

**The Impact of External Debt to Growth
in Kenya: 1980—2000** 4

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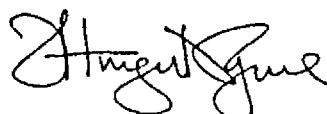


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A research project submitted to the Department of Economics, University of Nairobi, in partial fulfillment of the departmental requirements for the degree of Masters of Arts (Economics)

Declaration

This dissertation is my own original work and has not been presented for any academic award in any institution before now.



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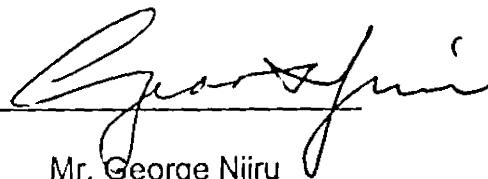
This dissertation has been submitted for examination with our approval as university supervisors.



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Dedication

To my mother whose support has always been unequivocal.

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Abstract

This research paper assesses the linear impact of external debt on growth in Kenya using a dataset that spans the period 1980—2000. The results are generally robust in econometric regressions using simple OLS methodology across the two different debt indicators employed. The paper finds that the impact of external debt on Kenya's economic growth is negative and significant. The paper's findings also suggest that the average impact of debt on growth becomes negative at about 251.4—310.4 per cent of exports and 71.2—87.3 per cent of GDP. The paper finds it difficult to fit an inverted U-shaped non-linear specification for the panel data used.

Abbreviations

ADF	Augmented Dickey-Fuller test
BoP	Balance of Payments
GDP	Gross Domestic Product
GNP	Gross National Product
HIC	Highly Indebted Countries
HIPC	Highly Indebted Poor Countries
IMF	International Monetary Fund
LDC	Least Developed Country
NPV	Net Present Value
OLS	Ordinary Least Squares
PRSP	Poverty Reduction Strategy Paper
ToT	Terms of Trade
WB	World Bank
WEO	World Economic Outlook

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1.0 INTRODUCTION

1.1 Background

In September 1996, the IMF and the World Bank launched an initiative for the "Heavily Indebted Poor Countries" (HIPC Initiative) which was designed to provide exceptional assistance to eligible countries following sound economic policies to help them reduce their external debt burden to sustainable levels. It has been well recognized that the external debt situation for a number of low-income countries, mostly in Africa, has become extremely difficult. For these countries, even full use of traditional mechanisms of rescheduling and debt reduction—together with continued provision of concessional financing and pursuit of sound economic policies—may not be sufficient to attain sustainable external debt levels within a reasonable period of time and without additional external support (IMF, 1996).

At present, the following developing countries are classified as being the heavily indebted poor countries: Angola, Benin, Bolivia, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Guyana, Honduras, *Kenya*, Lao PDR, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nicaragua, Niger, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, Somalia, Sudan, Tanzania, Togo, Uganda, Vietnam, and Zambia. Debt sustainability analysis suggests that Angola, *Kenya*, Vietnam, and Yemen would have

sustainable debt burdens after the application of traditional debt relief mechanisms, without special help from the Initiative.

High indebtedness of developing countries has received increased attention from policymakers and public opinion around the world as one of the main factors contributing to limit the development of numerous poor countries. Most of these countries have received very large amounts of loans over the past decades, often at highly concessional interest rates. It has become clear however, that repayment of the remaining obligations would not only be virtually impossible but would also be likely to severely constrain economic performance of the debtor countries. Personalities like the Pope; Bono and Manu Chao; movements such as Jubilee 2000; and demonstrations against globalization illustrate the increased sensitivity to the debt issue among people in many countries (Pattillo et al, 2002).

The magnitude of the debt issue is phenomenal. In the 20 year period between 1970 and 1989, the external debt of developing nations grew from \$68.4 billion to \$1,283 billion, an increase of 1,846 percent. Debt-service payments were in excess of \$160 billion by the end of the 1980s. These debts are deemed most vulnerable to default because of the very large share that is owed to commercial creditors at variable rates of interest. . The debt problem in the highly indebted countries (HICs) is made more troublesome by declining per capita incomes and stagnating economies. Both their debt/export and debt-service ratios (see table 1 below) are well above the overall LDC average and, in some cases, even above the ratios of some of the HICs.

Table 1: Dimensions of the Debt Crises 1970—89

	1970	1975	1980	1985	1989
World External Debt (US\$ billions)	68.4	180	635.8	1,016.6	1,262.8
Debt-service payments ¹ (US\$ billions)	11.0	25.8	102.4	138.4	158.8
World Debt/Export ratio (%) ²	99.4	76.4	81.9	148.8	139.0
Sub-Saharan Africa Debt/Export ratio (%)	-	-	92.5	190.5	232.9
World Debt/Service ratio (%) ³	13.5	9.5	13.2	20.3	17.5
Sub-Saharan Africa Debt/Service ratio (%)	5.7	9.5	13.2	20.3	17.5
World Debt/ GDP ratio (%) ⁴	13.3	15.4	24.4	36.6	34.5
Sub-Saharan Africa Debt/ GDP ratio (%)	20.9	-	28.3	45.4	53.2

Source: Todaro M. (1992), "Economics for a Developing World," 3rd Edition, Pg. 360, Longman Publishing, New York.

The 1980s debt crisis was born in the 1974-79 period, when there was a virtual explosion in international lending, precipitated by the first major OPEC oil price increase. By 1974, developing nations had begun playing a larger role in the world economy, having averaged growth rates of 6.6 per cent in 1967-73. To meet their growth needs, many countries had begun importing heavily, especially capital goods, oil and food. Following outward-looking development strategies, they expanded their exports aggressively. In the face of high oil prices and a world recession, in which the growth rates of the industrialized countries fell from an average of 5.2 per cent in 1967—74 to an average of 2.7 per cent for the rest of the decade (Todaro, 1992), many developing nations sought to sustain their high growth rates through increased borrowing. As a result, the total external debt of developing countries more than doubled from \$180 billion in 1975 to \$406 billion in 1979, increasing over 20 per cent annually (Todaro, 1992).

¹ actual payments of interest on total debt plus actual amortization payments on long-term debt

² ratio of external debt to exports of goods and services

³ debt service (see note 1 above) as a percentage of exports of goods and services

⁴ ratio of external debt to Gross Domestic Product

The surge in international lending that occurred in the 1974—1979 period had laid the ground-work for all the problems that were to come. The second oil shock, in 1979, brought about a complete reversal of economic conditions conducive to the success of internal lending in the previous period. Then developing nations faced an abrupt increase in oil prices that added to oil import bills and affected industrial goods imports. There was also a huge increase in interest rates caused by the industrialized countries' economic policies and decrease in Third World export earnings resulting from a combination of slowed down growth in the more developed nations and a precipitous decline of over 20 per cent in primary commodity export prices (Todaro, 1992). Moreover, developing nations inherited from the previous period a huge debt and debt-service obligation, which was made even more onerous by burgeoning interest rates and more precarious as a result of the aggregating short-term maturities.

In this critical situation, the developing countries had two policy options. Either curtail imports and impose restrictive fiscal and monetary measures, thus impeding growth and development objectives, or they could finance more external borrowing. Unable, and sometimes unwilling, to adopt the first option as a means of solving the balance of payments crisis, many countries were forced in the early 1980s to rely on the second option, borrowing even more heavily. As a result, massive debts and debt-service obligations accumulated, so that by the mid 1980s, these countries were faced with severe difficulties in paying even the interest on their debts out of export earnings. However, they could no longer borrow funds in the world's capital markets. In fact, not only

did private lending dry up, but by 1986 the developing countries were paying more than they were receiving in new loans. The HICs had no recourse but to seek IMF assistance and face up to the IMF stabilization programme, the conditions which were tantamount to the first policy option.

For Sub-Saharan Africa, the effects of the debt crisis have, if anything, been more pronounced. As of 1987, real imports were only two-thirds their 1980 level, reflecting the impact of higher debt-service obligations and export earnings only marginally about their 1977 levels. Between 1980 and 1987 gross capital formation fell from 20 to 14 per cent of GDP. Real GDP per capita dropped by 11 percent during this period. To some extent these figures reflect the impact of the 1986—1987 oil-price decline in Nigeria, the largest of the Sub-Saharan countries. Excluding Nigeria, real imports in 1987 were 17 per cent below their 1980 level. Nevertheless, real GDP per capita was 6 per cent lower in 1987 than in 1980, reflecting declines both in gross capital formation and gross domestic savings as a percentage of GDP (Green et al, 1990).

