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POLICY RESEARCH and ANALYSIS**

Effect of External Public Debt on Private Investments in Kenya

Josphat Machagua and Martha Naikumi

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**THE KENYA INSTITUTE FOR PUBLIC POLICY
RESEARCH AND ANALYSIS (KIPPRA)**

**YOUNG PROFESSIONALS (YPs) TRAINING
PROGRAMME**

Effect of External Public Debt on Private Investments in Kenya

Josphat Machagua and Martha Naikumi

Kenya Institute for Public Policy
Research and Analysis

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Abstract

In Kenya, an efficient modern infrastructure is one of the most critical factors in economic transformation through the creation of a conducive environment by lowering the cost of doing business and opening income-generating opportunities for private investors. Key public infrastructure projects and services are financed using capital from external debt as they require large capital that is beyond Kenya's domestic revenue capacity. Through foreign borrowing, the Kenyan government generates savings and ensures that the debt is used for productive infrastructural spending, thus enhancing private investment. The study examined the relationship between private investment and external public debt and external public debt sustainability. External debt level was measured using the ratio of external debt stock to GDP and debt sustainability as the ratio of external debt service to exports. The study results show that external debt levels tend to crowd-in private investment in the long-run, mainly because public investments that are financed using external debt tend to have long gestation period when the private sector start to benefit from the infrastructural services. In the short-run, external debt levels may discourage investment due to uncertainty on sustainability and future tax policy. When external debt is sustainable, private investment will increase in the short-run. However, in the long-run, deterioration on debt sustainability would see private investment reduce. Real GDP growth rate, private sector credit and real effective exchange rate have a positive effect on private investments. Thus, to ensure that debt is not a constraint to private investment, it is critical to enhance debt management with a focus on the structure and composition of public debt; improve on project management to ensure projects being implemented have high multiplier effect and are targeted to improve on the enabling environment for private sector; and explore alternative source of financing public investment, including local sources.

Abbreviations and Acronyms

ADF	Augmented Dickey Fuller
AfDB	African Development Bank
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Lag Model
CBK	Central Bank of Kenya
CUSUM	Cumulative Sum
DIGNAR	Debt Sustainability, Public Investment, and Natural Resources
FPE	Final Prediction Error
GDP	Gross Domestic Product
GFCF	Global Financial Crisis
GMM	Generalized Method of Moments
HQIC	Hannan-Quinn Information Criterion
IMF	International Monetary Fund
KNBS	Kenya National Bureau of Statistics
LAPSSET	Lamu Port South Sudan–Ethiopia Transport
OCOB	Office of the Controller of Budget
OLS	Ordinary Least Squares
SIC	Schwarz Information Criterion
SSA	Sub-Saharan Africa
VIF	Variance Inflation Factor

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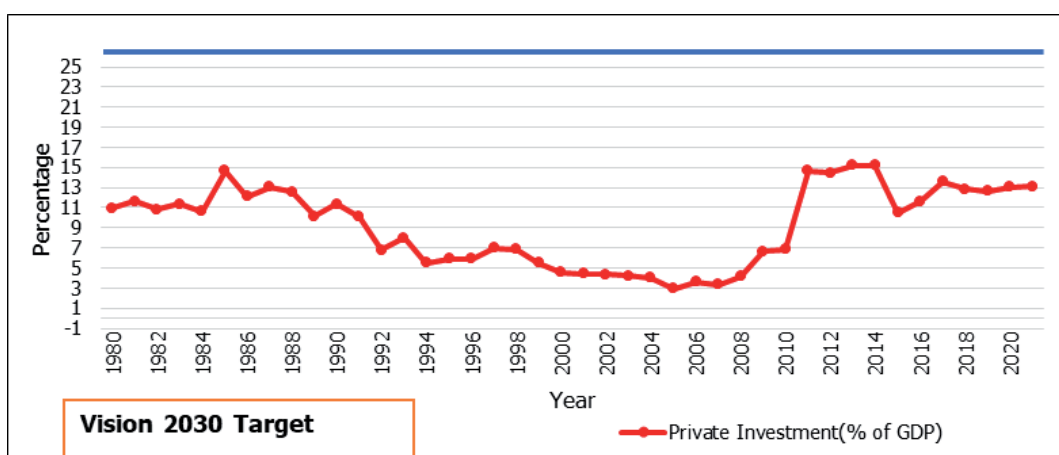
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1. Introduction

Private investment is the foundation of sustainable economic development in any country. However, it relies on public investment through the provision of infrastructure services, incentives, and other public services that create a conducive business environment for private investments. In Kenya, an efficient, modern infrastructure is one of the most critical factors in economic transformation through lowering business costs and opening income-generating opportunities for households and private investors (Government of Kenya, 2012). Ideally, an expansion in public investment enhances economic development by providing more infrastructural development and complementary public goods and services, whose positive externality boosts private sector investment. Most of public infrastructure projects and services are financed using capital from external debt as they require large capital that is beyond Kenya's domestic revenue capacity. External public debt is more effective in boosting private investments when compared to domestic debt. Through foreign borrowing, the Kenyan government can generate savings and ensure that the debt is used for productive infrastructural spending, thus enhancing private investment (Maingi, 2017; Onjala, 2018).

Sessional Paper No. 10 of 2012 highlights Kenya's aim of attaining a goal of 24 per cent of private investment as a percentage of GDP annually, which is pivotal towards the realization of the Kenya Vision 2030 development blueprint (Government of Kenya, 2012). However, the country has been unable to attain the target, with the country averaging 9.2 per cent as shown in Figure 1.1 (AfDB, 2022).

Figure 1.1: Private investments in Kenya



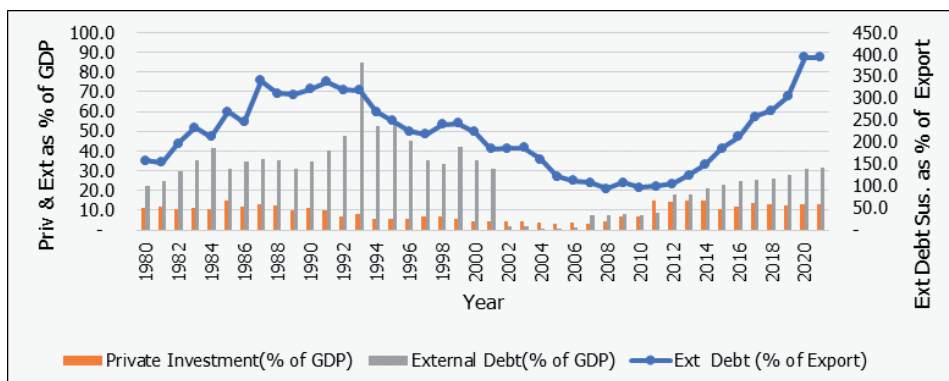
Data Source: African Development Bank (AfDB)

Kenya has experienced fluctuations in private investments over the years due to several factors. The departure from the low-interest rate policy and the debt

crisis in the 1980s led to the downward trend in private investments in the mid-1980s (Njuru et al., 2013; Were and KIPPRA, 2005). The structural adjustment programmes introduced by the World Bank and International Monetary Fund in 1986 were also associated with a sharp downturn in private investments in late 1980s to the mid-to-early 2000s. While there has been a noticeable increasing trend in private investments from 2008 onwards, the rise in private investments lacks the robustness expected to realize the 24 percentage share of private investment as a percentage of GDP annually. Kenya's external debt as a percentage of GDP in 2021 stood at 31.8 per cent. This shows that it has breached the 30 per cent external debt as a percentage of GDP joint World Bank- IMF debt burden threshold under the Debt Sustainability Framework for developing countries (AfDB, 2022; IMF and World Bank, 2021).

