, Appendix B) since lagging would lead to the loss of a lot of data. According to Mukras (1993), first differencing minimizes multicollinearity problem in time series data.

The effect of multilateral aid (MAID), Bilateral aid (BAID), foreign direct investment (FDI) and diaspora remittance (DR) on gross capital formation (GCF) in Kenya is procyclical. The cyclical relationship is demonstrated in Table 3 by positive and significant correlation between GCF and the foreign sources of capital.The procyclical behavior of multilateral and bilateral aids is consistent with the structure of multilateral and bilateral concessional loans. That is, loan aid is usually risk sensitive.The positive and significant correlation between gross capital formation and foreign direct investment is consistent with economic theory. It implies that FDI inflow reduces when gross capital formation declines, deepening the crisis. The procyclical behavior of diaspora remittance implies that diaspora remittance to Kenya is driven by investment motive and not altruistic motive. As such, it reduces when the diaspora's home country is experiencing economic downturns. The procyclical relationship between gross capital formation and the external sources of financing implies that multilateral aid, bilateral aid, foreign direct investment and diaspora remittance cannot be used as tools for macroeconomic stabilization by policymakers during capital formation downturns.

On the other hand, the positive significant correlations between multilateral aid and bilateral aid suggest the existence of complementary relationship between the two components of foreign aid. It suggests that multilateral and bilateral agencies can collaborate in order to ensure effectiveness in aid enhancing capital formation. The positive and significant correlation between multilateral aid and FDI suggest the existence of a strong vanguard effect in Kenya. That is, multilateral agencies involved in providing aid to Kenya are the ones who conduct foreign direct investment at the same time.

4.2.2 Unit Root Test

Augmented Dickey-Fuller unit root test was performed on ADF equations with both intercept and trend (equations 3.3 to 3.10) in level and after first differencing. The results were reported in table 4.2.

Table 1.2: Results of Unit Root Tests

	ADF Test Statistic (Intercept and Trend)		
Variable	**Level**	**Fist Difference**	**Order of Integration**
LNGCF	-1.671467	-6.616694***	I(1)
GDS	-5.667686***	-10.12323***	I(0)
LNMAID	-0.786341	-10.63569***	I(1)
LNBAID	-5.220637***	-6.504054***	I(0)
LNFDI	-5.045365***	-7.826766***	I(0)
LNDR	-4.486881***	-6.171721***	I(0)
LNPOP	-3.673193***	-7.464512***	I(0)
LNTECH	-2.300759	-5.960110***	I(1)
MacKinnon Critical Values for the Rejection of Unit Root			
	Level		**First Difference**
1 per cent level	-4.192		-4.199
5 per cent level	-3.521		-3.524
10 per cent level	-3.191		-3.193

Note: ***means the ADF statistic was significant at 1% level of significance. ** means the ADF statistic was significant at 5% level of significance. * means the ADF statistic was significant at 10% level of significance.

The unit root test results indicate that Augmented Dickey-Fuller (ADF) test accepted the null hypothesis of unit root for GDS, LNBAID, LNFDI, LNDR and LNPOP in level but accepted it for LNGCF, LNMAID and LNTECH after first difference at 5 per cent level of significance. The demonstration by ADF unit root tests that some of the series follow a random walk while other do not justified the study's employment of ARDL modelling developed by Pesaran, Shin & Smith (1995, 1999). It also validated the study's application of ARDL bounds testing procedure recommended by Pesaran, Shin & Smith (2001). The

application of ARDL model specification and ARDL bounds test procedure requires that the dependent variable for the model should be integrated of order I(1), while the explanatory variables can be I(0) or I(1) but not I(2).

The ADF unit root test results are in agreement with the graphical illustrations of level series and lagged series in (Figure C1 to Figure C9, Appendix C). It is evident that the series of integrated order I(0) are time invariant both in level and after first differencing, implying that their means and variances are constant. On the other hand, series of integrated order I(1) are time variant in level but time invariant after first differencing. It implies that differencing eliminates trends from the series.

4.2.3 Optimum Lag Selection Criteria

Table 4.3: Lag Structure Selection Results for top ten performing ARDL model specifications

Model	AIC	Adj. R-squared	Specification
1	-1.1948	0.6000	ARDL(1, 1, 1, 1, 1, 1, 1, 1)
2	-1.1115	0.5689	ARDL(1, 0, 1, 1, 1, 1, 1, 1)
3	-1.0540	0.5447	ARDL(1, 0, 1, 1, 1, 1, 1, 0)
4	-1.0146	0.5264	ARDL(1, 0, 1, 1, 1, 1, 0, 1)
5	-1.0062	0.5211	ARDL(1, 1, 1, 1, 1, 1, 1, 0)
6	-0.9846	0.5106	ARDL(1, 1, 1, 1, 1, 1, 0, 1)
7	-0.9630	0.5001	ARDL(1, 0, 1, 1, 1, 1, 0, 0)
8	-0.9486	0.4928	ARDL(1, 0, 0, 1, 1, 1, 0, 1)
9	-0.9386	0.4876	ARDL(1, 1, 1, 0, 1, 1, 1, 1)
10	-0.9237	0.4813	ARDL(1, 0, 1, 0, 1, 1, 1, 1)

ARDL(1, 1, 1, 1, 1, 1, 1, 1) model was automatically selected from among 128 ARDL model specifications. Results in Table 5 were extracted from a complete list of 128 models in Table G of Appendix G for Log likelihood (LogL), Akaike information criteria (AIC), Schwarz-Bayesian criterion (SBC) and Hannan-Quinn criterion (HQC). AIC was preferred over other criteria since it had the least information. That is, AIC had the least information of -1.1948 followed by HQC (-0.9621), SBC (-0.4335) and LogL (32.7270). The observations are in tandem with the views of Khim-Sen & Tai-leung Chong (2005). According to Khim-Sen *et al* (2005), for sample sizes of 60 and below like the case of this study, AIC selects optimal lag

lengths without prejudicing parsimony. Using AIC, a lag of 2 was selected in accordance with Pesaran & Shin (1999)'s recommendation for annual data. By moving down the lag, lag 1 was then selected since it yielded serially uncorrelated and stable elasticities. After picking the maximum lag of 1 for both the regressands and the regressors, the optimum lag for each variable was then selected automatically using AIC. Automatic selection for optimal lags was preferred by the study to fixed lag selection since it does not impose untested restriction to the model before estimation. Instead, it generates information about the model's lag structure from the data itself during estimation once the maximum lag is picked. According to Nwachukwu & Egwaikhide (2007), fixing the lag structure before estimation has been the main cause of misspecification and wrong forecasts.

4.2.4 Cointegration Test

4.2.4.1 Unrestricted Cointegration Rank Test (Trace)

Table 4.4: Results of Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.9303	246.0468	143.6691	0.0000
At most 1 *	0.8972	174.1196	111.7805	0.0000
At most 2 *	0.7592	112.6949	83.9371	0.0001
At most 3 *	0.6727	74.2512	60.0614	0.0020
At most 4 *	0.6161	44.0993	40.1749	0.0192
At most 5	0.3638	18.2480	24.2760	0.2380
At most 6	0.1895	6.0367	12.3209	0.4315
At most 7	0.0133	0.3626	4.1299	0.6100

*Denotes rejection of the hypothesis of no cointegrating equation at 0.05 level of significance.

**Denotes Mckinnon-Haug-Michelis (1999) p-values.

Results for unrestricted cointegration rank test (trace) for an adjusted sample of 1991 to 2017 under the assumption of no deterministic trend and lags interval in first difference of 1 to 1 revealed the presence of five cointegrating equations at 5 per cent level of significance. It implies that even if the series were not individually stationary, their linear combination was stationary. The five non-stationary series are therefore said to have cointegrating relationship.

Therefore, the null hypothesis of no cointegrating relationship was rejected by the trace test at 5 per cent level of significance. The existence of cointegrating relationship among the five I(1) series meant that the estimation of the determinants of gross capital formation could be best represented by ARDL and ECM models. This justified ARDL regression involving these variables without the risk of producing spurious estimates.

4.2.4.2 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Table 4.5: Results of Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.930329	71.92715	48.87720	0.0001
At most 1 *	0.897202	61.42468	42.77219	0.0002
At most 2 *	0.759213	38.44375	36.63019	0.0304
At most 3	0.672653	30.15186	30.43961	0.0543
At most 4 *	0.616132	25.85132	24.15921	0.0293
At most 5	0.363819	12.21136	17.79730	0.2830
At most 6	0.189538	5.674057	11.22480	0.3883
At most 7	0.013340	0.362606	4.129906	0.6100

*Denotes rejection of the hypothesis of no cointegrating equation at 0.05 level of significance, **Denotes Mackinnon-Haug-Michelis (1999) p-values.

The robustness of the unrestricted cointegration rank test (trace) results was checked by the unrestricted cointegration rank test (maximum eigenvalue). The results of the rank test in table 4.5 suggest the presence of three cointegrating equations.

4.2.4.3 ARDL bounds test

To determine the existence equation of cointegrating relationship between capital formation and its determinants, the study applied ARDL bounds test approach to cointegration developed by Pesaran, Shin & Smith (2001). The study tested the hypothesis that all elasticities for level relationship in conditional error correction (CEC) model (Appendix D) were jointly equal to zero. The results were reported in Table 4.6.

Table 4.6: ARDL Bounds Test Results

Test Statistic	Value	Significance level	I(0)	I(1)
F-Statistic	6.0414	10 per cent	1.92	2.89
K	7	5 per cent	2.17	3.21
		2.5 per cent	2.43	3.51
		1 per cent	2.73	3.90

Results for ARDL bounds test indicate that the calculated F-statistic of 6.0414 exceeds the I(1) upper bound critical value of 3.21 provided by Narayan (2004) at 5 per cent level of significance. According to Narayan (2004), if the calculated value of F-statistic exceeds the I(1) critical value (upper bound value), the test rejects the null hypothesis of no level relationship (all elasticities for long relationship in CEC model are equal to zero) and concludes that cointegration exists. Consequently, the study concluded that there exists cointegrating relationship between gross capital formation and the explanatory variables. The results paved the way for the estimation of long run relationship ARDL model and the speed of short-run adjustment to equilibrium following a shock to the system.

4.3 Diagnostic Tests Results

Econometric diagnostic tests were carried out in order to confirm whether the assumptions that underpin ARDL estimation method were observed or violated. In this respect, one data and a battery of eight residual tests were performed. The data test focused on the functional form test, Ramsey's Regression Specification Error Test (RESET). Residual tests were serial correlation test (Breusch-Godfrey LM Test), heteroskedasticity test (Breusch-Pagan-Godfrey test and autoregressive conditional heteroskedasticity test, ARCH), normality test (Jarque-Bera) and stability tests (CUSUM tests, CUSUM square tests and recursive coefficient tests). Results for Ramsey's RESET test, Breusch-Godfrey LM Test, Breusch-Pagan-Godfrey test, ARCH test and Jarque-Bera test are presented in table 4.7.

Table 4.7: Results of Econometric Diagnostic Tests for ARDL(1, 1, 1, 1, 1, 1, 1, 1) Model

Test	F Version	χ^2 Version
Ramsey's RESET*	$F[1, 11] = 0.011\ (0.918)$	Not Applicable
Breusch-Godfrey LM**	$F[2, 10] = 1.078\ (0.377)$	$CHSQ[2] = 4.964\ (0.084)$
Breusch-Pagan-Godfrey***	$F[15, 12] = 0.287\ (0.988)$	$CHSQ[15] = 7.386\ (0.95)$
ARCH****	$F[1, 25] = 0.621\ (0.438)$	$CHSQ[1] = 0.6542\ (0.419)$
Jarque-Bera*****	Not Applicable	$CHSQ[2] = 2.204\ (0.332)$

Note: p-values in parentheses ( ); *Ramsey's RESET test using the square of fitted values; **Breusch-Godfrey Serial Correlation Lagrange Multiplier serial correlation test; *** Breusch-Pagan-Godfrey Heteroskedasticity test based on the regression of squared residuals on squared fitted values; **** ARCH (Auto-Regressive Conditional Heteroskedasticity) test based on the regression of squared residuals on lagged squared residuals and a constant; ***** Jarque-Bera statisticbased on skewness and kurtosis of residuals test.

Results of econometric diagnostic tests indicate that gross capital formation model was correctly specified since Ramsey's Regression Specification Error Test (RESET) has a p-value of 0.9180 for F-statistic exceeded 0.05 threshold. Breusch-Godfrey Serial Correlation LM Test demonstrates that residuals for the model are serially uncorrelated given the Chi-square value 0.0836>0.05 after adjusting for 2 degrees of freedom. Breusch-Pagan-Godfrey Heteroskedasticity test has a p-value for the Chi-square test 0.946>0.05 after adjusting for 15 degrees of freedom while Auto-Regressive Conditional Heteroskedasticity (ARCH) test has a p-value of 0.4146>0.05 after adjusting for 1 degree of freedom. The evidence from the Breusch-Pagan-Godfrey and ARCH tests suggests that the residuals are homoscedastic and independent of regressors. The p-value for the Jarque-Bera Chi-square test is 0.3322 which is greater than the threshold p-value of 0.05 after adjusting for 2 degrees of freedom. Consequently, the study accepted the null hypothesis of normal distribution of the residuals for the model. The Jarque-Bera test results are robust for the graphical method as demonstrated by a well-behaved histogram plus superimposed normal distribution density curve for residuals (Figure H, Appendix H).