As it stands now, despite their inability to service debt, HICs repay debt because if they failed to do so, their assets abroad could be seized and their reputations would be tarnished, making it more difficult for them to borrow again or attract foreign investments.

1.2 Statement of the Problem

The debt situation has had a severe impact on African economies. With export earning falling, steadily rising debt-service obligations have sharply constrained Africa's import capacity. The decline in capital-goods and intermediate imports has, in turn, had serious repercussions for the ability of African countries to finance and undertake development projects with gross capital formation falling rapidly. Accordingly, the growth rate of real GDP fell to rates lower than the annual rate of population increase. Adjusted for the decline in the terms of trade Africa's fall in GDP was even sharper, implying a much larger decline in living standards.

Besides causing a decline in living standards, the substantial debt overhang has imposed tight constraints on economic policy. In many African countries and indeed Kenya, policy-making has deteriorated to a state of constant crisis management. Maintenance programmes relying on imported goods have been slashed to curb overall government expenditure, and longer-term issues, such as the need for addressing deteriorating social services or improving education programmes, cannot be addressed. Increasing amounts of time have instead been devoted to successive debt rescheduling and short-term adjustment programmes, many of which depend crucially on the vagaries of internal primary commodity markets. In general, the continuity of macroeconomic policies, which is an essential condition for the undertaking of structural reforms, has had to be sacrificed in order to cope with the pressures of the debt and debt servicing.

The debt build-up and the resulting squeeze on external resources has also been destructive to economic institutions. With foreign exchange resources stretched, arrears on debt-service and external commercial payments are common. This has impaired the credit worthiness and has led to the reduction of Foreign Direct Investment (FDI) with foreign firms unwilling to invest or do business in the economy. All these repercussions stem from external debt and impact on growth.

The consequences of the debt problem have been quite severe for Kenya. Growth rates, investment rates, and exports have fallen sharply since 1980. Real per capita GNP has declined steadily during this period. The existing debt burden is proving to be a significant obstacle to the development efforts of the government. Furthermore, debt has seriously constrained the scope of macroeconomic policy-making, and has had damaging effects on economic and financial institutions. Economic policy making has been reduced to crisis management, with longer-term strategies being shelved in order to meet the day-to-day needs of foreign exchange, to make debt service payments and acquire necessary imports for production and consumption.

Current efforts such as HIPC and debt rescheduling are aimed at the reduction of debt-service payments releasing funds that can be used for development needs. Kenya has been excluded from the HIPC initiative because the IMF believes that Kenya would have a sustainable debt burden after the application of traditional debt relief mechanisms, without special help from the Initiative.

In addition, Kenya continues to implore the multilateral donors for more aid and factors in budgetary support monies every fiscal budget. Kenya thus continues to accrue debt with a stolid understand of its impact on her growth. There is need to understand what level of external debt will impact negatively on economic growth.

For specific decisions to be made as to what rescheduling scheme would be optimal to achieve a certain level of growth there is need to develop an understanding of the debt growth relationship for Kenya. This relationship once understood, would help policy makers know what level of external debt would result to negative growth hence making informed decisions. This is the direction this research paper wishes to take.

1.3 Objective of the study

Despite the magnitude of the debt problem or the uproar and the fervor with which initiatives such as HIPC, PRSP and others, few studies have been done in a view to understanding the relationship between debt and growth. The objective of this study is to contribute to the understanding of the relationship between external debt and economic growth in Kenya.

The specific objectives of this study are as follows:

1. To explain the extent to which external debt impacts economic growth.
2. To estimate what levels of external debt impact negatively on economic performance.

1.4 Justification for the study

The debt question for Kenya has been a vicious circle. With a GNP per capita less than \$400, Kenya has had dilapidated infrastructure, lack of sufficient social amenities, low capital formation, low purchasing power hence low demand for goods and services. In this environment, the government struggles to balance the budget from year to year resulting in tighter fiscal policy further reducing effective demand while crowding out the private sector. As a result Kenya is forced to borrow funds for budgetary support every year. This has resulted in greater debt yet there seems no end to her need.

Kenya was excluded from the HIPC initiative as a result she can only benefit from debt restructuring/rescheduling that seeks to put off payments to ease the burden of debt repayments. This however does not end Kenya's obligation to repay the debt. In addition, her need for further help does not end with rescheduling of current repayment obligations so she is forced to borrow further increasing the stock of debt. As a result, debt rescheduling is somewhat negated and so the vicious circle of debt continues.

While all this is going on, the ever increasing stock of debt results in increased debt repayments now or in the future. This is tantamount to capital flight, with funds from export earnings tied down to servicing old debt, the crunching of consumer purchasing power with higher taxes to finance this debt. Money used in debt repayment would otherwise have gone to capital formation and in consequence would have translated to economic growth.

There is therefore need to understand the relationship between external debt and economic growth. For the policy maker who negotiates debt rescheduling understanding this relationship is paramount as he/she is well informed about the level of debt repayment obligation that is detrimental to economic growth.

Currently, with a new political dispensation there is plenty of external goodwill to help Kenya get out of the debt rut. This study will shed light on what levels of debt are sustainable for the specific case of Kenya which she can target as she negotiated new debt repayment plans.

2.0 LITERATURE REVIEW

In this section we explore literature on the effect of debt on growth in linear or nonlinear form. We discuss theory which asserts that low levels of debt can aid capital formation and hence have a positive effect on growth. We also assess models which illustrate that high accumulated debt stocks are likely to be associated with lower growth.

2.1 Theoretical Literature Review

The ever growing problem of debt accumulation in Sub-Saharan Africa has been received with much attention in literature and is now recognized as a serious global economic issue. Green (1989) attributes this debt problem to both domestic policies and external factors. Besides expansionary fiscal policies and borrowing against exports to maintain consumption levels, many of these countries pursued other policies that weakened their external positions—maintenance of high levels of imports, over valued exchange rates, government subsidy policies and eternal financing of over ambitious development projects. From the late 1970s the shift in terms of trade against African countries and the decline in export earnings has been a major external influence and has greatly hampered the countries' ability to meet their debt obligations. Another factor that contributed to sub-Saharan debt burdens was the decline in net capital inflows. The rise in foreign interest rates, although less important because of the predominantly official character of sub-Saharan

debt, may have affected a number of countries that made significant use of commercial borrowing.

2.1.1 Theoretical consideration of the Capital-Investment channel

Capital formation in the way through which growth manifests vide the investments function. The origin of economic theory of capital can be traced as far back as the classical school, where it was included as an essential argument in the production function. Although the recognition of the vital role of capital in the production process antedates theorization, the controversy there was centred on the degree of its importance and the form it should take to provide maximum utility. Beginning in the 1960s, the role of physical capital was downplayed in favour of human capital has helped to shift the focus from the former to the latter. But whatever form it may take, the crucial role of capital in the production process is solidly established (Harcourt, 1972).

A number of models have been constructed in an attempt to show the impact of capital imports on aggregate performance of sub-Saharan economies. The majority of these models deal with labour surplus economies and emphasize growth of capital stocks. Many models emphasize incremental capital-output relationships, which suggest that the rate of economic growth increases if the ratio of investment of national income rises and that an increase in capital imports increases the investment ratio as Chernery, (1966) observes.

Cherney and Bruno (1962) in their two-gap theory suggest that growth is limited by two constraints. First, the savings gap constrains the country's ability to save and invest. Second, the foreign exchange gap accruing from

limited export revenues and the targeted growth rate of the economy causes imports to exceed the economy's ability to finance them. To explain the theory we use the Harrod growth equation of the type

$$g = sk$$

where g is the real growth rate of national income, s is the ratio of savings to national income and k is the incremental capital output ratio.

Kenya like most of the other HIPC's is characterized by negative gross savings in the last two decades. When gross domestic investment is taken into consideration, the savings gap is seen to be extremely large. This has in most cases been accompanied by positive real growth rates and suggests that growth has been driven by aid. Therefore,

$$g = (s + a)k$$

where a is the ratio of aid to national income. If g^* is the targeted growth rate and k is the assumed constant over time, the rate of capital accumulation necessary to achieve the target growth rate is denoted by

$$g^* / k = s + a$$

let $s + a$ and $a = c - s$. Hence, $c - s$ represents the savings gap.