Debt sustainability measures how a country's existing and potential borrowing will affect its capacity to service its current and future debts. An exponential increment in external debt service through payment of interest and principal from external lenders can induce the government to raise taxes to service the debt. This in turn raises the cost of doing business, hence discouraging private investment. External debt service to revenues and the external debt service-to-export ratios are among liquidity indicators (Central Bank of Kenya, 2021). Kenya's external debt-to-exports ratio as of 2021 was 393.7 per cent, which is way beyond the upper threshold set by the Joint World Bank-IMF of 240 per cent as shown in Figure 1.2 (AfDB, 2022; IMF and World Bank, 2021).

Figure 1.2: Private investments, external debt and external debt sustainability



Data Source: AfDB and KNBS (Various) Economic Surveys

The trend of external debt as a percentage of GDP increased in the 1980s to around the mid-1990s when it decreased to less than 1 per cent in 2005, after which it increased significantly to 31.8 per cent in 2021. Equally, private investments as a percentage of GDP has been on a decreasing and increasing trend. In 2008, private investments increased to a high of 15.2 per cent in 2014. Against the

Kenya's Vision 2030 24 per cent of private investment as a percentage of GDP annually, the country has so far attained an average of 8.7 per cent from 1980 to 2021.

Kenya has invested on infrastructural development, such as the Thika Superhighway, the Standard Gauge Railway, the development of LAPSET corridor, power producing and irrigation projects to induce private investment. Most of these projects are financed by external public borrowing (Githaiga and Bing, 2019), which explains why external public debt has been on an upward trajectory. Kenya's external debt as a percentage of GDP in 2021 stood at 31.8 per cent, breaching the 30 per cent as a percentage of GDP threshold set jointly by IMF and World Bank (IMF and World Bank, 2021).

Therefore, this paper analyses the relation between external public debt and private investment given the existing literature that heavy external debt may result in crowding out private investments. This is achieved by analysing the effect of external public debt on private investment and external public debt sustainability on private investment.

The study's results will inform policy in deriving sound policies regarding the effect of external public debt on private investments. Further, the findings will enhance the collaboration of the Central Bank of Kenya (CBK) and The National Treasury in formulating and implementing fiscal and monetary policies that would regulate foreign borrowing to ensure macroeconomic stability. The study helps bridge the existing gaps in literature on the effect of external public debt on private investment in Kenya. Most studies in Sub-Saharan Africa have focused on the effect of public debt on investment (Akomolafe et al., 2015; Thilanka and Ranjith, 2018), while others focus on the relationship between domestic public debt and private investments (King'wara, 2014; Ozdemir and Gomez, 2020). Consequently, this study adds to the existing literature on the effect of external public debt on private investments in Kenya.

The paper comprises of five sections. The first section looks at the background. Section two presents literature review, which includes theoretical literature and empirical literature of existing studies and an overview literature. Section three entails research methodology, which looks at the theoretical and analytical models and data sources. The study's findings are discussed in section four while section five encompasses the conclusions of the study's results and their subsequent policy recommendations.

2. Literature Review

This section presents theoretical and empirical literature relevant to the study. The first part details the theoretical underpinnings of why developing countries borrow and how that may lead to private investment. The third part presents the empirical literature, followed by a section on overview of the literature.

2.1 Theoretical Literature

2.1.1 Accelerator Theory of Investment

This theory was put forward by (Clark, 1925). Accelerator is a numerical value that depicts the relationship between an increase in investment, which results from an increment in output. The accelerator theory states that the rate of investment levels is related to the rate of GDP change. Therefore, an increment in economic growth rate induces an increase in the level of investments, vice versa. However, a decline in economic growth rate induces a fall in the rate of investment. When consumption increases, investment also increases to meet the demand for goods and services attained through the addition of capital if the given stock of capital is fully utilized. Thus, an increment in GDP growth induces a correspondingly increment in private investments. The net induced investment is positive if GDP increases. However, induced investment may fall to zero if GDP growth remains constant.

2.1.2 Tobin's Q investment theory

The theory was first proposed by Kaldor but popularized by Brainard and Tobin (Brainard and Tobin, 1968; Kaldor, 1966). This theory extends on the neoclassical theory by incorporating the costs of adjustment to account for output losses due to adjustments. It postulates that investment is the ratio of a firm's asset market to their replacement cost, which is known as the q-ratio. Tobin states that investments can be linked with the fluctuations experienced in the stock market. Thus, firms choose the investment levels that maximize their expected present value. A firm's investment rate can be related to a ratio q, which is given by:

$$Q = (\text{Capital at market value}) / (\text{capital replacement cost})$$

q is the additional capital per unit at market value relative to its replacement cost. This version of q is unobservable and is usually a proxy by an observable average q. The average q incorporates existing capital at market value in place of additional capital. The q-ratio informs a firm's decision on whether to expand its stock of capital. The q-ratio also measures whether a firm is relatively over-valued or under-valued. Under a perfect competitive market, the marginal q and average q are equivalent (Hayashi, 1981). All the future information that a firm requires to facilitate its investment decision making process is summarized in q, and the firm does not need to worry about future expectations. If q is high, a firm increases its stock of capital, if q is low, the firm decreases it. At equilibrium the value of q is 1.

When the value of q is less than 1, that implies the cost of replacing a firm's assets supersedes the value of its stock hence investments are discouraged. However, when q is greater than 1, that indicates that the stock of a firm is more expensive than its asset's replacement cost, hence investments are encouraged (Brainard and Tobin, 1968).

A stock's valuation measure is the driving factor behind the investment decisions in Tobin's Q ratio. As firms continue to maximize their profits, the capital stock adjusts accordingly until there are no more profits to be made. The additional capital is made through investments, while the decrease in capital is as a result of depreciation of capital. As long as there are stock adjustments, the actual and desired stocks will always be equal and real investment would be at equilibrium. If q is not equal to 1, then this can be linked to factors such as taxation and presence of redundant capital.