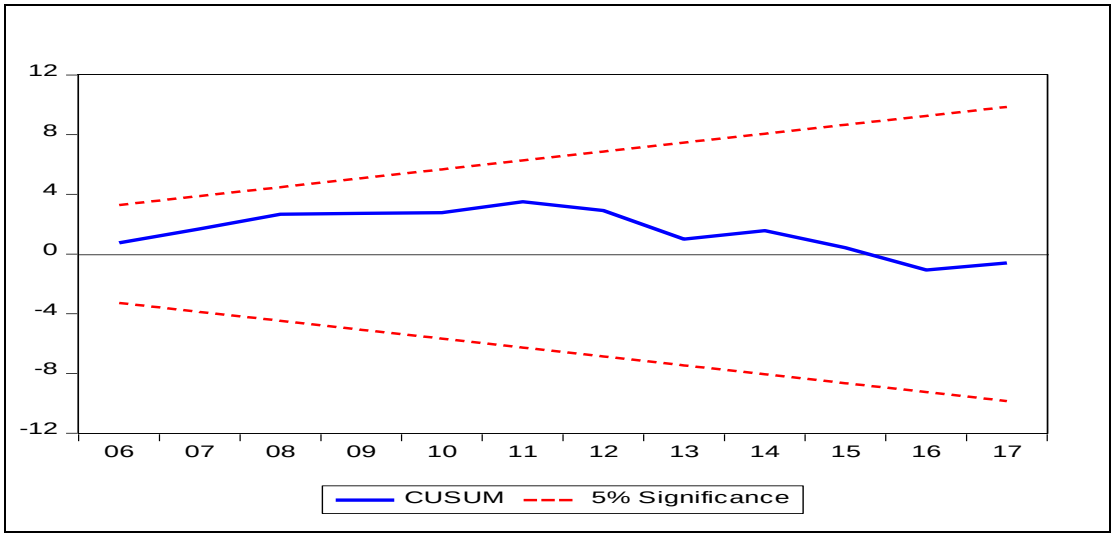

Figure 4.1: Cumulative Sum (CUSUM) of the Recursive Residuals

Plots of cumulative sum (CUSUM) suggest that CUSUM of residuals for gross capital formation model are within 5 per cent critical lines. Consequently, the study concluded that there is parameter stability in the gross capital formation model. In other words, gross capital formation does not suffer any structural break over the study's period. According to Brown, Durbin, & Evans (1975), if the CUSUM remains within the region defined by the 5 per cent bound lines, then the study should conclude that there is parameter stability. Econometrically, this implies that the explanatory variables and the disturbance term are not positively correlated. That is, explanatory variables are truly exogenous. This results are in agreement with Ramsey's RESET test in Table 9. This is further confirmed by recursive elasticities graphs which allow one to observe the evolution of elasticities within two standard errors as more data is included in the model (Figure I, appendix I). Consequently, this study concluded that the parameters of gross capital formation model are stable since they show insignificant variations with the inclusion of more data.

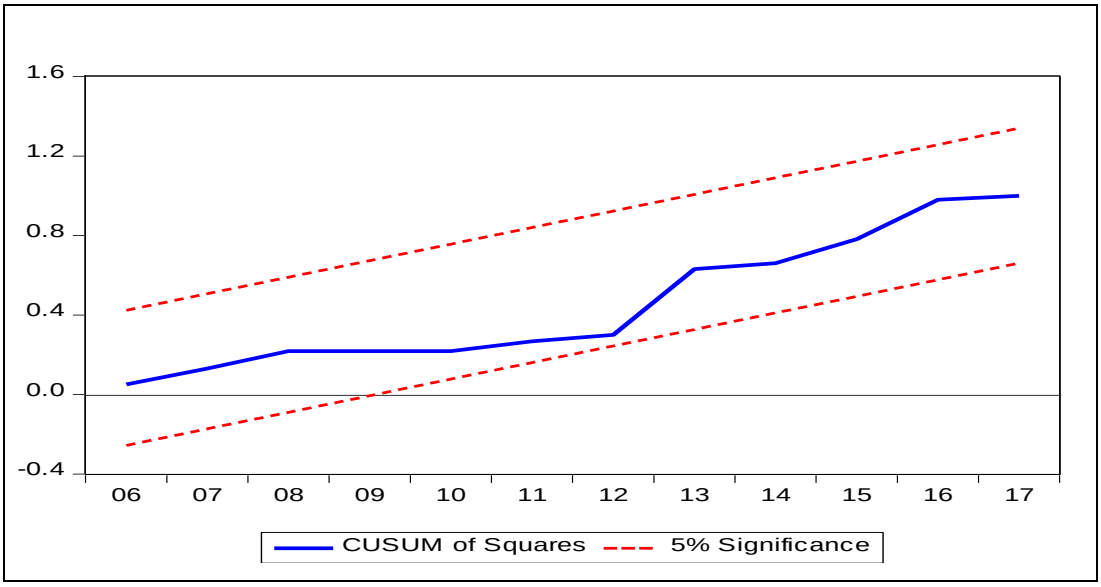

Figure 4.2: ***Cumulative Sum of Squares (CUSUMSQ)***

Control charts for cumulative sum of squares (CUSUMSQ) are in agreement with the findings of CUSUM chart. In practice, however, CUSUMSQ test is stricter than CUSUM test for serial correlation tests in ARDL estimation diagnostics. According to Shrestha & Chowdhury (2005) an optimum lag is a function of residual sum of squares. Developed by Brown, Durbin & Evans (1975), CUSUMSQ plots the cumulative sum of squares of residuals and the 5 per cent critical lines against time. According to Brown*et al* (1975), the study should conclude that there is parameter or variance stability if the CUSUMSQ of recursive residuals remain within the region defined by the 5 per cent bound lines. Based on the CUSUMSQ chart therefore, this study concluded that the explanatory variables and the disturbance term are not positively correlated.

The caveats demonstrates that the model estimates passed all econometric diagnostic tests. Thus paving the way for the interpretation of statistical tests of the estimates and their discussion through the lenses of economic theory and against benchmarks of previous studies' findings without fear of making spurious conclusions and wrong policy recommendations.

4.4 Long-Run and Short-Run Dynamics

The study analyzed the over-parameterized ARDL model 3.1 and ECM model 3.2. The dummy for political uncertainty was found to be statistically insignificant (see over-parameterized ARDL model, Table E, Appendix E) and failed to directly enter the short-run

model (see Table F, Appendix F). It was therefore dropped from the models since its inclusion did not add any value to their policy or forecasting power. Results for the parsimonious ARDL(1, 1, 1, 1, 1, 1, 1, 1) Model selected by Akaike Information Criterion (AIC) from 128 models are reported in table 4.8 and table 4.9 for long-run and short-run relationships respectively.

Table 4.8: Estimated Long-run Coefficients of Gross capital Formation Model

Independent Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGCF(-1)	0.0161	0.1769	0.0913	0.9288
GDS	-0.0008	0.0012	-0.7008	0.4968
GDS(-1)	-0.0016	0.0012	-1.4171	0.1819
LNMAID	-1.2075	0.3096	-3.9002	0.0021
LNMAID(-1)	0.8541	0.3422	2.4958	0.0281
LNBAID	0.0128	0.0533	0.2398	0.8145
LNBAID(-1)	-0.1005	0.0466	-2.1568	0.0520
LNFDI	0.0617	0.0263	2.3497	0.0367
LNFDI(-1)	0.0460	0.0207	2.2176	0.0466
LNDR	-0.0293	0.0568	-0.5166	0.6148
LNDR(-1)	0.1429	0.0565	2.5297	0.0264
LNPOP	-0.9766	0.9509	-1.0270	0.3247
LNPOP(-1)	2.1803	1.1035	1.9758	0.0716
LNTECH	-0.1917	0.0649	-2.9535	0.0121
LNTECH(-1)	-0.1249	0.0662	-1.8878	0.0835
C	0.1080	0.0788	1.3709	0.1955

R-squared	0.8222	S.E. of regression	0.1149
Adjusted R-squared	0.6000	Akaike info criterion	-1.1948
F-statistic	3.6996	Durbin-Watson	1.5647
Prob(F-statistic)	0.0139		

Table 4.9: Error Correction Mechanism (ECM) Representation for Gross Capital Formation Model

Independent Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δ(GDS)	-0.0008	0.0004	-1.8838	0.0840
Δ(LNMAID)	-1.2075	0.1542	-7.8290	0.0000
Δ(LNBAID)	0.0128	0.0175	0.7292	0.4799
Δ(LNFDI)	0.0617	0.0111	5.5601	0.0001
Δ(LNDR)	-0.0293	0.0232	-1.2637	0.2303
Δ(LNPOP)	-0.9766	0.2496	-3.9126	0.0021
Δ(LNTECH)	-0.1917	0.0375	-5.1178	0.0003
ECMT(-1)	-0.9838	0.1034	-9.5195	0.0000
R-squared	0.8934	Durbin-Watson stat		1.5647
Adjusted R-squared	0.8561	Akaike info criterion		-1.7662
S.E. of regression	0.0890			

4.4.1 Effect of Gross Domestic Saving on Capital Formation

At 5 per cent level of significance, the elasticity of gross domestic savings rate (GDS) fail statistical significance tests for short-run (ECM) and long-run (ARDL) models. The failure of domestic savings to achieve statistical significance is consistent with the popular view that domestic saving in developing countries has not been large enough to finance the required capital formation and to keep up with burgeoning population growth in these countries. The inability of domestic saving to attain statistical significance should be bad news to the Government of Kenya. It implies that Kenya's capital formation principally depends on foreign finance.

4.4.2 Effect of Multilateral and Bilateral aids on Capital Formation

The elasticity of multilateral aid is statistically different from zero in the short-run and during the current year in the long-run at 5 per cent level of significance. The negative sign (-1.2224) in the short-run and during the current year in the long-run was a priori expected. It implies that the debt element in concessional multilateral loan which was used as a proxy for multilateral aid dominated the grant element. According to the debt overhang hypothesis (Cohen, 1993), short-term debt tends to exert negative pressure on capital formation as

returns from capital investment are spent on interest servicing and principal repayment. An elasticity of -1.2224 implies that a one per cent increase in multilateral aid to Kenya leads to 1.2224 per cent reduction in gross capital formation in the short-run and in the long-run during the aid receipt year other conditions remaining constant. However, a positive elasticity of lagged multilateral aid of 0.8636 in the long-run suggests that a one per cent rise in multilateral aid leads to 0.8636 increase in gross capital formation in the long-run a year after aid receipt other factors remaining unchanged. The positive sign of lagged elasticity of multilateral aid in the long-run a year after delivery signifies reduction in pressure from interest servicing and principal repayment.

On the other hand, the elasticity of bilateral aid is not statistically different from zero in the short-run and during the current year in the long-run. However, the effect of bilateral aid on gross capital formation is significant in the long-run, one year down the line. Thus, unlike multilateral aid which exerts positive impact on gross capital formation in the long-run, a year after aid delivery, bilateral aid exerts a significant negative impact on gross capital formation over the same horizon. The elasticity of -0.1005 indicates that a one per cent increase in bilateral aid to Kenya leads to 0.1005 per cent reduction in gross capital formation *ceteris paribus*. A plausible explanation for the negative effect of bilateral aid on gross capital formation in the long-run, one year after aid delivery is inefficiency in bilateral aid delivery that makes them costly. It can also be attributed to inadequate surveillance and lack of technical support from bilateral agencies and the bigger debt element in bilateral aid loan. Another plausible explanation is the dominance of the debt component over the grant element in concessional bilateral loan which was used as a proxy for bilateral aid. According to the debt overhang hypothesis (Cohen, 1993), a huge debt component in aid tends to exert negative pressure on capital formation as returns from investment are used on interest servicing and principal repayment instead of recapitalization. The results are consistent with those of Ozturk (2011) for six Middle East and North African (MENA) countries (Yemen, Jordan, Tunisia, Algeria, Morocco and Egypt) and those of Uneze (2012) for 14 West African countries.

4.4.3 Effect of Foreign Direct Investment on Capital Formation

As expected*ex-ante*, the elasticity of foreign direct investment (FDI) has the theoretical positive sign. It is statistically significant at 5 per cent level of significance in the short-run and long-run during the investment year. The positive elasticity of 0.0617 implies that a 1

percent increase in FDI leads to 0.0617 per cent rise in gross capital formation in the short-run and long-run in the investment year, *ceteris paribus*. The effect remains positive and significant in the long-run one year after investment, though it declines from 0.0617 to 0.0460 representing 0.0157 percent reduction. The reduction in the magnitude of the impact a year after FDI in the long-run can be attributed to depreciation of FDI's fixed assets or repatriation of profits instead of ploughing them back. The elasticity of 0.0460 implies that 1 percentage increase in FDI leads to 0.0460 percent rise in gross capital formation. The results are consistent with the findings of Krkoska (2001) for central and eastern European countries, Miguel (2006) for Latin America, Mbaluku (2011) for Kenya and Onyeanu (2014) for Nigeria.

This results convey good news to the Government of Kenya given the non-debt creating nature of FDI. Evidence demonstrates that in addition to filling the saving gap, FDI has the potential of bridging technology and skill gaps. But the demonstration by the correlation matrix that the relationship between FDI and gross capital formation is procyclical (reduces during crisis and increases during stable periods) calls for prudence on the part of policymakers when designing capital formation policies with FDI as one of the significant sources of financing.