This analogy implies that aid inflows should have the following potential effects:

1. supplementing domestic savings, hence capital accumulation and
2. increasing the proportion of income saved

If this is the case then aid increases the capacity for economic growth and should be able to lead the country to self-sustaining levels that subsequently reduce the amount of aid contracted. The assumption is that the increase in aid is greater than the increase in consumption.

On the foreign exchange gap, the assumption made by Cherney and Bruno (1962) is that the value and volume of exports is given an exogenous ($X = X_0$), while the demand for imports largely depends on the targeted rate of economic growth. Imports of capital goods depend on the level of investment, and intermediate goods are a derived demand of capacity utilization rate. Since domestic inputs are an imperfect substitute for imported internet goods, the latter increase/decrease with and increase/decrease in production. The cost of financing such imports in most cases has exceeded the earnings of foreign exchange by exports. A foreign exchange gap arises, which—if not closed by aid resources—reduces the targeted economic growth.

Given that $M = mY$ where m is the marginal propensity to import and Y is national income, the size of the foreign gap is then denoted as $mY - X_0$ and can be denoted in terms of aid, a , as:

$$A = M - (X_0 / Y).$$

The implication of the foreign exchange gap is the potential domestic savings are being frustrated because the required capital goods necessary to undertake the desired investment can neither be produced locally nor be acquired externally. Additional foreign exchange when availed would raise the

level of investment and subsequently the rate of economic growth; this would imply that aid not only raised the level of investment but also permits an increase in domestic savings.

In export accounting sense, the two gaps are exactly equal, so that

$$a = c - s = m - (X_0 / Y).$$

In various theoretical models, reasonable levels of current debt inflows are expected to have a positive effect on growth. In traditional neoclassical models, allowing for capital mobility increased transitional growth. There is an incentive for capital-scarce countries to borrow and invest since the marginal product of capital is above the world interest rate. Some endogenous growth models have similar implications. Eaton (1993), extends the Uzawa-Lucas model and shows that an increase in foreign capital that lowers external borrowing leads to lower long-run growth.

Another relevant model is Calvo (1998), which links the debt and growth problem to capital flight. In a relatively simple model, high debt is associated with low growth since a higher distortionary tax burden on capital is required to service the debt, leading to a lower rate of return on capital, lower investment and growth. Low debt regimes have high growth for the opposite reasons. In intermediate ranges of debt, however, the effect on growth is indeterminate. The mechanism behind the possibility of multiple equilibria is a reverse causation from growth of the tax burden: if the economy grows more slowly, the tax rate necessary to obtain enough resources to repay a given debt will have to be higher and vice versa. The likely empirical implications of

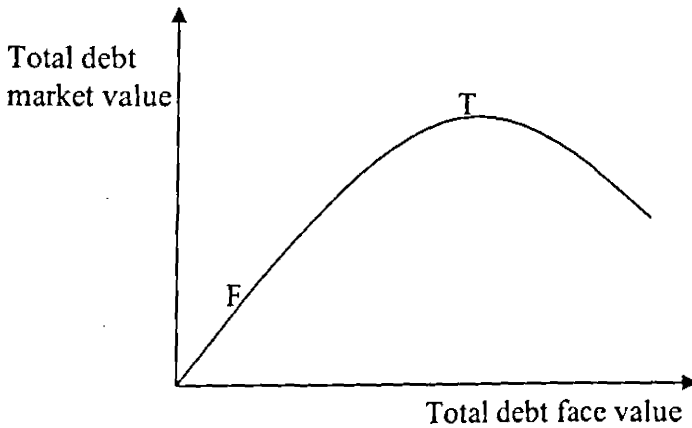
this type of model are nonlinear effects of debt on growth in the cross-sectional dimension of data.

2.1.2 Theoretical considerations of Debt overhang

To understand debt overhang we make use of the debt-laffer curve which is the fundamental tool used for analyzing the relation between the market value and the face value of the debt and is the mainstay of this study.

The Laffer curve shows a specific relation between two variables in a form of an inverse "U". The Debt Laffer Curve depicts, on a graph, the relation between the face value of a country's debt (on the x axis) and its creditor' expected value (on the y axis). The curve starts at point O, which corresponds to 0 debts.

Figure 1: Debt-Laffer Curve



The first issues of debt of amount "F" make nobody feels insecure and so its market value remains quite close to the face value. At this level, the Laffer curve follows the 45 degree line on figure 1. Further issues, from F until T, make the risk increase, and so the market value of the entire debt increases at a decreasing rate. Because of this fact, the level of debt greater than F, is

qualified of debt overhang. Note that point "T" gives the market value of the debt where the Debt Laffer Curve is at its top.

Although the debt overhang theory has not explicitly traced the effect to growth, it may be possible to extend these types of models and translate a debt Laffer curve into a Laffer curve for the effect of debt on growth. The debt Laffer curve shows along the left, of "good" side of the curve, increases in the face value of debt service are associated with increased in debt repayment, while increases in the face value lower expected repayment on the right or "wrong" side of the curve. Since the peak of the curve is the point where large debt stock begin acting as a step marginal tax on investment, policy reforms are or other activities that require up-front costs in exchange for future benefits, this may relate to the point at which debt begins to have a negative marginal impact on growth. Again, to the extent that the high debt serves as a tax hindering policy reforms, the resulting distorted macroeconomic environment is likely to contribute to lower investment efficiency and productivity.

2.2 Empirical Literature Review

Empirical growth literature has been large with several papers finding negative effects of debt on growth. It is important, however, to isolate the channel through which debt affects growth. Most existing studies do not attempt to distinguish the crowding out effect from debt overhang effect. To isolate the debt overhand effect (which can be captured with a variable representing the burden of future debt service, such as the debt stock), it is

important to also control for potential crowding out (proxied by the debt service ratio). In addition, previous studies use the face value of debt stock, rather than the net present value of debt. The latter reflects the degree of concessionality of loans and thus more accurately measures the expected burden of future debt service payment.

According to Pattillo et al (2002), the debt overhang models argue that if there is some likelihood that in the future debt will be larger than the country's repayment ability, then expected debt service will be an increasing function of the country's output level. The returns from investing in the country therefore face a high marginal tax by the external creditors, and new domestic and foreign investment is discouraged (Krugman, 1988; Sachs, 1989). Although the models do not analyze growth explicitly, the implication would be that large debt stocks would lower growth through the channel of reduced investments. However many others have argued that the debt overhang theory has broader implications, since any activity that requires incurring costs today for the sake of increased output in the future will be discouraged, as part of proceeds will be taxed away by creditors (Corden, 1989). One implication may be that the government will have less incentive to undertake difficult reforms such as trade liberalization or fiscal adjustment. This means that the channel for the debt overhang's effect on growth may not only be through the volume of investment, but also through a poorer macroeconomic policy environment which is likely to affect the efficiency of investment. This environment can contribute to investment projects that are poorly designed

and implemented and badly allocated, lowering the contribution of capital accumulation.

Other literature on debt overhang focuses on the fiscal aspects of the debt problem. Large accumulated debt stocks may be more likely to generate expectations that debt service will be financed with particularly distortionary types of taxation, such as the inflation tax, or with cuts in productive public investment. (Agenor et al, 1996). The inference therein is that transmission to growth is likely to be through the reduced efficiency of investment as well as lower investment volumes.

Serven (1997) points out that debt may have negative effects on economic performance because the uncertainty about what portion of the debt will actually be serviced with the countries own resources. It may not be clear at what terms debt will actually be serviced with the countries own resources. It may not be clear at what terms debt will be rescheduled, whether there would be additional lending, what change in government policies the rescheduling will entail. Serven (1997) stresses that investment under uncertainty has in highly uncertain environments, even if the fundamentals are improving, resulted in investors continuing to exercise their option of waiting.

Some studies imply that debt may have nonlinear effects on growth. They consider the nonlinear growth effects by debt are channeled through investment. Cohen and Sachs (1986), present an endogenous growth style growth model where capital accumulation is the sole force driving growth. A countries access to international capital markets is limited because of the risk of debt repudiation. They note that growth is high in the early states as the

country borrows and invests. Then later, growth falls to a lower level, but one that Cohen stresses is still higher than it would be if there were no international borrowing and lending (financial autarky). The stage of repaying the country's debt does not crowd out investment, but rather encourages it because lenders are more patient and value growth more than the debtor country itself. This result however, however, depends on the ability of lenders to implement an optimal rescheduling policy. If they are not able to commit to this policy over the life of the lending relationship, a debt overhang scenario will occur and investment and growth in the later stages will be even lower than in financial autarky.