2.1.3 Theory of irreversible investment under uncertainty

Most investments have two crucial traits: first, they are largely irreversible, making them sunk expenses because firms cannot disinvest. Second, they can be postponed, allowing the businesses to hold off on allocating resources until it has more knowledge about market factors such as demand, pricing, and expenses. This has significant ramifications for investment decisions and the factors that influence investment expenditure. Investments that are irreversible are particularly vulnerable to risk, whether that risk relates to expected interest rates, future cash flows or the investment's overall cost. The limitation that an irreversible investment's cost cannot be fully recouped raises the bar for positive investment while simultaneously truncating negative investments (investments that costs more to hold than it returns).

When investments are irreversible, investors make timing decisions that trade off extra returns from the early commitments against the benefits of the additional information that is gained by waiting. Uncertainty may come in many different forms, including uncertainty around the cost of production, future demand, customer preferences, and changes to institutional structures and governmental policies and regulations. With uncertainty, the return threshold that justifies irreversible investment rises. Irreversibility limits an investor's capacity to redeploy capital in undesirable conditions, making them particularly important to consider while making investments prior to the event. This discovery is comparable to the evaluation and use of financial options, and the assessment and understanding of irreversible investments using option pricing techniques. Investments that are irreversible admit that the capital's worth could not be entirely retrieved when sold. This straightforward generalization has broad investment ramifications. Irreversibility alters the investment dynamics by establishing a threshold for successful investment returns, in addition to truncating disinvestment. Investment is zero below this point, which obviously suggests sporadic rather than ongoing investment activity. Furthermore, the investment-justifying threshold return is higher than the needed return on a reversible investment.

Arrow et al. (2013) further highlighted the concept of an option value. Bernanke (1980) expanded on this notion to include the role that uncertainty plays in postponing investment choices. McDonald and Siegel (1986) offer explicit valuation of investment that takes irreversibility into account, including option pricing (real options) into investment theory. They demonstrate that the option value of waiting is included in the project's worth and can be evaluated and understood using the idea of option pricing. When compared to an investment decision that must be made now or never, there might be a significant added value that has intriguing consequences for investment decision. First, the availability of such an option indicates that the decision to delay the investment is optimal when compared to undertaking it immediately, even when a positive execution has a positive value. As an alternative, value can be raised by waiting out for further details with the value of the option increasing with uncertainty (McDonald, 1986). This characteristic suggests the level of uncertainty on the timing and value of investments not present in most investment models. Bertola (1988) and Pindyck, (1986) permits incremental investments, allowing firms to pick the time and scale of their investments. The theory demonstrates that a threshold exists for irreversible investments, which is higher than the return needed to support a successful reversible investment. Also, there are several investment decisions, each of which must meet the threshold condition as opposed to only one investment decision.

2.1.4 Debt overhang theory

The theory was developed by Reinhart et al. (2012). It sought to answer the question of why a large, accumulated debt slowed down economic growth and investments. The theory states that if an economy's debt exceeds its ability to repay, expected increment in debt service costs would discourage investment and thus affect economic growth. While researching the negative impacts of public debt, Reinhart and Rogoff used the phrase "debt overhang" to describe the degradation of an economy as a result of an exponential increase in public debt. They observed that countries with high public debt had a propensity towards long-term stagnation. They suggest that since this connection is non-linear, these instances show that a causal link exists between high public debt and slowing economic development. They also discovered that actual interest rates were not higher in 11 of the 26 high-debt events than they are in low-debt times (Reinhart et al., 2012).

Sachs (1989) and Krugman (1988) also opined that debt overhang exists when an economy's debt service burden is extremely large, such that a significant portion of the government's revenues are used to service the debt. A higher debt service to revenue ratio means there is a likelihood of tax increment on private investments, which lowers future private investments. Private investors would be less motivated to incur expenses now to raise output in the future because of fear that the more a country produces, the more it would be taxed by creditors to service the foreign debt (Kalemli-Ozcan et al., 2018). Consequently, high debt stocks hinder growth by stifling investment. The Laffer curve, which is non-linear and inverted U-shape,

is used to postulate when debt overhang occurs at the point of inflection in case of a negative relationship between increase in government revenue and tax rate.

2.1.5 Financial theory of investment (cost of capital theory of investment)

The theory was developed by James Duesenberry (Duesberry, 1958). The theory noted that the accelerator theory does not consider the cost of capital in a firm's investment decisions. Duesenberry stated that a firm gets investment funds from three sources: retained earnings (profits after taxes), bank loans, and equity financing through issuing shares. Firms borrow from the market at prevailing interest rates to finance investments through loans. The cost of borrowing (lending interest rates) funds increases with increased demand for investment funds. A firm's increased demand for investment funds increases interest rates (cost of borrowing) as the debt service ratio to earnings rises. This is because the opportunity cost of not repaying the debt increases. Therefore, investment is determined by the cost of capital (lending rate). The functional form of the theory can be written as follows:

$$I_t = f(R_t)$$

Where I_t is investments and R_t represent lending rates.

2.1.6 Pecking order theory

The theory was put forward by Myers and Majiuf (1981). It states that firms prioritize their financing sources, from internal financing, loans to equity financing. If firms want to inject in a particular project, internal funds are the first to be used and when they get depleted, the firms result to credit from commercial institutions with equity financing as the last resort of capital for development. The availability of credit matters for firms regarding the cost of acquiring credit. When credit is relatively cheap, firms are encouraged to borrow more to find their development projects. However, when credit is not available, or it is too costly, firms reduce their level of investment.

2.1.7 Purchasing power parity theory

The theory was first brought forward by Gustav Cassel during the first world war and George Terborgh to recommend sets of official exchange rate in international trade (Cassel, 1918; Strand, 1995). The theory states that in absence of international trade barriers, consumers shift their demand to areas with lower prices. In the case of two countries, A and B, which have inconvertible currencies, the currency of country A is valued in terms of currency of country B because it represents the purchasing power of country A because it can be exchanged for goods and services in country B. Each currency's value is determined by its purchasing power of goods and services, both at home and abroad. If the domestic purchasing power

of two currencies is similar, their values on the foreign-exchange market should be equal. If a currency is undervalued, the products produced in that economy tend to be cheaper than similar goods and services produced in a country with a stronger currency. This makes exports originating from the country with the undervalued currency cheaper as it would be profitable for the country with the overvalued currency to purchase goods in the country of the undervalued currency. This attracts private investments in the country with the undervalued currency because its exports are cheaper to produce compared to the country with overvalued currency. The ratio between the internal purchasing powers of two currencies is their purchasing-power parity. This is the ratio that fundamentally determines the exchange rate between countries.