4.4.4 Effect of Foreign Diaspora Remittance on Capital Formation

This study found the elasticity of diaspora remittance to be statistically significant in the long-run one year after remittance. The positive sign is in agreement with economic theory and the procyclical intuition between gross capital formation and diaspora remittance (Table 3). The elasticity of 0.1429 implies that a 1 per cent increase in diaspora remittance leads to 0.1429 per cent rise in gross capital formation one year later, assuming other factors remain constant. The results are consistent with those of Adams (1998) for Pakistan, Osili (2004) for Nigeria and Woodruff & Zenteno (2007) for Mexico.

The results should be good news to the government of Kenya given the non-debt creating behaviour of diaspora remittance. But the good news should be celebrated with caution given the procyclical characteristic of diaspora remitters to Kenya as suggested by the positive significant relationship between diaspora remittance and gross capital formation in the correlation matrix (Table 3). The positive and significant correlation implies that diaspora remittance to Kenya reduces when the country is experiencing capital formation downturns

and increases during stable periods. The implication of this behaviour is that diaspora remittance cannot play the macroeconomic role of stabilization in Kenya.

4.4.5 The Speed of Error Correction Mechanism

The results in table 11 indicate that the error correction term (ECMT(-1)) is statistically significant at 5 per cent level of significance. Its coefficient (-0.9838) has the theoretically appropriate (negative) sign. It suggests that 98.38 per cent of deviations from short-run equilibrium due to some shocks to the system are corrected in one year. In other words, if actual equilibrium is too low, the ECM term will raise it by 98.38 per cent in one year. Similarly, if actual equilibrium is too high, the ECM term will reduce it by 98.38 per cent in one year. The negative and highly significant ECM term results reinforce those yielded by the study's bounds test for cointegration. According to Engle & Granger (1987) representation theory, negative and significant error correction term signifies long run Granger causality running from explanatory variables to the explained variable.

4.4.6 Joint Effect of Gross Domestic Savings, Multilateral Aid, Bilateral Aid, FDI, Diaspora Remittance on Gross Capital Formation

R-squared for the long-run model is 0.8222. It implies that in the long-run, 82.22 per cent of the variations in gross capital formation are jointly explained by domestic savings, multilateral aid, bilateral aid, foreign direct investment, diaspora remittance and control variables before adjusting for the degrees of freedom. Only 17.78 per cent of the variations are not explained. Since majority of the variations in gross capital formation are explained, the study concluded that the long run model fitted sample data well. The results are in line with F-test rejection of the null hypothesis that all elasticities for long run relationship are zero.

R-squared for the short-run modelis reported in table 11 is 0.8934. The results indicate that 89.34 per cent of the variations in gross capital formation are jointly explained by domestic savings, multilateral aid, bilateral aid, foreign direct investment, diaspora remittance and control variables in the short-run. Only 10.66 per cent of the variations are unexplained. Because most of the variations in gross capital formation are explained, the study concluded that the short-run model fitted sample data properly. This conclusion was reinforced by the presence of non-zero elasticities in the coefficient column in table 11.

4.5 Conclusion

The models estimates passed all econometric diagnostic tests, statistical tests and economic theory tests. The successful tests demonstrated that the estimates are valid and reliable for informing policy.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings, conclusion, recommendations for policy consideration, contribution of study, limitations of the study and suggestions for further research under subsections 5.2, 5.3, 5.4, 5.5, 5.6 and 5.7 respectively.

5.2 Summary of Findings

5.2.1 Gross Domestic Savings and Capital Formation

At 5 per cent level of significance, the elasticity of gross domestic savings(GDS) failed statistical significance tests for short-run (ECM) and long-run (ARDL) models.

5.2.2 Multilateral Aid, Bilateral Aid and Capital Formation

At 5 per cent level of significance, the elasticity of multilateral aid was found to have negative significant effect on gross capital formation in the short-run and in the long-run during the current year. However, the effect becomes positive and significant in the long-run a year after aid delivery. On the other hand, the elasticity of bilateral aid was not significant in the short-run and in the long-run during the aid delivery year. However, the effect of bilateral aid on gross capital formation was negative and significant in the long-run, one year later.

But correlation analysis found procyclical relationship between multilateral aid and gross capital formation. That is, multilateral aid does not increase during crises (due to the debt element in concessional loan that create risk evasiveness).

5.2.3 Foreign Direct Investment and Capital Formation

The elasticity of foreign direct investment (FDI) was found to be statistically significant at 5 per cent level of significance in the short-run and long-run during the investment year. The elasticity remains positive and significant in the long-run one year after investment.

5.2.4 Diaspora Remittance and Capital Formation

This study found the elasticity of diaspora remittance to be positive and significant in the long-run one year after remittance at 5 per cent level of significance.

5.3 Conclusions

This study's first hypothesis stated that gross domestic saving does not affect gross capital formation in Kenya. Since results support the null hypothesis, the study concluded that there is insufficient evidence that domestic saving affects gross capital formation in Kenya.

The second null hypothesis of this study stated that multilateral aid and bilateral aid do not differently affect gross capital formation in Kenya. Given that the results do not support the null hypothesis, the study concluded that there is sufficient evidence that multilateral aid and bilateral aid differently affect gross capital formation in Kenya.

The third hypothesis of this study stated that foreign direct investment does not affect gross capital formation in Kenya. Since the results do not support the null hypothesis, the study concluded that there is sufficient evidence that FDI affects gross capital formation in Kenya.

The fourth hypothesis for this study stated that diaspora remittance does not affect gross capital formation in Kenya. Because results do not support the null hypothesis, the study concluded that there is sufficient evidence that diaspora remittance affects gross capital formation in Kenya.

Overall, the study concluded that in the long-run, gross capital formation in Kenya is enhanced by foreign aid and direct international investment.

5.4 Recommendations for Policy

On the basis of the above conclusion, the study proposed a set of policy prescriptions for consideration by the government of Kenya in order to enhance the positive effect of multilateral aid, foreign direct investment and diaspora remittance. The study also proposed policies to mitigate the negative effect of bilateral aid on gross capital formation in Kenya.

5.4.1 Domestic Saving Policy Recommendations

The failure of domestic saving to achieve statistical significance means that Kenya's capital formation primarily depends on outsourcing. This is dangerous to the domestic economy since over-dependence on outsourcing can lead to financial traps defined by vulnerability to sudden reversals and rises in domestic interest rate driven by the spreads of international loans and real interest rate appreciation. To cushion the economy against external shocks, this

study proposed measures for domestic saving mobilization in order to strengthen the inward-looking financing strategy to augment the observed outward-looking strategy. First, a credit policy to tighten consumption credit should be put into place. Two, the government of Kenya should avail pension funds for investment and capital formation. Three, the government of Kenya should through austerity measures ensure that tax/GDP ratio remains within 10-12 per cent brackets in order to enhance public saving. Four, develop a well regulated banking network in order to enhance the intermediation process. In this network, public banks such National Bank of Kenya and Kenya Commercial Bank should be allowed to play a bigger role in the intermediation process given that they have a moral obligation of compensating for credit cuts by private banks during financial crises.

5.4.2 Multilateral Aid-Bilateral Aid Policy Recommendations

One, since multilateral aid and bilateral aid were found to differently affect gross capital formation in the long-run, there is need for collaboration among multilateral and bilateral aid agencies. Specifically, this study recommends that since bilateral aid negatively affects gross capital formation to Kenya while multilateral aid positive affects gross capital formation in the long-run, development assistance committee (DAC) member countries should deliver bilateral aid to Kenya through multilateral channels. This might reduce the negative effect of bilateral aid on capital formation in Kenya. Two, in order to maximize the positive effect of multilateral aid on gross capital formation, the government of Kenya should, one, enhance transparency and accountability in the utilization of multilateral aid. Three, this study recommends that fungibility of aid should be minimized since it is the principal cause of misapplication of aid funds. Four, since multilateral aid may not be reliable as a tool for stabilizing of gross capital formation during crises due to its procyclical behaviour, this study recommends public-private-partnership between multilateral aid agencies and domestic private investors. This will augment non-collaborative multilateral aid. This recommendation is informed by the existence of vanguard effect as demonstrated by the positive and significant correlationship between multilateral aid and FDI.

5.4.3 Foreign Direct Investment Policy Recommendations

The government of Kenya should create an enabling environment for foreign direct investment by, one, rectifying those parts of the tax system that create obstacles to foreign direct investment. Two, by guaranteeing that rules and regulations and their applications are guided by the principle of non-discrimination between international and local businesses and

that they are in line with international law. Three, eliminate hurdles to international trade. Four, offer the right of unrestricted transfers connected to an investment and shielding against haphazard expropriation. Five, create a framework that fosters good competition in the domestic market.

5.4.4 Diaspora Remittance Policy Recommendations

To create a conducive investment climate for the diaspora community, the government of Kenya should, one, negotiate for lower costs of remittance with authorities of countries that host majority of Kenya's diaspora remitters. Two, it should work with the international community to ensure transparency in remittances. This will ensure that direct and indirect costs and remittances fees are made public, and thus enable remitters to make rational decisions. Three, the government should put into place an incentive structure that motivates internal migration and domestic remittance in order to cushion the economy against sudden reversals in diaspora remittance during crises. The policy advice is based on the positive and significant correlation between diaspora remittance and gross capital formation which implies that remittances to Kenya are procyclical. That is, they decline during economic crises and increase during stable times.

5.5 Contribution of the Study

5.5.1 Contribution of the Study to Economic Theory

This study contributes to macroeconomic theory in general and capital formation theory in particular. Specifically, suggests that the neoclassical theory that capital formation is accelerated by domestic savings does hold for Kenya. It supports the popular view that domestic saving in developing countries has not been large enough to finance the required capital formation and to keep up with burgeoning population growth in these countries.However, it accepts the big-push hypothesis that the role of foreign aid in developing countries is to boost capital formation. It rejects the hypothesis that aid is dead in Africa. Further, it rejects their proposition that aid to Africa should be replaced by FDI. Instead, it proposes a financing model whereby foreign aid complements FDI and diaspora remittance in financing capital formation in Kenya. Moreover, this study rejects the hypothesis that diaspora remittance is countercyclical. Instead, it reinforces the antithesis that investment motivated diaspora remittance is risk evasive and therefore procyclical.

5.5.2 Contribution of the Study to Policy Makers

From the policy perspective, this study contributes to policy direction by providing the answer to the unsettled policy question of whether the government of Kenya should respond to the problem of low capital formation by deploying policies which favour mobilization of domestic saving, or appeal for bilateral aid/multilateral aid or offer incentives to attract more foreign direct investment and diaspora remittance. It is expected that policy lessonsfrom this study's findings will enhance policymakers capacity to design a capital formation policy framework that takes into account the relative contribution of each source of financing. Knowledge of relative effects provides financing alternatives in the absence/reduced aid. This is especially significant for Kenya given thatthe World Bank's classification of the country as a low middle-income country in 2014disqualifies her from accessing multilateral concessional loans from the World Bank's IDA window and reduces the amount of bilateral aid from DAC member countries.

In a nutshell, policy lessons from the study findings will guide capital formation process and ensure the country's economic stability as it transits from being aid over-dependent to less aid dependent. The stability of the macroeconomic variable is critical to Kenya's realization of her aspiration of becoming a highly industrialized middle-income country that is able to provide a high quality of life to her citizens by 2030.To this end, policymakers should implement policy strategies that will allow domestic saving to play a significant role in the country's capital formation process.

5.6 Limitations of the Study

To avoid over-parameterization and the associated residual serial correlation problem in the study's auto-regressive distributed lag model, certain sources variables whose effect on gross capital formation remain issues of policy concern were not considered. For instance, debt was not included in the model despite public concern in recent years about the implications of Kenya's fast growing foreign debt on her economy. This study notes that domestic saving was not disaggregated. Yet, in practice domestic saving is done by microeconomic agents such as households, firms and the government. Even though foreign aid was disaggregated into bilateral and multilateral aids, in practice, bilateral aid is delivered by individual Development Assistance Committee (DAC) member countries or non-traditional bilateral donors such as China or by private sector institutions (Bilateral FDI) or through public-private partnerships (PPP). Similarly, the study limited itself to aggregate multilateral aid.

Yet in practice, multilateral aid is delivered by multilateral financial institutions such as The World Bank and the International Monetary Fund (IMF). In terms of direct international investment, the study limited itself to FDI and investment by the diaspora remitters. But in practice, besides FDI and diaspora remittances, international direct investment is done via portfolio equity, private grants and private debts.

5.7 Direction for Future Studies

This study recommends that future researches should focus on the effect of multilateral and bilateral grant aids on gross capital formation in Kenya. In that case, multilateral and bilateral grant aid (aid without debt element) will serve as control variables for this study's concessional multilateral and bilateral loan (aid with debt element) which were used as proxies for multilateral and bilateral aid, thus creating a with-and-without research design. Findings based on the approach will validate/invalidate this study's justification for differences in the effect of multilateral aid bilateral aid on gross capital formation in Kenya.

This study also suggests that future studies investigate the effect of domestic savings, multilateral aid, bilateral aid, FDI and diaspora remittance on gross capital formation disaggregates such as plant, machinery, and equipment; land improvement; railways, roads, ports and airports construction; building of hospitals, schools, offices, industrial and commercial buildings and private residential houses. It will be interesting to see how these sub-sectors respond to changes in domestic savings, foreign aid and direct international investment in Kenya. It is the author's conviction that findings based on sectoral studies will be important in informing target-specific policies which may reinforce the broad-based policies recommended by this study.