Two studies specifically relate to the nonlinear effects of debt. Cohen (1997) does not use the debt stock directly in a growth regression, but rather finds that a variable representing the predicted risk of a debt rescheduling (or debt crisis) significantly lowers growth. Such a probability of rescheduling depends positively on external indebtedness. He uses this method to find debt ratios above which the probability of rescheduling becomes excessive: debt on GDP of 50 per cent, and debt to exports of 200 per cent.

Elbadawi et al. (1997) is the only empirical study found during the course of this study that directly consider nonlinear effects of debt on growth. They present fixed and random effects panel estimate so a growth regression in which debt to GDP enters both in linear and quadratic form. The results imply growth maximizing debt of GDP ratio of 97 per cent.

3.0 METHODOLOGY

In this section we will describe the data, the sources to of this data, and specify the model for estimation. The methodology employed will trace the relationship between growth and external debt while controlling for others factors that contribute to economic growth. To this end, we will employ econometric model that will be estimated using OLS.

3.1 Data Description and Sources

We employ secondary time series data that spans the years 1980—2000 and is collected from various accredited sources. The list of variables used in the analysis is as follows:

- Real per capita income growth
- Real per capita income
- Investment to GDP
- Debt to Exports
- Debt to GDP
- Terms of Trade growth
- Fiscal Balance to GDP
- Openness as ratio of GDP (Total Trade % of GDP)

This is time series data. To net out the effects of short run fluctuations, we employ a lag on the income and fiscal balance variables while maintaining the ability to utilize the time series dimension of the data.

The sources of this data are various databases administered by the WB and IMF such as the latter's World Economic Outlook (WEO) database⁵ and the former's Global Development Finance dataset⁶ as published in various available annual reports as well as available on the Internet.

3.2 Estimation Methodology

As an initial test we check for the correlation between debt and growth. We investigate the relationship between debt and growth for the degree of association and the level to which this relationship is significant. We also evaluate the bivariate correlation of growth to the control variables.

We then check, using multivariate regression analysis using the traditional determinants of growth (investment, income, policy variables) as controls, whether there exists a debt-growth relationship or where the debt-growth correlation is robust. The analysis we employ will also check for nonlinearity of the debt debt-growth relationship as suggested by theory.

In order to investigate the impact of external debt on growth we use a standard growth specification and then adding two debt variables. The model that we estimate therefore has per capita growth as the dependent variable, and on the right-hand side includes, as control variables, lagged income per capita, the investment rate (all in logs), other variables to control for differences in total factor productivity (openness, fiscal balance), exogenous

⁵ Can be found on the Internet at <http://www.imf.org/external/pubs/ft/weo/2003/01/data/index.htm>

⁶ Can be found on the Internet at <http://www.worldbank.org/research/growth/GDNdata.htm>

shocks (terms of trade growth). This panel specification is estimated using simple OLS.

3.2.1 Control Variables

The following encompass the various control variables: initial income per capita, investment rates, (all in logarithm terms), terms of trade growth, fiscal balance to GDP, and openness (exports plus imports over GDP).

Initial income is expected to have a positive coefficient as a major driver for growth. The coefficient on investment is predicted to be positive. Investment reflects the positive impact of physical capital accumulation. The terms of trade growth reflects external shocks, and is expected to have a positive coefficient. The fiscal variable should have a positive coefficient, reflecting the positive effects of macroeconomic sustainability and stability on productivity. Trade openness is also seen as a boost to productivity through transfers of knowledge and efficiency gains.

3.2.2 Specifications Investigating the Debt-Growth Relationship

We start our investigation with a specification that assumes a linear relationship between external debt and growth. The linear specification is as follows:

$$y_{it} = \alpha_{it} + \beta X_{it} + \gamma D_{it} + \varepsilon_{it} \dots \dots \dots \text{Equation 1}$$

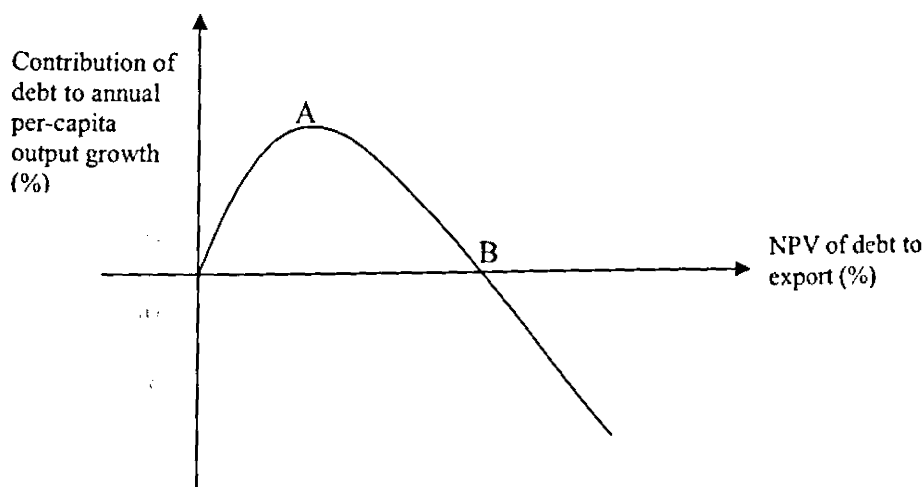
where y_{it} represents per capita growth, X_{it} the control variables, and D_{it} the debt indicator. This simple linear form is used to test whether the debt-income relationship is significant.

Theoretical and empirical literature suggested that such a linear specification might be inadequate to identify the impact of debt on growth, as the relation is likely to be non linear. This, they suggest, may explain the lack of robustness of linear specification thereof. The effect of debt could be positive at low levels of debt as the reduction of liquidity constraints in the economy might be associated with the growth inducing effects of capital flows. The effect of debt could however become negative when external indebtedness become excessive, as the debt overhang might be growth-retarding. The linear estimation would under estimate this relationship.

A non-linear relationship would help achieve the following:

1. It would help identify the level of debt at which debt's impact of debt on growth becomes negative, point B on figure 2 below. If we could plot growth against debt with all other growth determinants, including a constant term controlled for, the curve would negatively slope to an intercept on the horizontal axis as illustrated in figure 2 below.

Figure 2: Non-linear relationship between debt and growth



2. A non-linear specification would help identify the level of debt at which the marginal of debt on growth becomes negative, in the sense that increase in debt yields a negative marginal contribution to growth, independently of whether growth is higher with respect to the case of no indebtedness. This point corresponds to point A on figure 2 above. It has to be noted however; very few empirical studies have attempted a non-linear specification for the growth-debt relationship. In addition, the studies have found it difficult to estimate point A.

To address the first issue i.e. the level of debt at which the overall impact of debt on growth becomes negative, using a linear regression, we include a set of debt dummies in equation one as follows

$$y_{it} = \alpha_{it} + \beta X_{it} + \gamma_2 d_2 + \gamma_3 d_3 + \gamma_4 d_4 + \gamma_5 d_5 + \varepsilon_{it} \dots\dots\dots \text{Equation 2}$$

where d_2 to d_5 are dummies representing inclusion in the second to the fifth quintile of debt where the quintiles are constructed separately for each debt indicator after ranking all debt observations. Given the presence of a constant, the first dummy is omitted, implying that the coefficients of each dummy indicate the effect of that range (quintile) of indebtedness with respect to zero or low debt (first quintile).

On the second issue, the investigation into the level of debt at which it's marginal impact on growth becomes negative we employ a quadratic specification. The quadratic specification is as follows:

$$y_{(it)} = \alpha_{(it)} + \beta X_{it} + \gamma D_{it} + \delta D^2 + \varepsilon_{it} \dots\dots\dots \text{Equation 3}$$

According to Pattillo et al (1992), this function would support a debt and growth Laffer curve relationship (see figure 2 pg. 24) if the coefficient of debt is positive and the coefficient of debt squared is negative. The peak of the quadratic function identifies the level of debt at which the marginal impact of debt on growth becomes negative.

With these specifications we will be able to evaluate the impact of debt on growth. The objective of this methodology is to find if there is a significant debt—growth relationship (equation one), to find the level of debt at which growth turns negative (equation two) and finally to perform an experiment to find out if the 1980—2000 data for Kenya can fit a non-linear specification (equation three).