2.2 Empirical Literature

2.2.1 External debt and private investment

Although the existing literature on external debt and private investment is extensive, the results are inconclusive on whether external debt crowds in or crowds out private investment. Investments are a paramount medium through which external debt can affect economic development. Studies on the direct relationship between external public debt and private investment are few (Muhdi and Sasaki, 2009). The linkage between external public debt and private investments is often studied implicitly. The empirical findings are conflicting and equivocal for the few papers focusing on the direct linkage between external public debt and private investments. Some studies convey a positive effect, while others have a negative effect. However, the adverse effect is dominant as compared to the positive linkage between external debt and private investment (Hakimi et al., 2019).

A study undertaken by Borensztein (1990) for the Philippines revealed that external debt negatively impacts private investment. The study used a standard neoclassical investment demand function, adding a term to represent debt overhang to test for significance. The empirical results indicated a possibility of debt as a factor crowding out private investment.

Using ordinary least squares regression, Muhdi and Sasaki (2009) examined the effect of domestic private investment and foreign debt on the Indonesian economy. According to the research, foreign debt negatively impacts growth and investment rates. This suggests that the Indonesian economy's private investment is negatively impacted by external debt. Further, by encouraging private investment and increasing supply and attracting private investment capital, external debt also indirectly impacts both aggregate supply and aggregate demand. The study concluded that the Indonesian government needs to reduce its borrowing externally and broaden its revenue base.

In the quest to analyse the influence of external debt and investment on economic performance in Sub-Saharan Africa (SSA) (Kenya included), Abimbola Abedeji, and Oladipupo utilized a panel of 26 countries from 1999 to 2014. The study utilized the systemic General Method of Moments (GMM). According to the findings, external debt has a negative impact on growth but a positive one on investment.

Additionally, there is a negative outcome from the interplay of investment and foreign debt. Inflation has a negative influence on growth, whereas trade openness has a beneficial impact. The study's conclusion portrayed that economic growth was negatively impacted by inflation, the financial crisis, and the combination of foreign debt and the financial crisis, while the effect of trade openness was unclear. The study would inform current research on the relationship between external public debt and private investment in the Kenyan context (Abimbola et al., 2019)

In exploring the influence of public investment on private investment, Erden and Holcombe (2005) conducted a study on 19 developing countries. They applied the two-stage least squares (SYS-2SLS) method to obtain their findings. The study utilized an empirical model based on a flexible accelerator investment model that allows private investors to be explained by several pertinent variables. The study's results indicated that private investment would increase by about 2 per cent if public investment rose by 10 per cent. This could be attributed to complementary infrastructure for the private sector, the stabilizing effect that public investment has on the economy, or the fact that public investment informs private investors about investment productivity. However, the authors note that uncertainty negatively affects private investment.

Using annual data from 1970 to 2011, Augustine examined the factors affecting private investment in Ghana using the ARDL model. The study's results demonstrated that GDP and exchange rate had a positive and significant effect on private investments in the long-run. In contrast, inflation, interest rates, and the regime negatively and significantly impacted private investments (Agustine, 2014). Similarly, Ajide and Lawanson (2015) examined factors influencing private sector investment in Nigeria between 1970 and 2010 using annual time series data. They employed the ARDL model and discovered that terms of trade, interest rates, currency rates, output, foreign debt, private sector credit, and reforms were significant long-term determinants of private investment (Ajide and Lawanson, 2015).

A study by Adigun and others sought to test the causality between external debt and private investment using time series data between 1970 and 2003. The results found a bidirectional link between external debt and foreign private investments in Nigeria. The analysis, however, did not consider how this causation may affect the Nigerian economy (Adigun et al., 2017).

Kamundia, Gitahi and Mwilaria (2015) conducted a study to examine the effect of public debt on private investments and economic growth and the causality between public debt and private investment in Kenya. They used an Ordinary Least Square estimation on time series data from 1980 to 2013. The study revealed an inverse unidirectional linkage between the debt-GDP ratio and private investment. It demonstrates that the levels of public debt prediction have a negative effect on the level of private investment in the country. The results confirm the existing school of thought that high debt crowds out private investments by revealing that debt has a negative effect on private investment. Considering that the paper uses OLS to estimate the results, it assumes that government policy and other control variables are exogenous and could portray false results. The authors did not

highlight stationarity tests – a possible risk of inaccurate results and conclusions. The current study would take a slightly different approach to explore the effect of public external debt on private investment (Gitahi and Mwilaria, 2015).

2.2.2 External debt sustainability and private investment

From the reviewed literature, not much has been done on this relationship. Most studies have sought to understand the determinants of external debt sustainability. Consequently, the presented literature addresses the sustainability of external debt and its determinants. Intuitively, debt sustainability might have either an indirect positive or negative influence on private investment. The link would be through high public external debt, subjecting a country to difficulty servicing the debt. A study by Reinhart Navarro-Ortiz and Sapena sought to create a probabilistic approach to measure a nation's public external debt sustainability. The study used international investment position and balance of payment data from the IMF for 38 countries categorized into developed and developing. The authors estimated the parameters using an autoregressive model (VAR) (Navarro-Ortiz and Sapena, 2020). The paper used Monte Carlo Simulation to estimate the capacity distribution for each country to repay. The study's findings indicated that a large section of the projected distribution to the current debt is a cautionary sign for devaluation. The nations in this situation may have difficulties repaying their debts at current exchange rates. However, countries with independent monetary policies are compelled to devalue their currency to balance their current accounts and pay for foreign debts. The study revealed that ambitious frontloading plans for public investment might call for more borrowing, reducing debt sustainability risks because of declining investment efficiency.

Melina et al. (2016) did a study to develop the Debt Sustainability, Public Investment, and Natural Resources (DIGNAR) model. The model is useful for resource-rich developing countries to analyse how public investment affects growth and debt sustainability. It highlights widespread issues in these nations that may worsen during scaling-ups, such as ineffective investment and low absorptive ability. It also permits variable fiscal specifications, including joint financing of investments through resource income and debt, using a resource fund as a safety net, and the potential of distorting budgetary adjustments (Melina et al., 2016).

Eichler and Pyun studied the influence of sovereign solvency on the private-public savings balance. The study utilized data ranging from 1989-2018 on 80 economies. Further, the paper found vigorous evidence for a U-shaped pattern in the private-public savings balance in sovereign credit ratings using the Generalized Method of Moments (GMM). Consequently, when changing their saving habits in response to optional fiscal shocks, consumers appear to be paying attention to sovereign default risk (Eichler and Pyun, 2022).

2.3 Overview of Literature

In section two, we reviewed the theoretical and empirical literature on the effect of public external debt on private investment. Based on the literature, a few studies have focused on the linkage between public external debt and private investment. Most studies focused on the effect of public debt stock on private investment, while others focused on the influence of public domestic debt on private investment. Also, the studies on the effect of public external debt for specific countries were few, and thus the need to conduct the current study in Kenya.