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APPENDICES

APPENDIX A: DATA

Table A1

Refined Data

	LNBAID	LNDR	LNFDI	LNGCF	LNMAID	LNPOP	LNTECH	POL	GDS
1975	0.106593	-0.3372	-0.31235	-0.26261	-0.41897	0.037416	0	0	
1976	0.019041	-0.28746	0.995322	0.173707	0.574762	0.037613	0	0	86.30014
1977	0.138305	0.623469	0.197957	0.417157	0.439686	0.037772	0	0	1.871857
1978	-0.46087	0.357591	-0.49626	0.394617	0.319734	0.037967	0	0	-80.8453
1979	-0.09426	-0.32208	0.892614	-0.33693	0.295201	0.03822	0	0	8.94634
1980	0.18043	0.371604	-0.06217	0.455792	0.019499	0.03846	0	0	34.07769
1981	0.181022	1.040405	-1.72151	-0.12574	0.560832	0.038634	0	0	-27.7612
1982	0.084369	-0.14453	-0.08329	-0.10833	0.367099	0.038651	0	1	-16.0166
1983	0.482743	-0.1578	0.602735	-0.11967	0.427842	0.03846	0	-1	19.02054
1984	0.110867	-0.02234	-0.79	-0.01919	0.093721	0.038039	0	0	-11.9566
1985	0.29546	0.150747	0.984526	0.235971	0.327321	0.037453	0	0	37.68895
1986	0.125112	-0.23627	0.126434	0.01659	0.224908	0.036818	0	0	-25.2297
1987	-0.20776	0.236049	0.18514	0.204853	0.115335	0.036169	0	1	-8.61479
1988	0.339864	0.148122	-4.54598	0.09532	0.339506	0.035449	0	-1	12.55052
1989	0.171106	0.152303	5.003281	-0.0325	0.085342	0.034665	0	0	-45.0443
1990	-0.02769	0.446581	-0.08579	0.005809	0.312344	0.033843	0	0	85.77459
1991	0.239861	-0.11583	-1.10922	-0.19217	0.051126	0.033047	2.079442	0	-51.5019
1992	-0.33853	-0.07722	-1.07866	-0.21016	0.007047	0.032276	0.318454	1	-11.9156
1993	0.04378	0.028296	3.12432	-0.31515	0.464894	0.031487	0.241162	-1	5.306762
1994	0.721943	0.150399	-2.97503	0.309548	0.177967	0.03068	-0.07411	0	32.24983
1995	0.036914	-0.4509	1.739583	0.357311	0.011358	-0.12565	0.074108	0	-34.7841

1996	0.003939	0.00109	0.942508	-0.0875	-0.09429	0.184692	0.068993	0	-16.3863
1997	-0.26263	1.755368	-0.55831	0.091739	0.169652	0.028482	0.382992	1	17.34369
1998	-0.05455	0.048625	-0.85283	0.172647	0.168471	0.027985	0.204794	-1	-1.30594
1999	0.250847	0.094859	0.673664	-0.1634	0.298058	0.027656	-0.07696	0	-3.72033
2000	-0.19243	-0.08357	0.758104	0.100736	0.160458	0.02746	0.039221	0	30.08439
2001	-0.01712	-2.35779	-3.03651	0.099235	0.127908	0.02728	-0.03922	0	-47.253
2002	0.813696	0.116462	1.645913	-0.20678	0.174582	0.027124	-0.08338	1	29.40429
2003	0.446701	0.141378	1.084582	0.21408	0.174968	0.027096	-0.04445	-1	27.14023
2004	1.125771	1.741323	-0.57342	0.106718	0.053698	0.027208	0.342945	0	25.41842
2005	-2.86238	0.122905	-0.77659	0.19237	0.030322	0.027392	0.092373	0	-23.3455
2006	0.34363	0.294457	0.871542	0.370412	0.097672	0.027579	0.187212	0	52.76768
2007	0.992597	0.123128	2.66732	0.310329	0.096201	0.027686	0	1	-41.708
2008	0.535338	0.03361	-2.0327	0.071278	0.112033	0.027673	0.429563	-1	-42.0156
2009	-0.12856	-0.05499	0.196794	0.015472	0.11062	0.027508	-0.27193	0	1.705252
2010	-0.04406	0.082061	0.426064	0.147411	0.06969	0.027226	0.472604	0	12.02704
2011	0.059619	0.309504	2.097761	0.094857	0.146842	0.026938	0.561469	0	-23.0518
2012	0.337411	0.25933	-0.04949	0.174425	0.049153	0.026628	-0.09309	1	37.20984
2013	-0.1946	0.074168	-0.20985	0.021513	0.018424	0.026186	0.032003	-1	-48.5512
2014	0.053532	0.099764	-0.30975	0.217443	0.042558	0.025594	0.038615	0	60.01914
2015	-0.00299	0.085431	-0.28139	0.004445	-0.02556	0.024918	0.037179	0	-17.0573
2016	-0.05972	0.105987	-0.45435	-0.12587	0.051655	0.024208	0.049832	0	1.137856
2017	0.422299	0.117522	0.534584	0.168364	0.106684	0.023565	-0.06454	1	-48.4166

Source of raw data: World Bank (htt://www.indexmundi.com/facts/Kenya/IP.PAT.RESD.csv)

Table A2

Raw Data

	POP	GCF	GDS	MAID	BAID	FDI	DR	TECH	POL
1974	13077341	767113792.2	551102873.6	148665.4636	6006084.73	23429677.1	18493983.7	0	0
1975	13575907	589941433.4	438512267.7	97780.34808	6681657.12	17144154.4	13200347	0	0
1976	14096263	701857563.2	727360704.3	173727.1196	6810103.09	46385140.9	9902445.82	0	0
1977	14638890	1065167789	1220089028	269662.7313	7820219.21	56539286	18471897.1	0	0
1978	15205374	1580512995	1060216603	371261.4418	4932473.44	34421239.4	26412599.7	0	0
1979	15797776	1128424766	1016143385	498751.278	4488761.5	84039590.3	19139580.3	0	0
1980	16417197	1780002256	1320180449	508572.0732	5376333.35	78973977.7	27753504.6	0	0
1981	17063876	1569678543	1348689738	891083.889	6443221.97	14120252.4	78552472.1	0	0
1982	17736326	1408515879	1161800495	1286315.871	7010421.5	12991790.3	67981793.8	0	1
1983	18431761	1249652479	1221789414	1973135.493	11360477.1	23737417.9	58058017.1	0	0
1984	19146400	1225904540	1138791020	2167002.975	12692446	10773100.5	56775477.9	0	0
1985	19877083	1552163688	1490629293	3006166.826	17055395.5	28834661.4	66012969.5	0	0
1986	20622560	1578129624	1575089191	3764345.893	19328468.3	32720852.8	52121712.4	0	0
1987	21382112	1936909389	1528643961	4224534.881	15702516.4	39375853.4	65998394	0	1
1988	22153676	2130622124	1675420974	5932320.424	22058205.5	417769.044	76535288.9	1	0
1989	22935092	2062495547	1081609111	6460829.425	26174642.3	62206191	89126313.6	1	0
1990	23724579	2074510917	1626005086	8829529.938	25459906.7	57091912	139300836	1	0
1991	24521703	1711810591	1606982571	9292686.065	32361371.6	18829916.5	124065510	8	0
1992	25326078	1387342830	1396701237	9358407.256	23067653	6403120.75	114845717	11	1
1993	26136216	1012315025	1288055834	14897135.88	24099999.7	145635321	118141765	14	0
1994	26950513	1379592058	1603257526	17798881.99	49608128.9	7434071.19	137315873	13	0
1995	23768296	1972099081	1437913527	18002188.86	51473595.3	42336806	87477973	14	0
1996	28589651	1806878765	1054000567	16382367.47	51676732.7	108653643	87573390.8	15	0
1997	29415659	1980481834	955392306.4	19411345.13	39740794.4	62168767.5	506662339	22	1

1998	30250488	2353697807	853532570	22973218.12	37630976.9	26496717.8	531907516	27	0
1999	31098757	1998882104	730778401.4	30950432.58	48360050.9	51970934.7	584834216	25	0
2000	31964557	2210732136	845528809.8	36337321.31	39894821.3	110917768	537944820	26	0
2001	32848564	2441369396	578760379	41295503.61	39217742.4	5324263.04	50905149.1	25	0
2002	33751739	1985309331	566339069	49172562.23	88484316.5	27610262.2	57192686	23	1
2003	34678779	2459245412	707890065.8	58574754.36	138313924	81676756.7	65877968	22	0
2004	35635271	2736207306	1064754835	61806094.44	426365480	46032664.1	375826121	31	0
2005	36624895	3316607901	1352951169	63708852.33	24359267.1	21173824.5	424975521	34	0
2006	37649033	4803547617	2433074344	70245427.51	34347948	50618028.6	570485843	41	0
2007	38705932	6551430012	3360723805	77338832.34	92678766	728966432	645235961	41	1
2008	39791981	7035450052	3230025372	86507319.52	158297626	95481107.9	667290900	63	0
2009	40901792	7145151825	3159489881	96626146.45	139200885	116247548	631586996	48	0
2010	42030676	8280018288	3470487665	103600228.8	133200294	178000393	685601514	77	0
2011	43178274	9103895089	3012088718	119986820.1	141383071	1450330199	934302966	135	0
2012	44343467	10838742295	3735030595	126031887.2	198122127	1380301228	1210914372	123	1
2013	45519981	11074442338	2818087446	128375376.4	163086315	1119014547	1304139553	127	0
2014	46700055	13764361310	3817643926	133956730.6	172054516	820945835	1440956575	132	0
2015	47878336	13825674257	4520547428	130575812.4	171540773	619595031	1569470059	137	0
2016	49051534	12190538381	5404306640	137497932.9	161595509	393357488	1744947994	144	0
2017	50221142	14425879786	3844259174	152977736.2	246508166	671358252	1962553756	135	1

Source: World Bank

APPENDIX B: CORRELATION MATRIX OF LOG FIRST DIFFERENCED DATA

Table B

Correlation Matrix

	ΔLNGCF	ΔGDS	ΔLNMAID	ΔLNBAID	ΔLNFDI	ΔLNDR	ΔLNPOP	ΔLNTEC	ΔPOL
ΔLNGCF	[1.000] ----- -----								
ΔGDS	[0.028] (0.179) {0.859}	[1.000] ----- -----							
ΔLNMAID	[0.819] (9.138) {0.000}	[0.331] (1.825) {0.079}	[1.000] ----- -----						
ΔLNBAID	[0.029] (0.153) {0.880}	[0.122] (0.639) {0.528}	[0.150] (0.789) {0.437}	[1.000] ----- -----					
ΔLNFDI	[−0.128] (−0.668) {0.510}	[−0.072] (−0.374) {0.711}	[0.185] (0.976) {0.338}	[0.132] (0.694) {0.494}	[1.000] ----- -----				
ΔLNDR	[0.028] (0.146) {0.887}	[0.381] (2.141) {0.041}	[0.050] (0.221) {0.796}	[0.129] (0.674) {0.506}	[0.174] (0.918) {0.367}	[1.000] ----- -----			
ΔLNPOP	[−0.351]	[0.068]	[−0.110]	[−0.007]	[−0.049]	[0.092]	[1.000]		

	(−1.946) {0.062}	(0.356) {0.725}	(−0.577) {0.569}	(−0.037) {0.971}	(−0.256) {0.800}	(0.479) {0.636}	----- -----		
ΔLNTEC	[−0.253] (−1.359) {0.186}	[−0.263] (−1.415) {0.169}	[−0.099] (−0.515) {0.611}	[0.015] (0.076) {0.940}	[−0.148] (−0.777) {0.444}	[0.102] (0.533) {0.598}	[0.020] (0.105) {0.0.918}	[1.000] ----- -----	
ΔPOL	[0.031] (0.161) {0.873}	[0.066] (0.345) {0.733}	[−0.231] (−1.233) {0.228}	[0.093] (0.487) {0.630}	[0.060] (0.312) {0.757}	[0.161] (0.846) {0.405}	[−0.004] (−0.021) {0.984}	[−0.078] (−0.409) {0.686}	[1.000] ----- -----

Where: $\Delta LNGCF = LNGCF - LNGCF(-1)$

$$\Delta GDS = GDS - GDS(-1)$$

$$\Delta LNMAIN = LNMAID - LNMAID(-1)$$

$$\Delta LNBAID = LNBAID - LNBAID(-1)$$

$$\Delta LNFDI = LNFDI - LNFDI(-1)$$

$$\Delta LNDR = LNDR - LNDR(-1)$$

$$\Delta LNPOP = LNPOP - LNPOP(-1)$$

$$\Delta LNTECH = LNTECH - LNTECH(-1)$$

$$\Delta POL = POL - POL(-1)$$

APPENDIX C: PLOTS OF SERIES IN LEVEL AND FIRST DIFFERENCE

Figure C1

Evolution of Gross Capital Formation in Level and First Difference (1974-2017)