4.0 REPORT ON FINDINGS AND CONCLUSION

In this section we look at the findings of the investigation. We begin by looking at the time series trend in the two debt variables that we employ as well as growth, from 1975 to 1999. We also look at the time series trend of the various control variables i.e. initial income per capita, fiscal balance/GDP, openness (measured by total trade/GDP) and terms of trade. After an overview of trend, we subject the data to more rigorous tests through correlation and regression analysis, as explained in the previous section, to determine the significance of the effect of debt to growth. We then conclude by inferring what level of debt turns growth negative hence the target level for debt restructuring.

4.1 Descriptive Analysis of data (1975—1999)⁷

1. **Per Capita GDP Growth:** Figure 3 on page 44 illustrates the time series trend of per capita GDP growth. This is the dependent variable that we wish to explain. Per capita GDP growth is a good indicator of the general wellbeing of the nation and hence economic growth. In determination of per capita GDP growth, population levels as well as population growth are taken into account. For this reason, we do not take population growth as one of the explanatory variables. The graphical illustration of GDP growth is seen to fluctuate at particular intervals. First, in the late 1970s, when the

⁷ See appendix, Table 10 pg 49, for the listing of the raw data used for analysis in this paper.

effects of the first oil crisis began to be felt with increasing indebtedness. Second, in the mid 1980s on the onset of the debt crisis when private international lenders stopped providing funds. During these two particular periods, per capita GDP was seen to be at a slump and below zero. Third, in the early 1990s, there were effects of trade openness after a change in trade policy as well as an increase in money supply during the first multiparty elections in Kenya. A combination of these factors and the political and social climate that ensued led to another slump in per capita GDP growth.

2. **Debt Indicators:** These are variables of particular interest. Figure 3 on page 44 show the visual trend of our two debt indicators alongside per capita growth. The first indicator is External Debt as a percentage of Exports. Since foreign exchange earned from exports is used to service debt, the ratio of external debt to exports shows the strain on resources that debt exerts. It is therefore expected to have a significant effect on per capita growth. The second indicator, External Debt as a percentage of GDP helps to measure the weight of debt to the nation's total income. This therefore translates to some impact on per capita GDP growth. Visual inspection on the graph shows a consistent growth of debt to exports from the onset of the second oil crises in the late 1970s through to the late 1980s when levels of debt had escalated to a level commonly described as the debt crises. The trend of these two variables is consistent with the observations made on per capita GDP growth. The level of debt declined in the late 1990s after a hiatus on multilateral loans in the period. We wish

to see statistically, the effect of these two variables on per capita growth while controlling for other drivers of growth.

3. **Per Capita GDP:** Income generates effective demand that results in economic activity. Therefore, income is a major determinant of economic growth. In the statistical analysis that follows later in this paper, a lag of one year is used to take care of the period in which income is expected to translate to growth. This particular variable is expected to be significant at any level of confidence. Visual investigation (see Figure 4 on page 45) reveals that GDP income is highly correlated with per capita GDP growth. By induction, therefore, we find that the impact of population growth on per capita GDP is minimal. This is further collaborated by the fact that Kenya has experienced minimal change in population growth (hardly one percentage point, see Table 10 page 49) through the period of analysis. For this reason, population growth is left out of the statistical analysis.

4. **Investment:** Gross domestic investment to GDP is intrinsic to our analysis. By and large, economic growth is realized through the investment function. First and most important, funds that come in as debt are deployed in the economy through the investment channel. Hence, the positive influence on external debt is realized through this variable. Secondly, investment levels are to some extent a good indicator of the social political environment, particularly in Kenya. The illustration (Figure 5 page 45) shows slumps in investment, immediately after the oil crises in the late 1970s and early 1980s as well as at the onset of the debt crises in the mid 1980s. In addition, in the run-up to the first multi-party elections

during which time there was social unrest in the Rift Valley region, the investment ratio was seen to have slumped. In general, the investment ratio is seen to have declined through the entire period of our analysis. The late 1990s are observed to have the lowest investment to GDP ratio. During this time, the multilateral donors had stopped aid to Kenya a result of which other private external investors shied away.

5. **Terms of Trade:** This variable controls for external shocks that have an impact on the performance of the domestic environment. This variable is not expected to be significant in our analysis but serves the important purpose of netting out external effects that would otherwise be attributed to debt variables. Visual inspection of the data (Figure 6 page 46) reveals periodic shocks on the economy. The second oil crises in the late 1970s and the onset on the debt crises in the mid 1980s are clearly visible. Being an exporter of primary product results in external shocks whenever international prices of these products fluctuate in the world markets. Such was the case in the early 1990s.

6. **Fiscal Balance to GDP:** This control variable is a measure of the policy taken by government. It indicates the governments spending habits hence the fiscal policy undertaken by government. Sometimes policy pursued is as a result of the prevailing conditions, such as internal debt obligation, efforts to bridge a deficit et cetera. Such policy in the Keynesian model translates to increasing to decreasing effective demand as well as income. As such therefore, it is a key driver of growth. Fiscal policy has an inside lag, which means, it takes a while before the effects of policy are felt. For

this reason, we use a one year lag in the statistical analysis that that comes in the next section of this paper. Figure 7 page 46 shows the trend of Fiscal balance to GDP between 1980 and 1999. In the early 1980s, the government spent more than its revenues as funding from external sources was readily available despite the oil crises of the 1970s. With the onset of the debt crises and the resulting crunch in funds from international private lenders, the government realized that it had to equalize spending to expenditure in essence pursue a balanced budget. We therefore observe a reducing negative fiscal balance from the mid 1980s to the late 1990s. In statistical analysis we expect fiscal balance to have a positive effect on per capita growth since it represents a policy tool that is used to increase effect demand hence income.

7. Trade Openness: Trade openness is measured as the summation of imports and exports as a ratio of GDP. If barriers of trade exist, such as imports tariffs and import quotas we expect there to be reduced imports. In addition, the trade policy pursued by trading partners determines the quantities of goods exported. Hence, the summation of both imports and exports as a percentage of GDP helps to show how open trade is. Empirical literature and free trade theories predict that trade openness is expected to have a positive influence on per capita income. Figure 8 page 47 illustrates the trend of this control variable. The early 1990s stand out in the illustration—this period represents the time Kenya pursued aggressive trade liberalization as well as gave up price controls.

Most growth literature also considers the growth in human capital as an important driver to economic growth. The common proxy used is the level numbers of persons pursuing secondary school education as a percentage of the total persons old enough to be going to secondary school. As such, in the period of analysis, this statistic has been fairly stable as can be seen on Table 10 page 49. This variable is therefore left out of the analysis.

4.2 Statistical and Correlation Analysis of data (1975—1999)

We begin this section with a table of descriptive statistics of all the variables employed. In addition we show the correlation matrix to find any significant relationships between growth and all the control variables as well as the debt variables under test. Finally, we describe the results of OLS regression analysis on the specifications describes in the previous chapter.

4.2.1 Descriptive Statistics

The table below summarises the number of observations, minimum and maximum values, mean and standard deviation of all variables. This gives a statistical overview of the data. We have twenty five observations spanning 1975 to 1999 and have seven variables used in each of the regressions carried out. The Fiscal Balance variable has twenty observations. However, we have positive degrees of freedom in any one regression undertaken.

Table 2: Descriptive Statistics for variables employed

	Descriptive Statistics					
	N	Minimum	Maximum	Mean		Std.
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Per capita growth	25	-3.71	5.54	.4018	.4655	2.3275
Per capita income	25	794.00	931.00	879.0824	7.6782	38.3908
Investment	25	13.70	29.76	19.1133	.7069	3.5347
ToT growth	25	-.36	.29	-9.17E-03	2.897E-02	.1448
Fiscal Balance	20	-8.00	.30	-3.6100	.5901	2.6392
Trade Openess	25	47.78	76.10	59.6966	1.6046	8.0232
Debt/ Export	25	106.81	339.98	237.5336	13.6100	68.0502
Debt/ GDP	25	38.54	155.93	69.2764	5.1458	25.7288
Valid N (listwise)	20					

4.2.2 Bivariate Correlation Analysis⁸

The table below helps to illustrate the relationship between growth and debt as well as growth and all the other control variables. As was expected a priori, debt is negatively and significantly correlated with growth.