3. Methodology

This section presents the methodological approach used in examining the relationship between government external debt. The first part introduces the theoretical framework, with the second part presenting the analytical framework. The last part looks at variable description and data sources.

3.1 Theoretical Framework

The study adopts the accelerator investment theory developed by Clark (1917), augmented with the theory of debt overhang, theory of irreversible investment under uncertainty, and the financial theory of investment. The accelerator theory of investment states that capital demand increases with acceleration in demand for output; therefore, the name accelerator (Bojnec and Latruffe, 2011). The accelerator principle holds that an increase in a firm's output rate will require a proportionate increase in its capital stock. The accelerator, β , is the ratio between induced investment and a change in output.

$$K_t = \beta(Y_t) \quad (3.1)$$

Where K_t is the optimal capital stock in time t , β (our accelerator coefficient) is a positive, and Y_t is the output in period t .

A change in output induces a change in capital stock, hence:

$$K_t - K_{t-1} = \beta(Y_t - Y_{t-1}) \quad (3.2)$$

But the change in capital stock $K_t - K_{t-1}$ represents investments I_t , while $\Delta Y_t = Y_t - Y_{t-1}$

Therefore;

$$I_t = \beta \Delta Y_t \quad (3.3)$$

Equation (iii) represents the naïve accelerator.

The general model of investment from this theory is written as:

$$I_t = f(Y_t) \quad (3.4)$$

Where Y_t represents a change in output

Additionally, the theory of debt overhang states that high public debt has a propensity towards long-term economic stagnation due to a slowdown in private investments, as private investors are less inclined to incur expenses in the form of increased taxes to service public debt. The tax disincentive suggests that a high debt stock deters private investments because potential investors believe taxes would be levied on their future earnings to pay off the debt.

Thus, equation (3.4) can be extended to include government external debt as follows:

$$I_t = f(Y_t, Ext_t) \quad (3.5)$$

Further, the theory of irreversible investment under uncertainty states that when investments are irreversible, investors make timing decisions that trade off the extra returns from early commitment against the benefits of increased information gained by waiting. Uncertainty may come in different form, such as government policies, laws and regulations that guide external debt service, and policies and laws on taxation and foreign exchange, which may affect investors' cost of doing business. With this uncertainty, the threshold return that justifies an irreversible investment rises, which limits an investor's capacity to redeploy capital in undesirable conditions. Therefore, external debt sustainability becomes a key factor affecting private investments due to the reallocation of resources that the government may use to expand the capacity for external debt service, such as increase in taxation, which exacerbates private sector's cost of doing business.

Thus, equation (3.5) can be extended to include government external debt sustainability as follows:

$$I_t = f(Y_t, Ext_t, Dsub_t) \quad (3.6)$$

Where Ext_t represents government external debt and $Dsub_t$ represents government external debt sustainability while Y_t represents a change in output.

Also, the financial theory of investment (cost of capital theory of investment) holds that firms get investment funds from three sources; retained earnings (profits after taxes), loans from banks, and equity financing through the issuance of shares. If private firms finance their investments with loans from financial institutions, then lending rates are an essential element of the rental cost of capital. Nelson (2018) found an inverse and significant relationship between lending rates and private investments. It was informed by the fact that lending rates influence the cost of capital and credit availability to domestic private investors in Kenya. Nnamdi (2019), while examining the asymmetric effects of lending rates on private investments in Nigeria, also showed that positive shocks from lending rates exerted a significant decrease in private investment while the effect of negative shocks on lending rates led to an insignificant increase in investment (Nnamdi (2019). In addition, Assibey and Baah-Boateng found that higher lending cost negatively affected private investments in Ghana. Also, the banking sector, through financial intermediation, plays a crucial role in channelling savings into productive investment through credit to the private sector. This in turn allows the private sector to use the credit to enhance their productive capacity through investment (Osei-Assibey and Baah-Boateng, 2012). Banks accept deposits from individuals and institutions and transfer these funds from the surplus sector to the deficit sector of the economy through credit (Dickey and Fuller, 1979; Phillips and Perron, 1988). The functional form of the theory can be written as:

$$I_t = f(R_t) \quad (3.7)$$

Where I_t is investments and R_t represents lending rates to private sector by banks.

Thus, equation (3.7) can be further extended to include the lending rates. As such, the investment model can be expressed as follows:

$$I_t = f(Y_t, Ext_t, Dsub_t, R_t) \quad (3.8)$$

Credit to private sector is an essential factor that influences private investments through cost of capital. The pecking order theory states that the availability of credit matters for these firms regarding the cost of acquiring credit. When credit is relatively cheap, firms are encouraged to borrow more to fund their development projects. However, when credit is not available, or it is too costly, firms reduce their level of investment. Thus, equation (3.8) can be extended to include credit to private sector.

$$I_t = f(Y_t, Ext_t, Dsub_t, R_t, Cr_t) \quad (3.9)$$

Additionally, the purchasing power parity theory states that if a currency is undervalued, the products produced in that economy tend to be cheaper than similar goods and services produced in a country with a stronger currency. This makes exports originating from country with the undervalued currency cheaper as it would be profitable for the country with the overvalued currency to purchase goods in the country of the undervalued currency. This attracts private investments in the country, with the undervalued currency because its exports are cheaper to produce compared to the country with overvalued currency. Therefore, equation (3.9) can be extended to include real effective exchange rate as follows:

$$I_t = f(Y_t, Ex_t, Dsub_t, R_t, Cr_t, REER_t) \quad (3.10)$$

3.2 Empirical Model Specification

The study estimates the following equation derived from equation (3.10) above.

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 Ext_t + \beta_3 Dsub_t + \beta_4 R_t + \beta_5 Cr_t + \beta_6 REER_t + \varepsilon_t \quad (3.11)$$

Where:

β_0 represents a constant, I_t represents private investments, Y_t represents real GDP growth, Ext_t represents government external debt, $Dsub_t$ represents external debt sustainability, R_t represents the lending rates, Cr_t represents credit to the private sector, $REER_t$ represents real effective exchange rate.