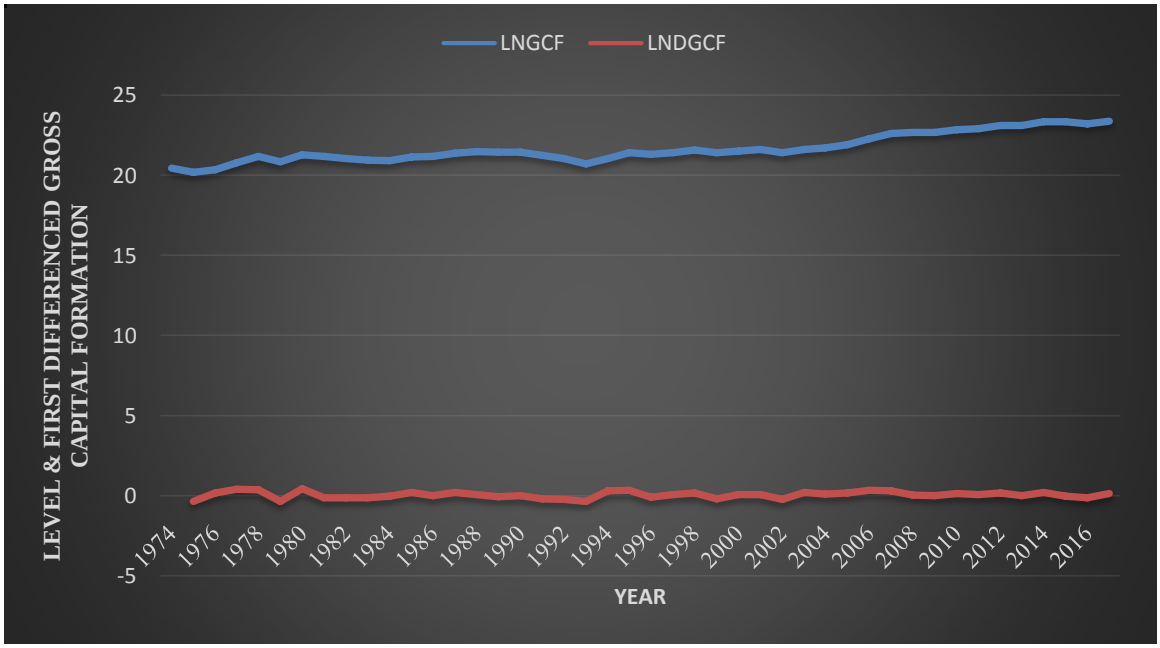


Figure C2

Evolution of Gross Domestic Saving in Level and First Difference (1974-2017)

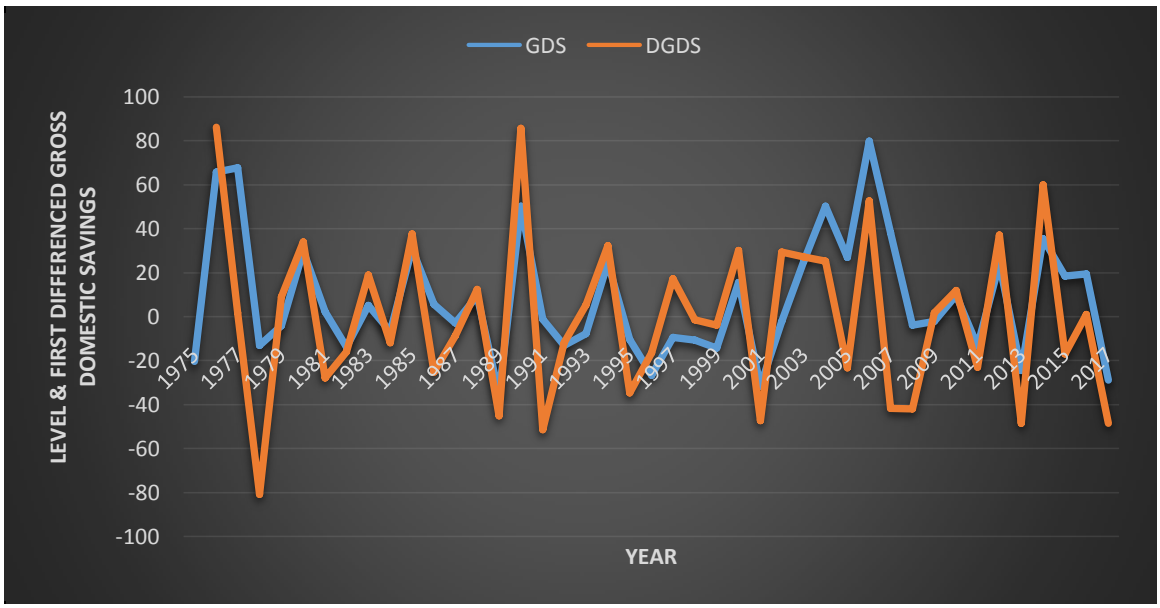


Figure C3

Evolution of Multilateral Aid in Level and First Difference (1974-2017)

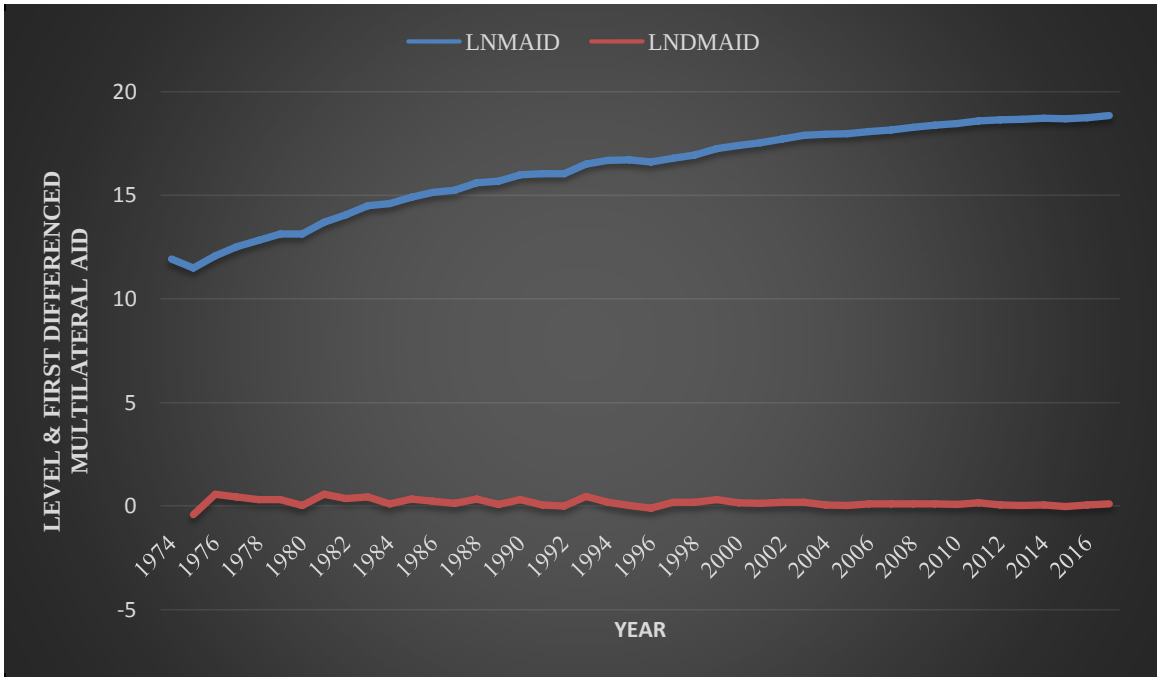


Figure C4

Evolution of Bilateral Aid in Level and First Difference (1974-2017)

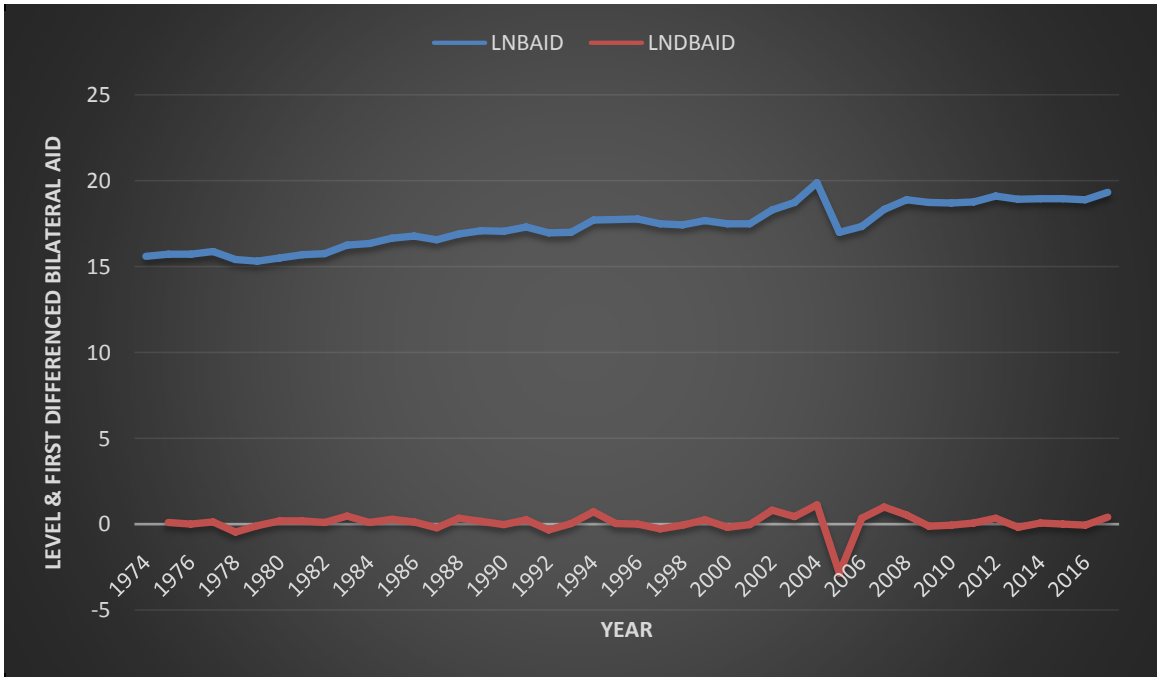


Figure C5

Evolution of Foreign Direct Investment in Level and First Difference (1974-2017)

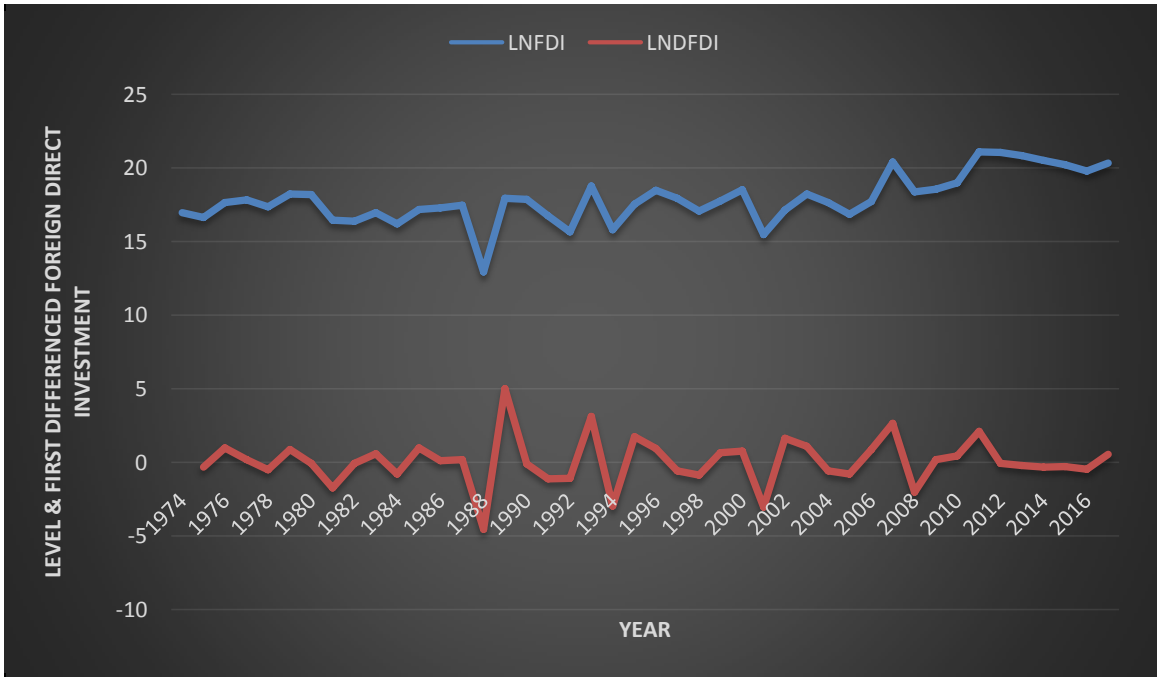


Figure C6

Evolution of Diaspora Remittances in Level and First Difference (1974-2017)