Table 3: Correlation Matrix

		Correlations ^a							
		Per capita growth	Per capita income	Investment	ToT growth	Fiscal Balance	Trade Openess	Debt/ Export	Debt/ GDP
Per capita growth	Pearson Correlation	1.000	.194	.497*	.366	-.323	-.207	-.036	-.475*
	Sig. (2-tailed)		.411	.026	.113	.165	.382	.879	.034
Per capita income	Pearson Correlation	.194	1.000	-.086	.038	.396	.530*	-.008	.197
	Sig. (2-tailed)	.411		.720	.873	.084	.016	.972	.405
Investment	Pearson Correlation	.497*	-.086	1.000	.441	-.631**	-.140	-.179	-.270
	Sig. (2-tailed)	.026	.720		.052	.003	.556	.450	.249
ToT growth	Pearson Correlation	.366	.038	.441	1.000	-.389	-.197	-.202	-.444*
	Sig. (2-tailed)	.113	.873	.052		.090	.406	.393	.050
Fiscal Balance	Pearson Correlation	-.323	.396	-.631**	-.389	1.000	.703**	.012	.460*
	Sig. (2-tailed)	.165	.084	.003	.090		.001	.958	.041
Trade Openess	Pearson Correlation	-.207	.530*	-.140	-.197	.703**	1.000	-.255	.496*
	Sig. (2-tailed)	.382	.016	.556	.406	.001		.278	.026
Debt/ Export	Pearson Correlation	-.036	-.008	-.179	-.202	.012	-.255	1.000	.613**
	Sig. (2-tailed)	.879	.972	.450	.393	.958	.278		.004
Debt/ GDP	Pearson Correlation	-.475*	.197	-.270	-.444*	.460*	.496*	.613**	1.000
	Sig. (2-tailed)	.034	.405	.249	.050	.041	.026	.004	

*. Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

^a. Listwise N=20

⁸ Correlation and descriptive analysis was done using SPSS Base version 9.

Investment, the channel through which borrowed funds are translated to growth is found to be positively correlated to growth. The relationship is also significant. ToT growth is positively correlated to growth as was expected. Fiscal balance and trade openness are negatively correlated to growth which is contrary to theory. A priori, it is expected that fiscal policy tools serve to augment output hence growth. In the case of Kenya, fiscal policy has been seen to adversely affect growth by crowding out the private sector which explains the negative correlation to growth albeit insignificant (at 95% confidence). Free trade is expected to be a driver of growth; however, our data suggests the opposite in the case of Kenya. This is explained by the fact that Kenya liberalized trade without the necessary regulatory framework in place resulting in negative effects after increasing her openness to external trade.

4.3 Econometric Analysis of data (1975—1999)

In this section we report three sets of econometric analysis: The first is a linear OLS regression to show the degree of influence of debt on growth as well as the other control variables. The second is a linear regression with debt dummies to estimate the level at which debt negatively impacts growth. The third, reports a regression experiment on a non-linear specification to find out if the Kenyan data fits a non-linear relationship. We additionally report the results of stationarity tests carried out on all variables to verify that they are trend stationarity.

4.3.1 Stationarity of data

Of particular concern when undertaking time series analysis is the paramount necessity of stationary data. The assumptions of the classical regression model often necessitate that the regression variables are trend stationary. If they are not stationary then the regression would be *spurious* and the results would have no economic meaning. A spurious regression is characterized by the high R^2 , significant t-ratios, and a Durbin-Watson statistic lower than the R^2 . To mitigate against this problem we employ the Augmented Dickey-Fuller (ADF) test which revolves around testing the hypothesis of a unit roots on different regression equations formed from each variable. If the coefficients (ADF coefficients) are significantly different from zero, then the associated variables are trend stationary hence can be used in regression analysis. The table below reports the ADF coefficients for each of our variables.

Table 4: Unit Root Test

Variable	ADF test statistic
Per Capita Growth	-5.6765
Per Capita Income	-4.0144
Investment	-3.6146
ToT growth	-4.9826
Fiscal Balance	-3.3766
Trade Openess	-2.6979
Debt/ Exports	-2.9347
Debt/ GDP	-3.2938

Constant, trend and seasonals included

The results from the Augmented Dickey-Fuller test show that the variables are trend stationary. Most the variables are significant at 1% and 5% and all are significant at 10%. The hypothesis of a unit root on any of the variables is

therefore rejected and hence there is no need to perform a transformation on any of the variables.

4.3.2 Econometric growth-debt relationship

The results of the specification set out on equation one in the previous chapter are reported in tabular form below. The two debt variables are regressed separately hence reported separately.

Table 5: Debt/GDP linear effects on Growth

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.901 ^a	.812	.726	1.0933	1.346

- a. Predictors: (Constant), Debt/ GDP, Per capita income, Investment, Trade Openess, ToT growth, Fiscal Balance
 b. Dependent Variable: Per capita growth

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.246	6	11.208	9.376	.000 ^a
	Residual	15.540	13	1.195		
	Total	82.786	19			

- a. Predictors: (Constant), Debt/ GDP, Per capita income, Investment, Trade Openess, ToT growth, Fiscal Balance
 b. Dependent Variable: Per capita growth

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Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-267.091	49.989		-5.343	.000
	Per capita income	40.511	7.287	.785	5.559	.000
	Investment	9.693	2.633	.709	3.682	.003
	ToT growth	-.488	2.119	-.033	-.230	.821
	Fiscal Balance	.134	.208	.169	.643	.532
	Trade Openess	-6.083	3.039	-.407	-2.002	.067
	Debt/ GDP	-2.456	1.085	-.330	-2.264	.041

a. Dependent Variable: Per capita growth

This regression model fits with a significant F statistic and Durbin-Watson coefficient of 1.346 which rules out autocorrelation at six degrees of freedom. Adjusted-R² reveals that the model explains 72.6% of per capita growth. As expected debt/GDP is significant at 95% confidence and shows that it influences debt negatively.

Table 6: Debt/ Export linear effects on Growth

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.889 ^a	.791	.694	1.1546	1.376

a. Predictors: (Constant), Debt/ Export, Fiscal Balance, ToT growth, Per capita income, Investment, Trade Openess

b. Dependent Variable: Per capita growth

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	65.456	6	10.909	8.184	.001 ^a
	Residual	17.330	13	1.333		
	Total	82.786	19			

a. Predictors: (Constant), Debt/ Export, Fiscal Balance, ToT growth, Per capita income, Investment, Trade Openess

b. Dependent Variable: Per capita growth

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-273.055	52.742		-5.177	.000
	Per capita income	44.161	8.000	.855	5.520	.000
	Investment	10.071	2.791	.737	3.608	.003
	ToT growth	.238	2.164	.016	.110	.914
	Fiscal Balance	.159	.222	.201	.714	.488
	Trade Openess	-9.691	3.532	-.648	-2.744	.017
	Debt/ Export	-2.827	1.567	-.270	-1.804	.094

a. Dependent Variable: Per capita growth

This model fits with a significant F statistic and Darbin-Watson coefficient of 1.376 which rules out autocorrelation at six degrees of freedom. Adjusted-R² reveals that the model explains 79.1% of per capita growth. As expected debt/GDP is significant at 90% confidence and shows that it influences debt negatively.

Regressions on both debt indicators revealed as reported above that they are significant in their influence on growth. In both cases Investment is also significant and positively influences growth. This is expected as the investment function forms the channel through which loan funds (debt) is converted to growth. Income is also highly significant (at beyond 99% confidence) and has the greatest influence on growth. As expected a priori, the effect of fiscal balance is positive albeit not significant in both regressions. ToT has a positive effect on growth as well though not significant. This explains that external shocks on the Kenyan economy have had little impact. Trade openness is significant and has negative influence on growth. This demonstrates that trade reforms in the case of Kenya were done without the necessary regulatory framework in place. This may be also be due to the fact

that Kenyan exports are primary products that are susceptible to constant price distortions adversely affecting Kenya's Balance of Payments (BoP). A profile on imports reveals that a high percentage consists of capital goods whose international prices are stable, again negatively affecting Kenya's BoP. Trade openness, as a result, has influenced growth negatively.

4.3.3 Level of Debt at which Growth turns negative

Here we report the linear regression results of equation two. This specification is based on the fact that various levels of debt have different magnitudes of impact on growth. Initial levels of debt are expected to have a positive impact on growth. As the level of indebtedness rises, the nation's resources are constrained resulting in negative growth. Hence, the objective is to find the level of debt that negates growth.