$\beta_1, \beta_2 \dots \beta_6$ are coefficients of the variable estimates

ε = error term

3.3 Econometric Approach

The study used the Autoregressive Distributed Lag (ARDL) time series estimation technique to examine the effect of public external debt on private investment in Kenya. This is a time series model used to investigate relationships between variables when considering various time lags. This is informed by the fact that ARDL estimates both the long-run and short-run time series parameters more efficiently as opposed to the OLS estimation technique. In Addition to that, this technique is preferable when dealing with variables that are integrated at level and at first difference while OLS can only estimate I(0). The ARDL model took the following form:

$$\Delta I_t = \beta_0 + \sum_{i=1}^l \lambda \beta_1 \Delta I_{t-k} + \sum_{i=1}^m \beta_2 \Delta Y_{t-k} + \sum_{i=1}^n \beta_3 \Delta Ext_{t-k} + \sum_{i=1}^p \beta_4 \Delta Dsub_{t-k} + \sum_{i=1}^p \beta_5 \Delta R_{t-k} + \sum_{i=1}^p \beta_6 \Delta Cr_{t-k} + \sum_{i=1}^p \beta_7 \Delta REER_{t-k} + \gamma \Delta J_{t-k} + \varepsilon_t \quad (3.12)$$

The Δ are known as the first difference operators. The constant term is denoted by β_0 . Parameters β_1 to β_7 represent the coefficients of estimates in the short-run (short-run dynamics). λ denotes the adjustment speed to the equilibrium after any initial disequilibria. It shows how fast the short-run dynamics adjust towards run equilibrium and should be negative and statistically significant. The error correcting term ΔJ_{t-k} represents the lagged values of the residuals obtained from the cointegrating regression between dependent and independent variables. It depicts long-run relation between the variables in the study. The ε_t is the error term.

3.4 Diagnostic Tests

3.4.1 Pre-estimation test

The study carried out kurtosis and skewness diagnostic test to examine the distribution of the data. Unit roots presence may result to spurious inference, hence the need to examine for stationarity to achieve valid inference. Phillips Perron and Augmented Dickey-Fuller (ADF) tests were used to examine for the existence of the unit-roots (Dickey and Fuller, 1979; Phillips and Perron, 1988). The ADF test is more powerful and handles more complex models than the Dickey-Fuller test. The advantage of using the Philips and Perron test is that it is not necessary to specify the model and lags in the regression, since it is a non-parametric test. Akaike Information Criterion (AIC) was used to select maximum lag length. Thereafter, the Johansen co-integration test was used to examine the presence of a long-run relationship among the variables (Johansen, 1991). The study also used Variance Inflation Factor (VIF) to examine for the presence of multicollinearity.

3.4.2 Post-estimation tests

The normality of residuals was checked using Shapiro-Wilk test. Heteroscedasticity of residuals was tested using Breusch-Pagan test while model stability was tested using recursive CUSUM test.

3.5 Data Sources and Descriptive Statistics

The study utilized annual time-series secondary data from the year 1980 to 2020. Data on gross capital formation in private sector was sourced from the African Development Bank socio-economic statistics. The data on external debt as a percentage of GDP, external debt service as a percent of exports, commercial bank loans and advance lending rate, credit to private sector and real GDP growth were extracted from Kenya National Bureau of Statistics Economic Surveys. Data on real effective exchange rate was extracted from Bruegel database.

Private investment (I), the dependent variable, was measured as gross capital formation in private sector as a percentage of GDP. The independent variables are external debt (Ext), external debt sustainability (Dsub), lending rate (R), and real GDP growth (Y), credit to private sector (Cr), real effective exchange rate (REER) (Table 3.1). External debt (Ext) was measured by external debt stocks as a percentage of GDP while external debt sustainability (Dsub) was measured by external debt service as a percentage of exports. GDP growth was measured by real Gross Domestic Product growth (percentage). The lending rate was measured by commercial bank loans and advances rate. Credit to private sector was measured by credit to private sector as a percentage of GDP while real effective exchange rate was measured by real effective exchange rate index.

Table 3.1: Measurement of variables

Variable Name	Notation	Variable Description	Expected Sign	Source
Dependent Variable				
Private Investment	I	Gross capital formation, private sector as a % of GDP		African Development Bank (AFDB) Socio- Economic Database
Independent variables				
External debt	Ext			
	External debt stocks as a % of GDP			
	Positive or Negative	KNBS Economic Surveys		
Debt sustainability	Dsub	External debt service as a percent of exports	Positive or Negative	World Bank World Development Indicators
Lending rates	R	Commercial bank loans and advances rate	Negative	KNBS Economic Surveys
Economic growth	G	Real gross domestic product growth (%)	Positive	KNBS Economic Surveys
Credit to Private Sector	Cr	Credit to private sector as % of GDP	Positive	KNBS Economic Surveys
Real effective exchange rate	REER	Real effective exchange rate index (2007 = 100)	Positive or Negative	Bruegel Database

Source: Authors' compilations

Based on characteristics of the study variables presented in Table 3.2, all the variables are skewed towards the right as shown by their positive values. Kurtosis estimates how heavy the tails are in the distribution. A normal distribution is supposed to have a kurtosis between zero and three. All the variables have a kurtosis value between zero and three, which implies a normal distribution standard kurtosis.

Table 3.2: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Private investment	42	9.219	3.925	2.900	15.200	0.7893	0.0000
External public debt	42	27.360	17.158	0.800	85.000	0.0861	0.0506
External public debt sustainability	42	220.293	83.961	94.300	393.700	0.5437	0.1437
Real GDP growth rate	42	3.9238	2.031	-0.300	7.500	0.1444	0.2831
Lending rates	42	18.383	7.215	11.000	38.500	0.0010	0.2631
Credit to private sector	42	20.141	10.756	4.600	39.800	0.2269	0.0115
Real effective exchange rate	42	99.207	26.781	58.600	158.700	0.0145	0.8831

Source: Authors' computations

4. Empirical Findings

4.1. Pre-Estimation Tests

4.1.1 Lag length determination

The study variables lag length was determined using Akaike Information Criterion (AIC) at 5 per cent level. Based on the results, most criteria identified the lag length to be 4 (Table 4.1).

Table 4.1: Lag length determination

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-959.642				2.9e+13	50.8759	50.9832	51.1776
1	-761.311	396.66	49	0.000	1.2e+10	43.0164	43.875	45.4296*
2	-725.407	71.807	49	0.019	3.1e+10	43.7056	45.3156	48.2305
3	-659.503	131.81	49	0.000	2.9e+10	42.816	45.1772	49.4525
4	-525.048	268.91*	49	0.000	3.0e+09*	38.3183*	41.4309*	47.0665

* Indicates the lag length selected by a criterion

Source: Authors' computations

4.1.2 Determination of time series properties

Stationarity test results

Real GDP growth rate was found to be stationary at level while all the variables were stationary at first difference (Table 4.2).

Table 4.2: Stationarity test results

Variables	Augmented Dickey Fuller			Philips Perron		
	P-value (level)	P-value at 1st Difference	Order of integration	P-value (level)	P value (1st Difference)	Order of integration
Private investment	0.5547	0.0000	I (1)	0.5027	0.0000	I (1)
External debt	0.4945	0.0000	I (1)	0.3184	0.0000	I (1)
Debt sustainability	0.9102	0.0000	I (1)	0.7936	0.0000	I (1)
Real GDP growth rate	0.0034	0.0000	I (0)	0.0030	0.0000	I (0)
Lending rates	0.5348	0.0000	I (1)	0.3982	0.0000	I (1)
Credit to private sector	0.2532	0.0000	I (1)	0.2105	0.0000	I (1)
Real effective exchange rate	0.9880	0.0000	I (1)	0.9890	0.0000	I (1)

Source: Authors' computations

Cointegration test results

Johansen cointegration test was used to examine for the presence of long-run relationship between the variables in the study. The Trace Statistic and Maximum eigen value cointegration indicate that there are at most two cointegrating equations. This implies the presence of long-run relationship between private investment, external public debt, external public debt sustainability, GDP growth rate, lending rate, credit to private sector and REER (Table 4.3).