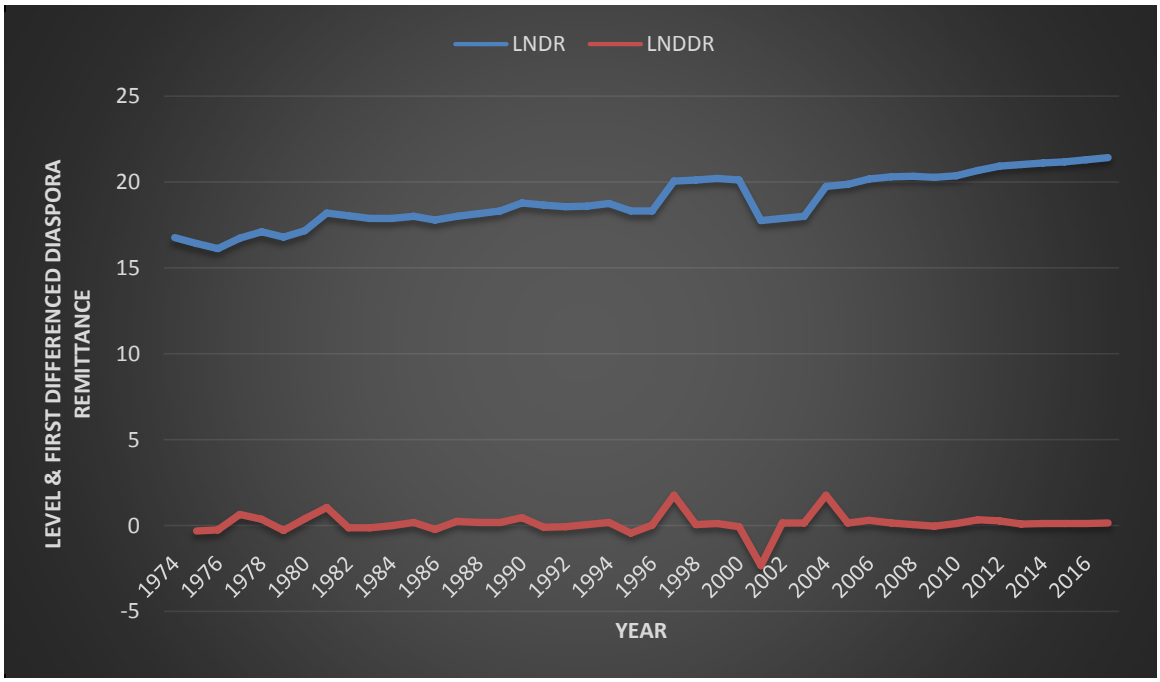


Figure C7

Evolution of Population in Level and First Difference (1974-2017)

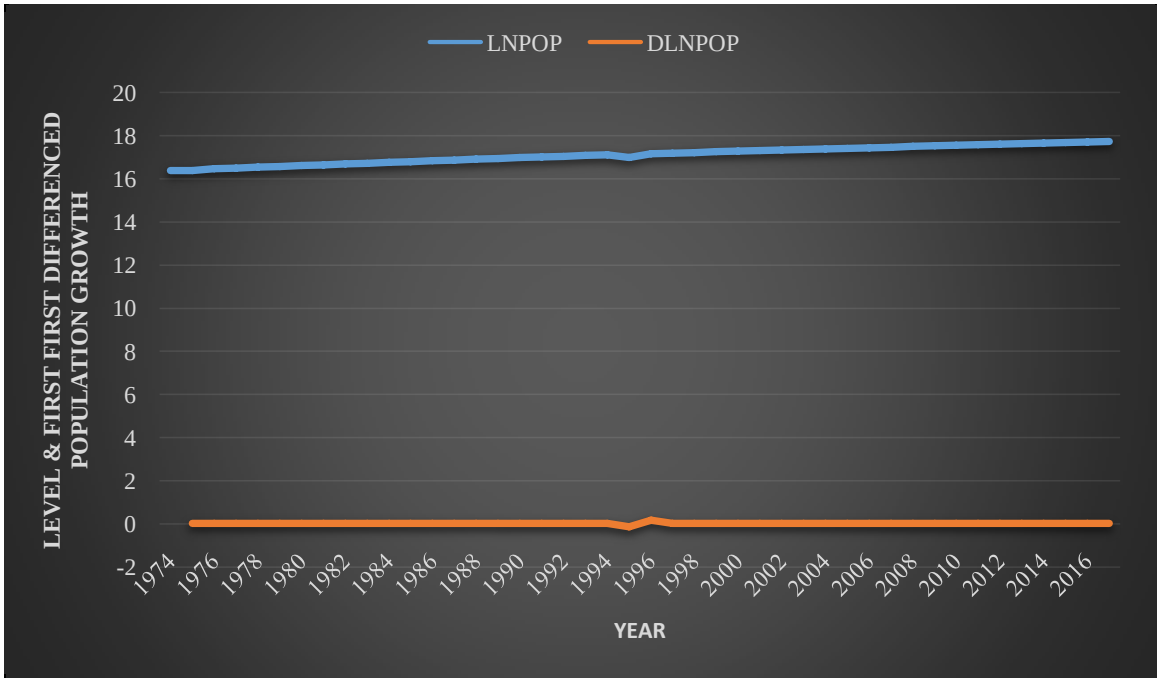


Figure C8

Evolution of Technology in Level and First Difference (1974-2017)

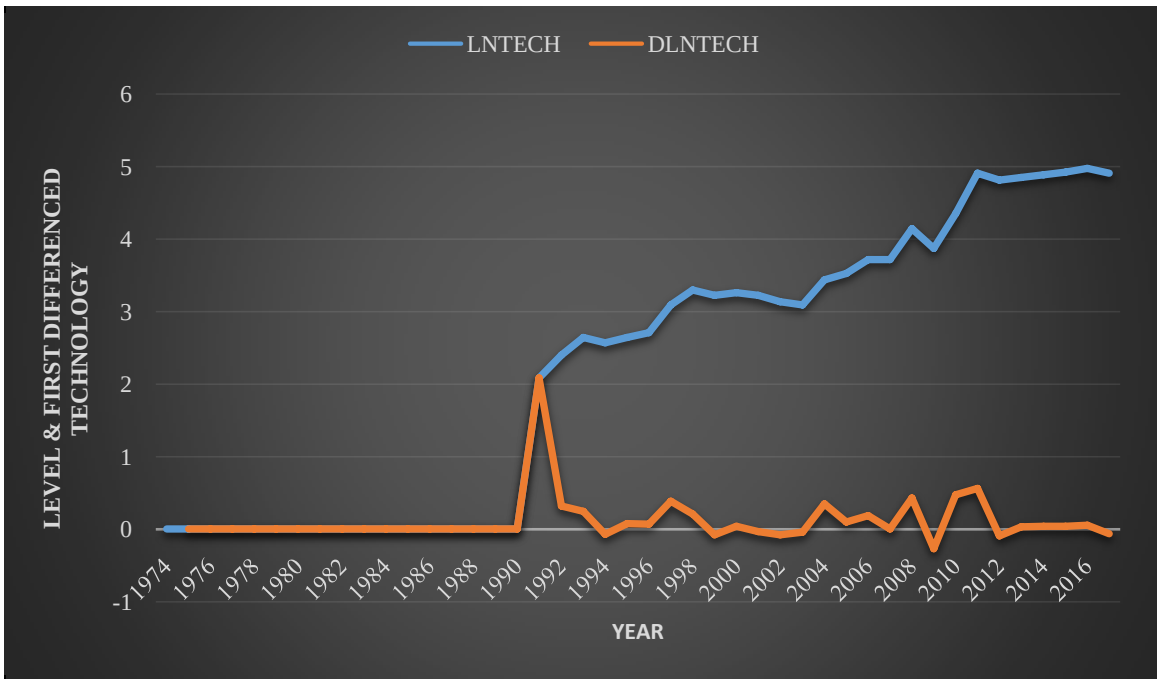
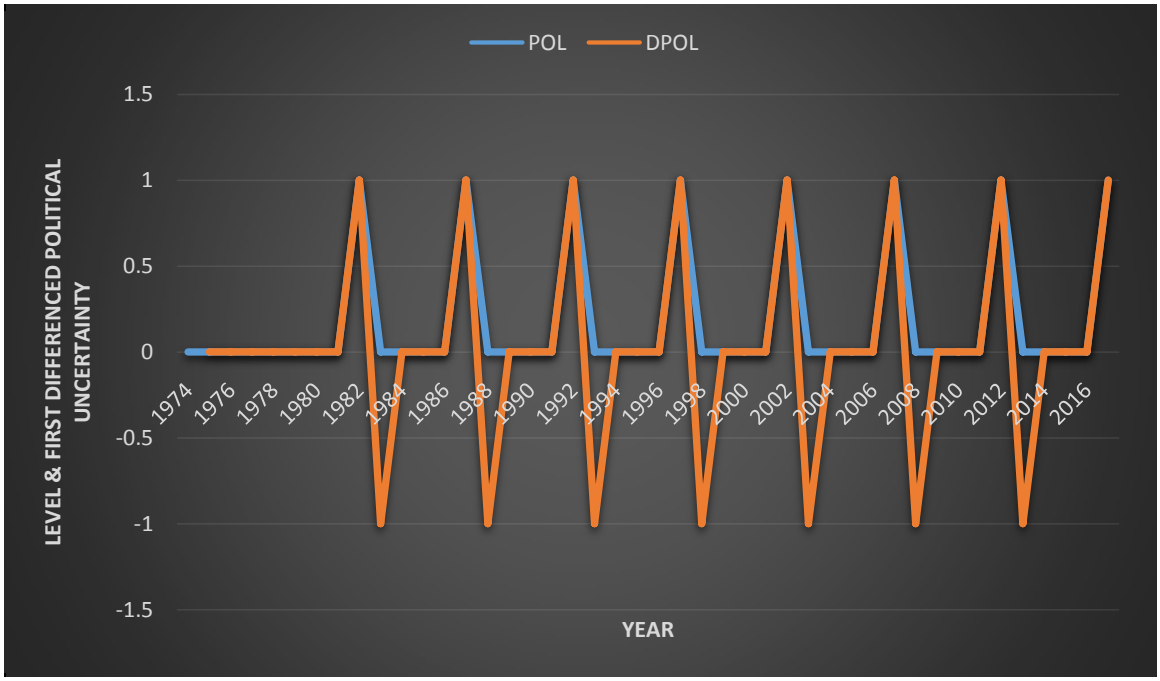


Figure C9

Evolution of the Political Dummy in Level and First Difference (1974-2017)



APPENDIX D: CONDITIONAL ERROR CORRECTION (CEC) FORM OF ARDL MODEL

$$\begin{aligned}\Delta \mathrm{LNGCF}_{t} = \chi_0 &+ \sum_{i=1}^{n} \chi_{1i}\, \Delta \mathrm{LNGCF}_{t-i} + \sum_{i=0}^{p_1} \chi_{2i}\, \Delta \mathrm{LNGGDS}_{t-i} + \sum_{i=0}^{p_2} \chi_{3i} \Delta\, \mathrm{LNMAID}_{t-i} \\ &+ \sum_{i=0}^{p_3} \chi_{4i}\, \Delta LN\mathrm{BAID}_{t-i} + \sum_{i=0}^{p_4} \chi_{5i}\, \Delta \mathrm{LNFDI}_{t-i} + \sum_{i=0}^{p_5} \chi_{6i}\, \Delta \mathrm{LNDR}_{t-i} \\ &+ \sum_{i=0}^{p_6} \chi_{7i}\, \Delta \mathrm{LNPOP}_{t-i} + \sum_{i=0}^{p_7} \chi_{8i}\, \Delta \mathrm{LNTECH}_{t-i} + \eta_1 \mathrm{LNGCF}_{t-1} + \eta_2 \mathrm{GDS}_{t-1} \\ &+ \eta_3 \mathrm{LNMAID}_{t-1} + \eta_4 \mathrm{LNBAID}_{t-1} + \eta_5 \mathrm{LNFDI}_{t-1} + \eta_6 \mathrm{LNDR}_{t-1} \\ &+ \eta_7 \mathrm{LNPOP}_{t-1} + \eta_8 \mathrm{LNTECH}_{t-1} + \varepsilon_t\end{aligned}$$

Where χ_0 is the drift component; Δ is the first difference operator; n, p_1, p_2, p_3,p_4,p_5, p_6, p_7 and p_8 are optimal lag lengths; η_1, η_2, η_3, η_4, η_5, η_6, η_7 and η_8 are coefficients of long run relationship; χ_1, χ_2, $\chi_3\chi_4, \chi_5, \chi_6, \chi_7$and χ_8 are coefficients of short run relationship; ε_t is the white noise process.