The dummy thresholds used to define quintiles can be found in the appendix page 48. They were computed after ranking the debt statistics then dividing them into equal quintiles.

Table 7: Effect of various debt levels on Growth

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52.684	8	6.585	2.406	.089 ^a
	Residual	30.102	11	2.737		
	Total	82.786	19			

a. Predictors: (Constant), Debt/GDP dummy5, Investment, Trade Openness, Debt/GDP dummy4, Per capita income, Debt/GDP dummy3, ToT growth, Fiscal Balance

b. Dependent Variable: Per capita growth

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-29.619	14.250		-2.079	.062
	Per capita income	3.260E-02	.015	.554	2.136	.056
	Investment	.326	.221	.442	1.476	.168
	ToT growth	-2.710	3.899	-.186	-.695	.502
	Fiscal Balance	1.826E-03	.349	.002	.005	.996
	Trade Openess	-9.02E-02	.084	-.366	-1.067	.309
	Debt/GDP dummy3	.345	1.274	.073	.271	.791
	Debt/GDP dummy4	1.901	1.142	.405	1.665	.124
	Debt/GDP dummy5	-1.323	1.210	-.282	-1.094	.298

a. Dependent Variable: Per capita growth

Excluded Variables^b

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Debt/GDP dummy2	.a000

a. Predictors in the Model: (Constant), Debt/GDP dummy5, Investment, Trade Openess, Debt/GDP dummy4, Per capita income, Debt/GDP dummy3, ToT growth, Fiscal Balance

b. Dependent Variable: Per capita growth

The model with dummies estimated explains 63% of the per capita growth with the F-statistic significant at 92%. The Durbin-Watson statistic shows no evidence of first-order serial correlation. This regression used the data without any conversions to natural logs because the differences in debt statistics would be too small for effective ranking. The regression also ignored the observations with missing fiscal balance figures (1975-79) which interestingly lie in the second quintile hence dummy two was automatically omitted by the regression software.

The table above shows that between quintile four and quintile five the effect of debt on growth turns from positive to negative. The coefficient of dummy four

(level of debt associated with dummy four) positively influences growth at 87.6% confidence while dummy five (level of debt associated with dummy five) negatively influences growth at 70.2% confidence. Theory has it that initially lower levels of debt have a positive influence on growth due to the increasing capital inflows. As the level of debt continues to rise debt overhang results in higher debt levels influencing growth negatively. Between the fourth and fifth quintiles the impact on debt on growth turns negative. The levels of debt associate with this observation are 71.2 to 87.25 of debt/GDP and 251.4 to 310.4 of debt/export. These are the levels at which debt exerts negative influence on growth and as such should be the targeted levels of debt when Kenya negotiates its debt restructuring. Levels of debt lower than this, would ensure at least some growth resulting from external debt while Kenya finds other means of augmenting capital and effective demand to raise national incomes which would then pay off the outstanding external debt totally eliminating the debt overhang.

4.3.4 Testing the non-linear specification of debt to growth

Non-linear regression for the data we have for the case of Kenya produced highly insignificant results with the model explaining a very small percentage of deviations. The coefficients of debt and debt squared were not as predicted a priori (debt be positive and debt squared negative). For this specification to work, there would be need to expand the dataset backwards from 1980 back to 1960. This would capture a profile of data that shows, in time series, debt levels from zero to the high levels. Unfortunately, data in the period 1960-1980 was not readily available at the time of carrying out this research paper.

Our analysis started at 1980 at which point the levels of debt were already high. Therefore with the dataset employed in this paper is not able to capture the origin of the debt-laffer relationship. It is therefore difficult to plot a non-linear relationship with our 1980—2000 dataset.

4.4 Conclusion

This research paper tries to provide an analytic answer to an important economic phenomenon that is demanding increasing attention and efforts from policymakers, lending institutions, international organizations, and citizens around the world: the impact of debt negatively affecting growth; debt which was originally intended as aid at giving growth a boost.

Towards this end, we began with a standard growth framework specific to Kenya and added two indicators of debt (debt/GDP and debt/Exports). We employed two main models; a simple linear OLS model to trace impact of debt on growth, another simple linear OLS model with debt dummies (different levels of debt) to approximate the levels of debt that turn growth negative. We then attempt to fit a non-linear model on the 1980-2000 Kenya data.

The main results of the paper are as follows:

1. Debt has a significant negative impact on growth in the case of Kenya.
2. Control variables: investment has a significant positive linear effect on growth as expected a priori, fiscal balance has a significant negative impact on growth evidence of consistent fiscal imbalance and suggestive of high domestic debt. ToT growth is insignificant indicating hardly any

effect of external shocks, trade openness significantly affects growth indicating ill executed trade liberalization.

3. The impact of debt on per capita growth appears to become negative for debt levels between 251.4—310.4 per cent of exports and 71.2—87.3 per cent of GDP.
4. Results of a non-linear regression on the 1980—2000 were insignificant mostly because the levels of debt were already relatively high at 1980 hence the model does not cover the initial levels of debt which are expected to have a high and significant positive impact on debt. This meant that it became difficult to plot an inverted U-shaped debt growth relationship.

The main contribution of this paper therefore has been to approximate the levels of debt at which debt begins to negatively impact on debt. Kenya was omitted from the HIPCs, for the reason that with *appropriate* debt restructuring she would be back on track towards sustainable growth. This paper therefore suggests the levels of debt that should be targeted in debt restructuring and rescheduling in an effort to curtail negative growth resulting from indebtedness. It also sets the pace for further research on the non-linear specification of debt in the case of Kenya with a more refined and expanded dataset to provide a more precise relationship between debt and growth as suggested by the more recent theoretical literature.