Table 4.3: Cointegration test results

No. of CE(s)	None *	At most 1*	At most 2*	At most 3	At most 4	At most 5	At most 6
Trace test							
Eigenvalue		0.767	0.577	0.478	0.346	0.28724	0.111
Trace statistic	154.153	95.821	61.452*	35.445	18.4815	4.937	0.212
5% Critical value	124.240	94.150	68.520	47.210	29.68	15.410	3.760
Max-eigenvalue test							
Eigenvalue		0.76737	0.577	0.47804	0.346	0.287	0.111
Trace statistic	58.332	34.369	26.007	16.964	13.545	4.725	0.212
5% Critical value	45.280	39.370	33.460	27.070	20.97	14.070	3.760

Source: Authors' computations

Multicollinearity test (variance inflation factor)

The study also examined the presence of multicollinearity between variables using variance inflation factor, which was found not be a serious issue since, as per the rule of thumb, all the VIF values were below 10 and tolerance levels were above 0.1 (Table 4.4).

Table 4.4: Multicollinearity test

Variable	VIF	1/VIF
External public debt	5.35	0.187083
External public debt sustainability	2.25	0.443485
Real GDP growth rate	1.53	0.651487
Lending rate	3.01	0.332368
Credit to private sector	2.06	0.486253
Real Effective Exchange rate	1.44	0.692905
Mean VIF	2.61	

Source: Authors' computations

4.2 ARDL Results

ARDL approach was used, since all the variables in the study were cointegrated. The results were obtained after estimating equation (3.12) as shown in Table 4.5 and 4.6.

ARDL results with linear variables

The adjusted R^2 values indicate that 75.8 per cent of the variations in private investments are caused by external public debt, external public debt sustainability, real GDP growth, lending rate, private sector credit and real effective exchange rate. Adjustment (ADJ) represents speed of the adjustment to converge back to long-run equilibrium. It should be negative between 0 and 1 and statistically significant for the variables converge to long-run equilibrium. According to the ARDL results below, the speed of adjustment coefficient (-0.527) was negative and was statistically significant at all levels, reflecting convergence and the ability to correct the short-run errors for returning to the long-run balanced positions. This implies that 52.7 per cent of disequilibrium in the previous year is corrected in the current year.

The short-run coefficient for external public debt (-0.261) was found to be statistically significant at all levels of significance. This implies that in the short-run, *ceteris paribus*, a percentage increase in external public debt reduces private investments by 0.261 per cent. These findings are in line with Checherita and Rother, who stated that a rise in external public debt levels generates increased expenditure on interest and principal payments, which serves as a disincentive for private investments (Checherita-Westpal and Rother, 2014).

The short-run coefficients for external public debt sustainability (0.054) were statistically significant all levels of significance. This indicates that in the short-run, *ceteris paribus*, a percentage increase in external public debt sustainability increased private investment by 0.054 per cent. These findings disagree with Cassimon who opined that the risk of debt distress because of rapid accumulation of external debt discourages private investments (Cassimon et al., 2015).

The short-run coefficients for real GDP growth (0.375) was statistically significant at one per cent level of significance. That implies that in the short-run, *ceteris paribus*, a percentage increase in real GDP growth rate increased private investments by 0.375 per cent. These findings support Augustine (2014), who found out that real GDP growth had a positive effect on private investments in Ghana.

The short-run coefficient for lending rate (0.728) was statistically significant at all levels of significance, implying that in the short-run, *ceteris paribus*, a percentage increase in lending rates increased private investments by 0.728 per cent. These findings disagree with Olweny and Chiluwe (2012), who found that lending rates had an inverse relationship with private investments in Kenya. Onwumere, Okore a Ibe (2012) and George-Anokwuru (2017) also found that there exists an inverse relationship between private domestic investments and lending rates

in Nigeria (Chidinma George-Anokwuru, 2017; Onwumere et al., 2012). Also, the study agrees with Osei-Assibey and Baah-Boateng who found out that the higher cost of lending had a negative impact on private investments in Ghana. This was due to the higher costs associated with servicing the loans (Osei-Assibey and Baah-Boateng, 2012).

The short-run coefficients for credit to private sector (0.105) was statistically significant at five per cent level of significance. That indicates that in the short-run, *ceteris paribus*, a percentage increase in credit to private sector increased private investments by 0.036 per cent. These findings are in line with Onwumere who found that credit to private sector induced private investments in Nigeria (Onwumere et al., 2012).

The long-run coefficients for external public debt (0.772) were statistically significant at all levels of significance. This indicates that in the short-run, *ceteris paribus*, a percentage increase in external public debt increases private investment by 0.772 per cent. These findings support Olweny and Chiluwe, who opined that external public debt used for capital spending enhances private investments in Kenya (Olweny and Chiluwe, 2012). Also, external public debt complements tax revenues, enabling an economy to smoothen its consumption patterns across generations. That raises its society's inter-temporal welfare in addition to crowding in private investment through provision of public infrastructure and services that reduce the cost of doing business (Adigun et al., 2017).

The long-run coefficients for external public debt sustainability (-0.701) were negative and statistically significant at all levels of significance. This implies that in the long-run, *ceteris paribus*, a percentage increase in external public debt sustainability decreases private investments by 0.701 per cent. These findings are online with Senadza and Fiagbe, who opined that the risk of debt distress due to rapid accumulation of external debt discourages private investments (Senadza and Fiagbe, 2017).

The long-run coefficients for lending rates (-0.680) was statistically significant at five per cent levels of significance. This implies that in the long-run, *ceteris paribus*, a percentage increase in lending rates reduces private investments by 0.68 per cent. These findings compare with Onwumere, Okore and Ibe (2012) and George-Anokwuru (2017) who found that an inverse relationship exists between private domestic investments and lending rates in Nigeria. Also, the results of the study corroborate with Osei-Assibey and Baah-Boateng, who found that the higher cost of lending had a negative impact on private investments in Ghana. This was due to the higher costs associated with servicing the loans (Osei-Assibey and Baah-Boateng, 2012).

The long-run coefficients for real effective exchange rate (0.091) were statistically significant at five per cent levels of significance. This implies that in the long-run, *ceteris paribus*, a percentage increase in real effective exchange rate increases private investments by 0.091 per cent. These findings compare with Clausen (2008), who found that a minimal rise in real effective exchange rate stimulated private investments in Chile and Mexico.