APPENDIX E: ESTIMATES FOR OVERPARAMERITIZED ARDL MODEL

Table E

Overparametized ARDL Model

Dependent variable is LNGCF	Coefficient	Std. Error	t-Statistic	Prob.
LNGCF(-1)	0.0176	0.1857	0.0949	0.9261
GDS	-0.0009	0.0013	-0.6757	0.5132
GDS(-1)	-0.0017	0.0012	-1.3593	0.2013
LNMAID	-1.2224	0.3735	-3.2730	0.0074
LNMAID(-1)	0.8636	0.3766	2.2929	0.0426
LNBAID	0.0121	0.0564	0.2144	0.8342
LNBAID(-1)	-0.1014	0.0497	-2.0385	0.0663
LNFDI	0.0626	0.0294	2.1264	0.0569
LNFDI(-1)	0.0463	0.0222	2.0898	0.0607
LNDR	-0.0295	0.0593	-0.4964	0.6294
LNDR(-1)	0.1410	0.0635	2.2217	0.0482
LNPOP	-0.9633	1.0068	-0.9568	0.3592
LNPOP(-1)	2.2293	1.3061	1.7069	0.1159
LNTECH	-0.1930	0.0695	-2.7760	0.0180
LNTECH(-1)	-0.1226	0.0750	-1.6353	0.1303
POL	-0.0043	0.0539	-0.0797	0.9379
C	0.1069	0.0834	1.2814	0.2264
R-squared 0.8223		Akaike info criterion-1.1239		
Adjusted R-squared0.5638		Durbin-Watson stat1.5777		
F-statistic 3.1816		S.E. of regression0.1199		
Prob(F-statistic)0.0286				

APPENDIX F: ECM REPRESENTATION OF OVERPARAMERITIZED MODEL

Table F

Results of ECM Representation for Gross Capital Formation Model

Dependent Variable is Δ (LNGCF)	Coefficient	Std. Error	t-Statistic	Prob.
(ΔGDS)	-0.0009	0.0004	-1.9043	0.0833
Δ(LNMAID)	-1.2224	0.1550	-7.8846	0.0000
Δ(LNBAID)	0.0121	0.0175	0.6891	0.5050
Δ(LNFDI)	0.0626	0.0112	5.6044	0.0002
Δ(LNDR)	-0.0295	0.0232	-1.2687	0.2307
Δ(LNPOP)	-0.9633	0.2499	-3.8550	0.0027
Δ(LNTECH)	-0.1930	0.0375	-5.1441	0.0003
ECMT(-1)	-0.9824	0.1032	-9.5229	0.0000
R-squared0.8934		Akaike info criterion -1.7668		
Adjusted R-squared 0.8562		Durbin-Watson stat 1.5777		
S.E. of regression 0.0889				

APPENDIX G: MODEL SELECTION CRITERIA FOR PARSIMONIOUS ARDL MODEL

Table G

Model Selection Criteria for Parsimonious ARDL Model

Model	LogL	AIC*	BIC	HQ	Adj. R-sq	Specification
1	32.726998	-1.194786	-0.433526	-0.962061	0.599965	ARDL(1, 1, 1, 1, 1, 1, 1, 1)
65	30.560644	-1.111475	-0.397794	-0.893295	0.568939	ARDL(1, 0, 1, 1, 1, 1, 1, 1)
66	28.756458	-1.054033	-0.387930	-0.850399	0.544675	ARDL(1, 0, 1, 1, 1, 1, 1, 0)
67	28.204932	-1.014638	-0.348536	-0.811004	0.526379	ARDL(1, 0, 1, 1, 1, 1, 0, 1)
2	29.086340	-1.006167	-0.292486	-0.787988	0.521069	ARDL(1, 1, 1, 1, 1, 1, 1, 0)
3	28.783735	-0.984553	-0.270872	-0.766373	0.510604	ARDL(1, 1, 1, 1, 1, 1, 0, 1)
68	26.482042	-0.963003	-0.344479	-0.773914	0.500065	ARDL(1, 0, 1, 1, 1, 1, 0, 0)
99	26.280644	-0.948617	-0.330094	-0.759529	0.492821	ARDL(1, 0, 0, 1, 1, 1, 0, 1)
17	28.140625	-0.938616	-0.224935	-0.720437	0.487599	ARDL(1, 1, 1, 0, 1, 1, 1, 1)
81	26.932197	-0.923728	-0.257626	-0.720094	0.481305	ARDL(1, 0, 1, 0, 1, 1, 1, 1)
9	27.918610	-0.922758	-0.209077	-0.704578	0.479408	ARDL(1, 1, 1, 1, 0, 1, 1, 1)
97	26.828568	-0.916326	-0.250224	-0.712692	0.477451	ARDL(1, 0, 0, 1, 1, 1, 1, 1)
70	25.759443	-0.911389	-0.292865	-0.722300	0.473584	ARDL(1, 0, 1, 1, 1, 0, 1, 0)
69	26.645081	-0.903220	-0.237118	-0.699586	0.470557	ARDL(1, 0, 1, 1, 1, 0, 1, 1)
72	24.628322	-0.902023	-0.331078	-0.727479	0.464957	ARDL(1, 0, 1, 1, 1, 0, 0, 0)
25	26.625576	-0.901827	-0.235725	-0.698193	0.469819	ARDL(1, 1, 1, 0, 0, 1, 1, 1)
71	25.609494	-0.900678	-0.282155	-0.711589	0.467915	ARDL(1, 0, 1, 1, 1, 0, 0, 1)
73	26.604017	-0.900287	-0.234185	-0.696653	0.469002	ARDL(1, 0, 1, 1, 0, 1, 1, 1)
89	25.578397	-0.898457	-0.279933	-0.709368	0.466732	ARDL(1, 0, 1, 0, 0, 1, 1, 1)
4	26.484286	-0.891735	-0.225632	-0.688101	0.464441	ARDL(1, 1, 1, 1, 1, 1, 0, 0)
35	26.294832	-0.878202	-0.212100	-0.674568	0.457145	ARDL(1, 1, 0, 1, 1, 1, 0, 1)
82	25.259832	-0.875702	-0.257179	-0.686613	0.454459	ARDL(1, 0, 1, 0, 1, 1, 1, 0)
100	24.248851	-0.874918	-0.303973	-0.700374	0.450256	ARDL(1, 0, 0, 1, 1, 1, 0, 0)
113	25.117592	-0.865542	-0.247019	-0.676453	0.448888	ARDL(1, 0, 0, 0, 1, 1, 1, 1)

33	26.873604	-0.848115	-0.134434	-0.629935	0.439062	ARDL(1, 1, 0, 1, 1, 1, 1, 1)
121	23.819251	-0.844232	-0.273287	-0.669689	0.433125	ARDL(1, 0, 0, 0, 0, 1, 1, 1)
6	25.765387	-0.840385	-0.174283	-0.636751	0.436222	ARDL(1, 1, 1, 1, 1, 0, 1, 0)
5	26.743141	-0.838796	-0.125115	-0.620616	0.433811	ARDL(1, 1, 1, 1, 1, 0, 1, 1)
115	23.732154	-0.838011	-0.267066	-0.663467	0.429587	ARDL(1, 0, 0, 0, 1, 1, 0, 1)
8	24.729225	-0.837802	-0.219278	-0.648713	0.433386	ARDL(1, 1, 1, 1, 1, 0, 0, 0)
98	24.700789	-0.835771	-0.217247	-0.646682	0.432234	ARDL(1, 0, 0, 1, 1, 1, 1, 0)
7	25.614841	-0.829631	-0.163529	-0.625997	0.430127	ARDL(1, 1, 1, 1, 1, 0, 0, 1)
123	22.600506	-0.828608	-0.305242	-0.668609	0.417944	ARDL(1, 0, 0, 0, 0, 1, 0, 1)
36	24.558032	-0.825574	-0.207050	-0.636485	0.426414	ARDL(1, 1, 0, 1, 1, 1, 0, 0)
90	23.414788	-0.815342	-0.244397	-0.640798	0.416509	ARDL(1, 0, 1, 0, 0, 1, 1, 0)
107	23.370521	-0.812180	-0.241235	-0.637637	0.414661	ARDL(1, 0, 0, 1, 0, 1, 0, 1)
75	24.356816	-0.811201	-0.192678	-0.622112	0.418111	ARDL(1, 0, 1, 1, 0, 1, 0, 1)
18	25.354996	-0.811071	-0.144969	-0.607437	0.419451	ARDL(1, 1, 1, 0, 1, 1, 1, 0)
74	24.187253	-0.799089	-0.180566	-0.610001	0.411021	ARDL(1, 0, 1, 1, 0, 1, 1, 0)
49	25.186482	-0.799034	-0.132932	-0.595400	0.412421	ARDL(1, 1, 0, 0, 1, 1, 1, 1)
105	24.156928	-0.796923	-0.178400	-0.607835	0.409743	ARDL(1, 0, 0, 1, 0, 1, 1, 1)
114	23.148633	-0.796331	-0.225386	-0.621787	0.405310	ARDL(1, 0, 0, 0, 1, 1, 1, 0)
83	24.038534	-0.788467	-0.169943	-0.599378	0.404731	ARDL(1, 0, 1, 0, 1, 1, 0, 1)
34	24.949754	-0.782125	-0.116023	-0.578491	0.402401	ARDL(1, 1, 0, 1, 1, 1, 1, 0)
116	21.947333	-0.781952	-0.258586	-0.621954	0.390144	ARDL(1, 0, 0, 0, 1, 1, 0, 0)
91	22.932420	-0.780887	-0.209942	-0.606344	0.396055	ARDL(1, 0, 1, 0, 0, 1, 0, 1)
57	23.864595	-0.776042	-0.157519	-0.586954	0.397289	ARDL(1, 1, 0, 0, 0, 1, 1, 1)
51	23.747268	-0.767662	-0.149139	-0.578573	0.392217	ARDL(1, 1, 0, 0, 1, 1, 0, 1)
11	24.609302	-0.757807	-0.091705	-0.554173	0.387691	ARDL(1, 1, 1, 1, 0, 1, 0, 1)
59	22.607842	-0.757703	-0.186758	-0.583159	0.381889	ARDL(1, 1, 0, 0, 0, 1, 0, 1)
40	22.510010	-0.750715	-0.179770	-0.576172	0.377555	ARDL(1, 1, 0, 1, 1, 0, 0, 0)
103	22.468488	-0.747749	-0.176804	-0.573206	0.375706	ARDL(1, 0, 0, 1, 1, 0, 0, 1)
26	23.434292	-0.745307	-0.126783	-0.556218	0.378476	ARDL(1, 1, 1, 0, 0, 1, 1, 0)
84	22.417923	-0.744137	-0.173193	-0.569594	0.373447	ARDL(1, 0, 1, 0, 1, 1, 0, 0)
43	23.375225	-0.741088	-0.122564	-0.551999	0.375848	ARDL(1, 1, 0, 1, 0, 1, 0, 1)

104	21.335946	-0.738282	-0.214916	-0.578284	0.362922	ARDL(1, 0, 0, 1, 1, 0, 0, 0)
50	23.334237	-0.738160	-0.119636	-0.549071	0.374018	ARDL(1, 1, 0, 0, 1, 1, 1, 0)
122	21.311482	-0.736534	-0.213168	-0.576536	0.361807	ARDL(1, 0, 0, 0, 0, 1, 1, 0)
124	20.309281	-0.736377	-0.260590	-0.590924	0.352533	ARDL(1, 0, 0, 0, 0, 1, 0, 0)
10	24.221450	-0.730104	-0.064001	-0.526469	0.370490	ARDL(1, 1, 1, 1, 0, 1, 1, 0)
52	22.210582	-0.729327	-0.158383	-0.554784	0.364099	ARDL(1, 1, 0, 0, 1, 1, 0, 0)
41	24.189715	-0.727837	-0.061735	-0.524203	0.369062	ARDL(1, 1, 0, 1, 0, 1, 1, 1)
19	24.163877	-0.725991	-0.059889	-0.522357	0.367896	ARDL(1, 1, 1, 0, 1, 1, 0, 1)
27	23.036824	-0.716916	-0.098392	-0.527827	0.360578	ARDL(1, 1, 1, 0, 0, 1, 0, 1)
39	23.021974	-0.715855	-0.097332	-0.526767	0.359899	ARDL(1, 1, 0, 1, 1, 0, 0, 1)
76	21.986711	-0.713337	-0.142392	-0.538793	0.353848	ARDL(1, 0, 1, 1, 0, 1, 0, 0)
92	20.849783	-0.703556	-0.180190	-0.543558	0.340410	ARDL(1, 0, 1, 0, 0, 1, 0, 0)
108	20.788085	-0.699149	-0.175783	-0.539151	0.337497	ARDL(1, 0, 0, 1, 0, 1, 0, 0)
60	20.720799	-0.694343	-0.170977	-0.534345	0.334305	ARDL(1, 1, 0, 0, 0, 1, 0, 0)
58	21.640270	-0.688591	-0.117646	-0.514047	0.337659	ARDL(1, 1, 0, 0, 0, 1, 1, 0)
38	22.518886	-0.679920	-0.061397	-0.490832	0.336479	ARDL(1, 1, 0, 1, 1, 0, 1, 0)
20	22.494252	-0.678161	-0.059637	-0.489072	0.335311	ARDL(1, 1, 1, 0, 1, 1, 0, 0)
106	21.481243	-0.677232	-0.106287	-0.502688	0.330093	ARDL(1, 0, 0, 1, 0, 1, 1, 0)
101	22.469704	-0.676407	-0.057884	-0.487319	0.334144	ARDL(1, 0, 0, 1, 1, 0, 1, 1)
102	21.339652	-0.667118	-0.096173	-0.492574	0.323283	ARDL(1, 0, 0, 1, 1, 0, 1, 0)
44	21.269078	-0.662077	-0.091132	-0.487534	0.319863	ARDL(1, 1, 0, 1, 0, 1, 0, 0)
12	22.077224	-0.648373	-0.029850	-0.459284	0.315213	ARDL(1, 1, 1, 1, 0, 1, 0, 0)
37	23.026431	-0.644745	0.021357	-0.441111	0.314396	ARDL(1, 1, 0, 1, 1, 0, 1, 1)
28	21.004649	-0.643189	-0.072244	-0.468646	0.306895	ARDL(1, 1, 1, 0, 0, 1, 0, 0)
42	21.861788	-0.632985	-0.014461	-0.443896	0.304594	ARDL(1, 1, 0, 1, 0, 1, 1, 0)
56	19.275790	-0.591128	-0.067762	-0.431130	0.261924	ARDL(1, 1, 0, 0, 1, 0, 0, 0)
86	20.163463	-0.583105	-0.012160	-0.408561	0.263973	ARDL(1, 0, 1, 0, 1, 0, 1, 0)
120	17.959545	-0.568539	-0.092752	-0.423086	0.234212	ARDL(1, 0, 0, 0, 1, 0, 0, 0)
88	18.836607	-0.559758	-0.036392	-0.399759	0.238403	ARDL(1, 0, 1, 0, 1, 0, 0, 0)
119	18.795372	-0.556812	-0.033446	-0.396814	0.236157	ARDL(1, 0, 0, 0, 1, 0, 0, 1)
85	20.779677	-0.555691	0.062832	-0.366602	0.248712	ARDL(1, 0, 1, 0, 1, 0, 1, 1)

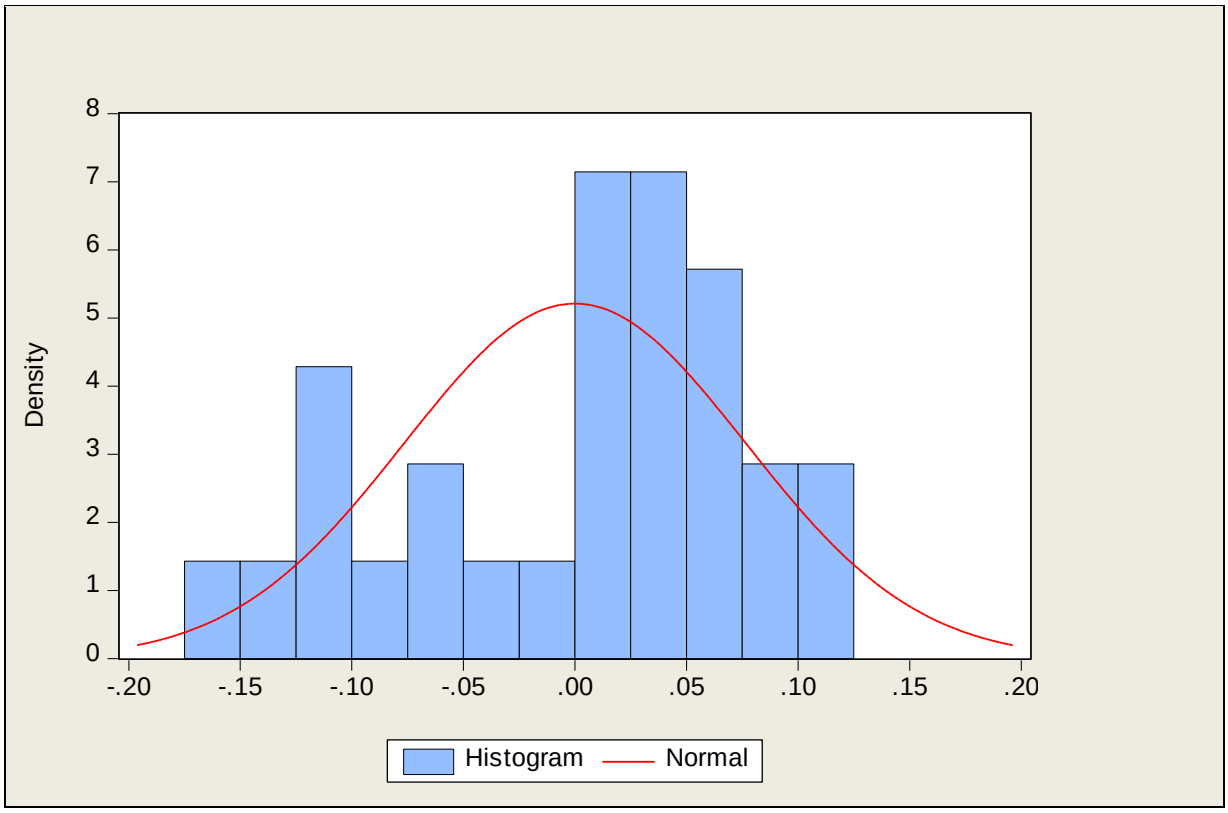
55	19.556831	-0.539774	0.031171	-0.365230	0.231380	ARDL(1, 1, 0, 0, 1, 0, 0, 1)
24	19.553064	-0.539505	0.031440	-0.364961	0.231173	ARDL(1, 1, 1, 0, 1, 0, 0, 0)
54	19.549475	-0.539248	0.031697	-0.364705	0.230976	ARDL(1, 1, 0, 0, 1, 0, 1, 0)
87	19.549225	-0.539230	0.031714	-0.364687	0.230962	ARDL(1, 0, 1, 0, 1, 0, 0, 1)
22	20.516074	-0.536862	0.081661	-0.347774	0.234432	ARDL(1, 1, 1, 0, 1, 0, 1, 0)
118	18.209504	-0.514965	0.008402	-0.354966	0.203513	ARDL(1, 0, 0, 0, 1, 0, 1, 0)
117	19.040203	-0.502872	0.068073	-0.328328	0.202486	ARDL(1, 0, 0, 0, 1, 0, 1, 1)
21	20.888700	-0.492050	0.174052	-0.288416	0.201292	ARDL(1, 1, 1, 0, 1, 0, 1, 1)
23	19.882050	-0.491575	0.126948	-0.302486	0.198964	ARDL(1, 1, 1, 0, 1, 0, 0, 1)
53	19.823085	-0.487363	0.131160	-0.298274	0.195583	ARDL(1, 1, 0, 0, 1, 0, 1, 1)
64	16.748716	-0.482051	-0.006264	-0.336598	0.165032	ARDL(1, 1, 0, 0, 0, 0, 0, 0)
79	18.745795	-0.481843	0.089102	-0.307299	0.185538	ARDL(1, 0, 1, 1, 0, 0, 0, 1)
48	17.497747	-0.464125	0.059241	-0.304127	0.161973	ARDL(1, 1, 0, 1, 0, 0, 0, 0)
80	17.420405	-0.458600	0.064766	-0.298602	0.157331	ARDL(1, 0, 1, 1, 0, 0, 0, 0)
16	18.392892	-0.456635	0.114310	-0.282092	0.164746	ARDL(1, 1, 1, 1, 0, 0, 0, 0)
77	19.336700	-0.452621	0.165902	-0.263533	0.167145	ARDL(1, 0, 1, 1, 0, 0, 1, 1)
63	17.111460	-0.436533	0.086833	-0.276535	0.138529	ARDL(1, 1, 0, 0, 0, 0, 0, 1)
78	18.102994	-0.435928	0.135017	-0.261385	0.147270	ARDL(1, 0, 1, 1, 0, 0, 1, 0)
15	19.081611	-0.434401	0.184123	-0.245312	0.151831	ARDL(1, 1, 1, 1, 0, 0, 0, 1)
32	17.030993	-0.430785	0.092581	-0.270787	0.133563	ARDL(1, 1, 1, 0, 0, 0, 0, 0)
47	17.985196	-0.427514	0.143431	-0.252970	0.140065	ARDL(1, 1, 0, 1, 0, 0, 0, 1)
62	16.846413	-0.417601	0.105765	-0.257603	0.122064	ARDL(1, 1, 0, 0, 0, 0, 1, 0)
127	15.824422	-0.416030	0.059757	-0.270577	0.108046	ARDL(1, 0, 0, 0, 0, 0, 0, 1)
14	18.802894	-0.414492	0.204031	-0.225404	0.134776	ARDL(1, 1, 1, 1, 0, 0, 1, 0)
95	16.797701	-0.414121	0.109245	-0.254123	0.119004	ARDL(1, 0, 1, 0, 0, 0, 0, 1)
96	15.738950	-0.409925	0.065862	-0.264472	0.102584	ARDL(1, 0, 1, 0, 0, 0, 0, 0)
111	16.688414	-0.406315	0.117051	-0.246317	0.112100	ARDL(1, 0, 0, 1, 0, 0, 0, 1)
94	16.640529	-0.402895	0.120471	-0.242897	0.109058	ARDL(1, 0, 1, 0, 0, 0, 1, 0)
93	17.617955	-0.401282	0.169662	-0.226739	0.117209	ARDL(1, 0, 1, 0, 0, 0, 1, 1)
128	14.565709	-0.397551	0.030658	-0.266643	0.075498	ARDL(1, 0, 0, 0, 0, 0, 0, 0)
30	17.555771	-0.396841	0.174104	-0.222297	0.113279	ARDL(1, 1, 1, 0, 0, 0, 1, 0)

13	19.527011	-0.394787	0.271316	-0.191152	0.119704	ARDL(1, 1, 1, 1, 0, 0, 1, 1)
46	17.504092	-0.393149	0.177795	-0.218606	0.110000	ARDL(1, 1, 0, 1, 0, 0, 1, 0)
31	17.447799	-0.389129	0.181816	-0.214585	0.106414	ARDL(1, 1, 1, 0, 0, 0, 0, 1)
61	17.206069	-0.371862	0.199083	-0.197319	0.090851	ARDL(1, 1, 0, 0, 0, 0, 1, 1)
112	15.197338	-0.371238	0.104549	-0.225786	0.067185	ARDL(1, 0, 0, 1, 0, 0, 0, 0)
29	18.013396	-0.358100	0.260424	-0.169011	0.084582	ARDL(1, 1, 1, 0, 0, 0, 1, 1)
45	17.987963	-0.356283	0.262240	-0.167194	0.082917	ARDL(1, 1, 0, 1, 0, 0, 1, 1)
125	15.890893	-0.349349	0.174017	-0.189351	0.060051	ARDL(1, 0, 0, 0, 0, 0, 1, 1)
109	16.688418	-0.334887	0.236058	-0.160344	0.056606	ARDL(1, 0, 0, 1, 0, 0, 1, 1)
126	14.627357	-0.330526	0.145262	-0.185073	0.028424	ARDL(1, 0, 0, 0, 0, 0, 1, 0)
110	15.198323	-0.299880	0.223486	-0.139882	0.012383	ARDL(1, 0, 0, 1, 0, 0, 1, 0)

APPENDIX H: HISTOGRAM OF RESIDUALS PLUS SUPERIMPOSED NORMAL DENSITY CURVE

Figure H

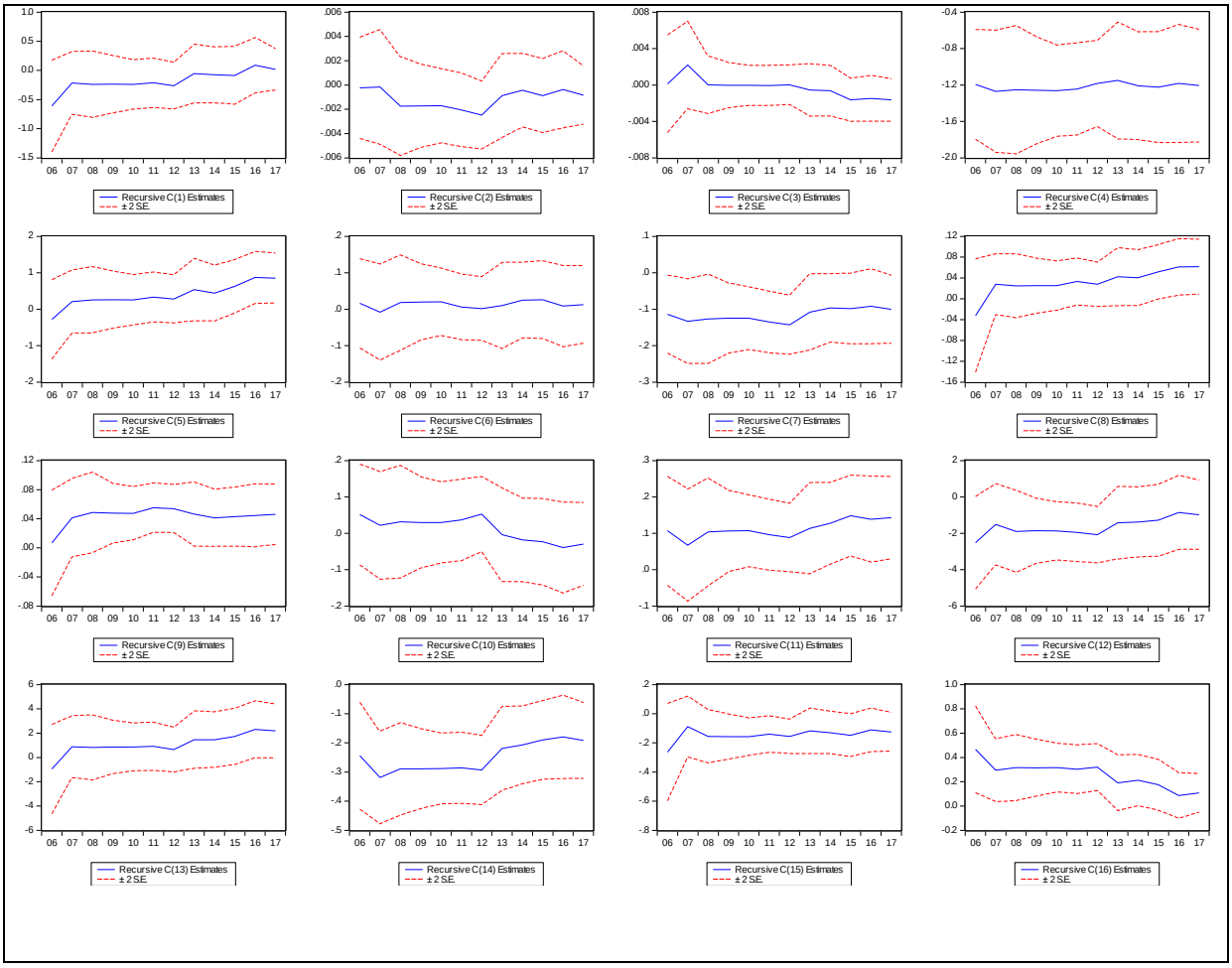
Histogram plus Superimposed Normal Distribution Density Curve for Residuals



APPENDIX I: GRAPHS OF RECURSIVE ESIMATES OF ELASTICITIES

Figure I

Graphs of Recursive Estimates of Elasticities



APPENDIX J: THE MAP OF KENYA

Figure I

The Map of Kenya

Source: CIA World Fact Book & Permanent Mission of Kenya to the UN Office in Geneva