Table 4.5: Linear ARDL results

	Private investment
Speed of Adjustment (ADJ)	-0.527*** (-4.05)
Long-run	
External public debt	0.573** (3.47)
External public debt sustainability	-0.070** (-3.55)
Real GDP growth	0.403 (0.70)
Lending rate	-0.680* (-2.35)
Private sector credit	0.289 (2.00)
Real effective exchange rate	0.091* (2.52)
Short-run	
External public debt	-0.261*** (-4.52)
Debt sustainability	0.054** (4.37)
Real GDP growth	0.375* (2.28)
Lending rate	0.728*** (5.10)
Credit to private sector	0.106* (2.38)
Observations	38
Adjusted R ²	0.758
t- statistic in parentheses ***p < 0.001, **p < 0.05, *p < 0.1	
Shapiro-Wilk test for Normality of Residuals	0.674
Breusch-Pagan / Cook-Weisberg test for heteroscedasticity	0.337
Recursive Cumulative sum (CUSUM) test for parameter stability	0.776

Source: Authors' computation

ARDL results with public debt as non-linear variable

Table 4.6: ARDL results with public debt as non-linear variable

	Private investment
Speed of Adjustment (ADJ)	1.212 (1.83)
Long-run	
External public debt	0.203 (1.58)
Public debt squared	0.127 (2.99)
External public debt sustainability	0.127* (2.99)
Real GDP growth	2.234* (3.76)
Lending rate	-0.155 (-0.65)
Private sector credit	-0.191 (-1.53)
Real effective exchange rate	0.156 (1.60)
Short-run	
External public debt squared	0.132 (0.92)
Debt sustainability	0.155* (3.59)
Public debt squared	-207.989 (-3.17)
Real GDP growth	0.727 (1.52)
Lending rate	0.701* (4.19)
Credit to private sector	0.205 (2.84)
Observations	38
Adjusted R ²	0.877
t- statistic in parentheses ***p < 0.001, **p < 0.05, *p < 0.1	

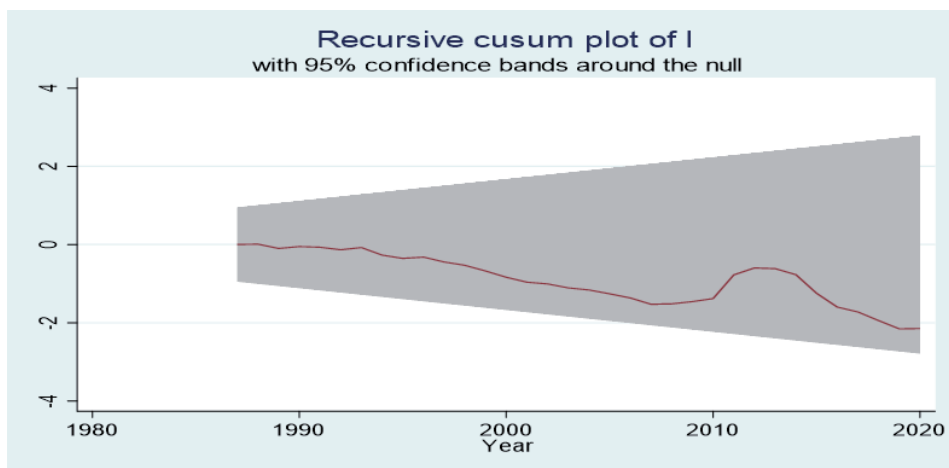
Source: Authors' computation

The study carried out Shapiro Wilk test for normality of residuals, Breusch Pagan test for heteroscedasticity of errors in the regression and Recursive CUSUM model stability test (Breusch-Pagan, 1979; Shapiro and Wilk, 1965). From the table above, we can see that the p-value ($\text{Prob} > z$) for the normality of residuals $0.674 > 0.05$. Therefore, we deduce that the residuals are normally distributed. The value of Chi square statistic ($\text{Prob} > \chi^2$) in Breusch Pagan test for heteroscedasticity of the error term was $0.337 > 0.05$, and therefore we fail to reject null hypothesis and make the conclusion that there is constant variance among the residuals (Table 4.5).

The CUSUM tests examines whether coefficients in the time-series regression are stable over time. From the results in the table, we fail to reject the null hypothesis at five per cent levels because the test statistic value (0.776) is less than the 5 per cent critical level of 0.95. This implies the ARDL regression model is stable at the 5 per cent significance level (Table 4.5).

From Figure 4.1, we can also see that the ARDL model attains the recursive cumulative sum (CUSUM)) model stability test. The CUSUM line is within the 0.05 significance line. Therefore, we conclude that the ARDL estimates are stable.

Figure 4.1: Recursive CUSUM stability test results



Source: Authors' computation

5. Conclusion and Policy Implications

The study sought to examine the effect of external public debt on private investments in Kenya. The key debt variables used included external debt levels measured as a ratio to GDP and external debt sustainability measured by the ratio of external debt servicing to exports. The key findings of the study area as follows:

- External public debt levels tend to crowd in private sector investment in the long-run, while in the short-run, external debt crowds out private investment. This is because external public debt provides key infrastructural development and complementary public goods and services, which creates a conducive environment that boosts private sector investment.
- External public debt sustainability had a negative effect on private investment in the long-run, but a positive effect in the short-run. This implies that external public debt sustainability crowds-out private investments in the long-run because of using relatively large amounts of domestic revenue to service external public debt obligations.
- The net effect of external public debt and external public debt sustainability on private investment was positive in the long-run, as the positive magnitude of external public debt superseded the negative magnitude of external public debt sustainability.
- Real GDP growth and real effective exchange rate have a positive effect on private investments in the long-run. This implies that real GDP growth and a weak domestic currency encourage private investments to meet the increased domestic demand for goods and services in addition to boosting demand for exports as imports become more expensive. However, lending rates had a negative effect on private investment. This is because high lending rates increase the cost of acquiring investment capital by private investors.

The following are the policy implications:

- To ensure that the long-run effects of external debt used to finance infrastructure are secured, the Public Investment Management Unit at the National Treasury, which focuses on projects that are being implemented, could do extensive feasibility and viability studies of public infrastructure projects to ensure that they are sustainable. The Unit could conduct regular appraisals of key public infrastructure projects to enable the optimization of project design and ensure the projects yield the highest social and economic returns in line with national, regional, and international development goals.
- To ensure that payments in external debt servicing do not make it difficult for the private sector to invest, the National government through the Kenya Revenue Authority could ensure that tax rates are not increased to meet debt obligations.
- The national government, through the Public Investment Management Unit in the National Treasury, could ensure that public investment financed by the external public debt serves to create a conducive environment for

private sector investments. The Central Bank of Kenya could implement accommodative monetary policies that encourage private investment. The National government is also encouraged to provide incentives to lower the cost of production, which ensures that domestic products are competitive in the global market.

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