5.0 APPENDIX

Figure 3: Per capita Income and Debt Indicators growth 1975—1999

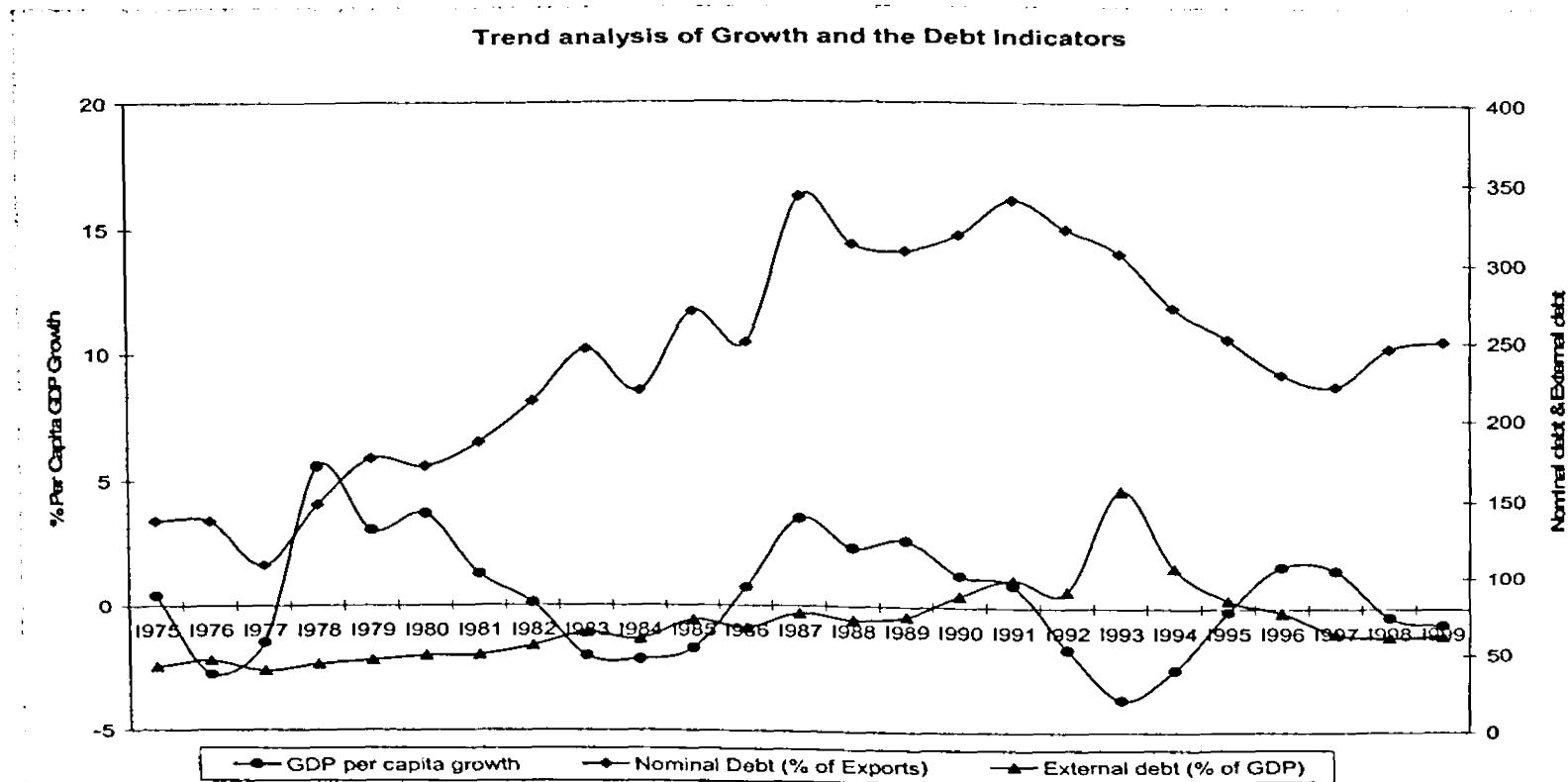


Figure 4: Real Income per capita 1975-1999

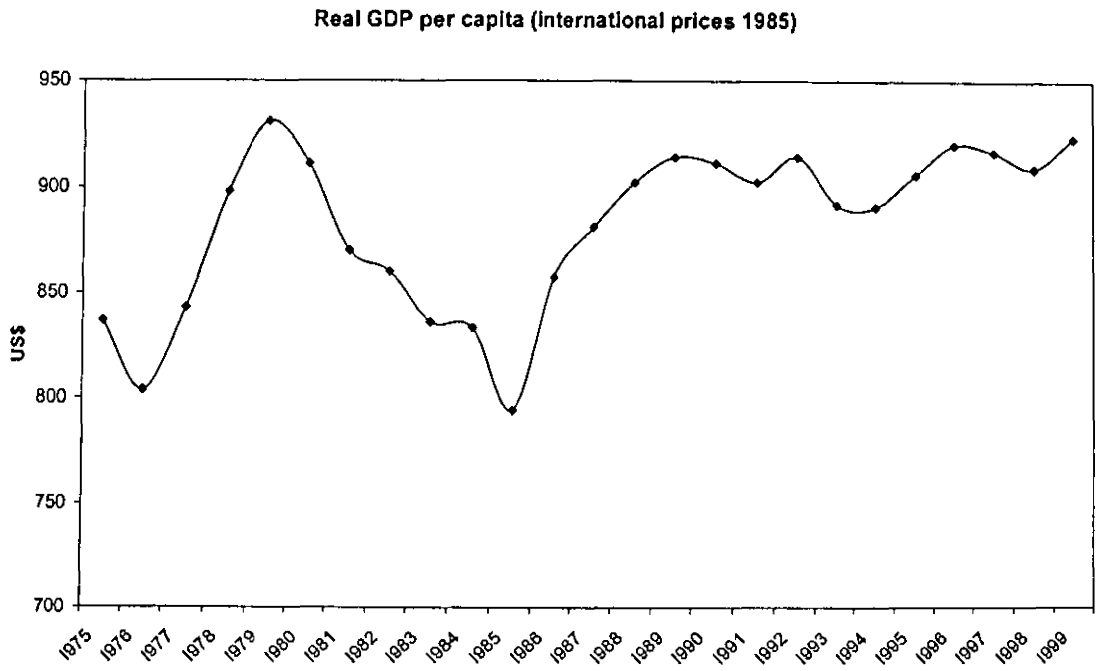


Figure 5: Investment as a ratio of GDP 1975-1999

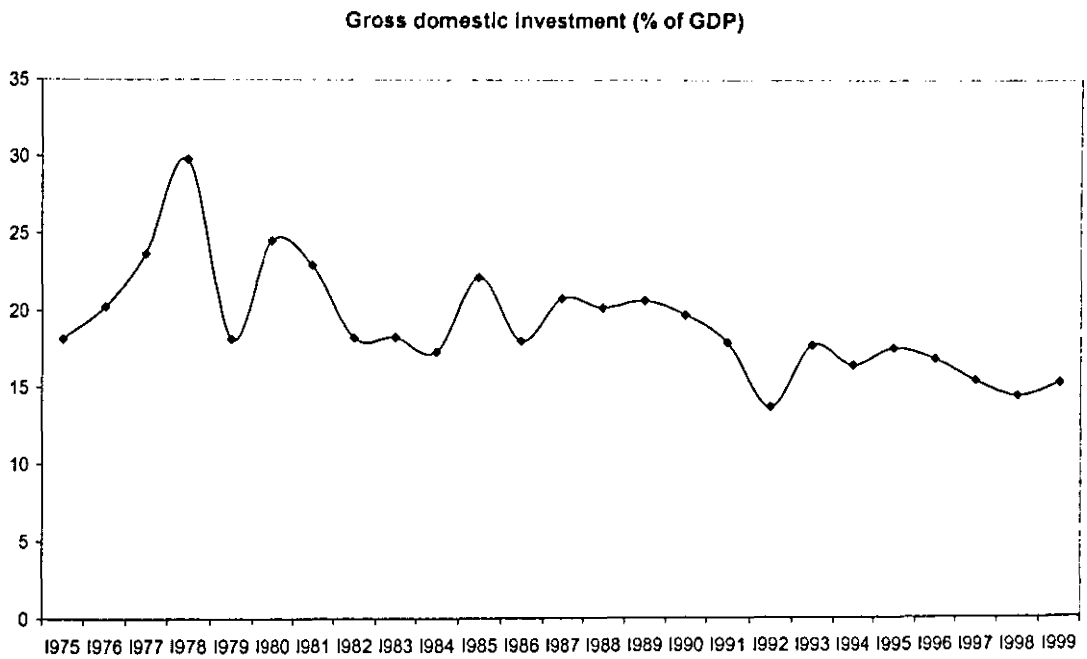


Figure 6: Terms of Trade Growth 1975—1999

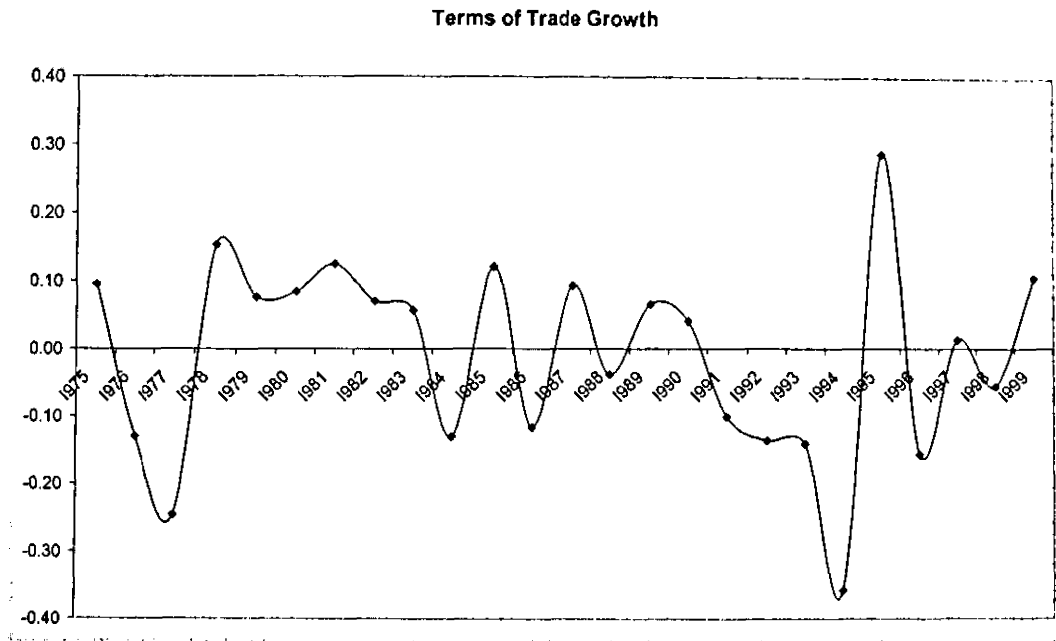


Figure 7: Fiscal Balance as a percentage of GDP 1980—1999

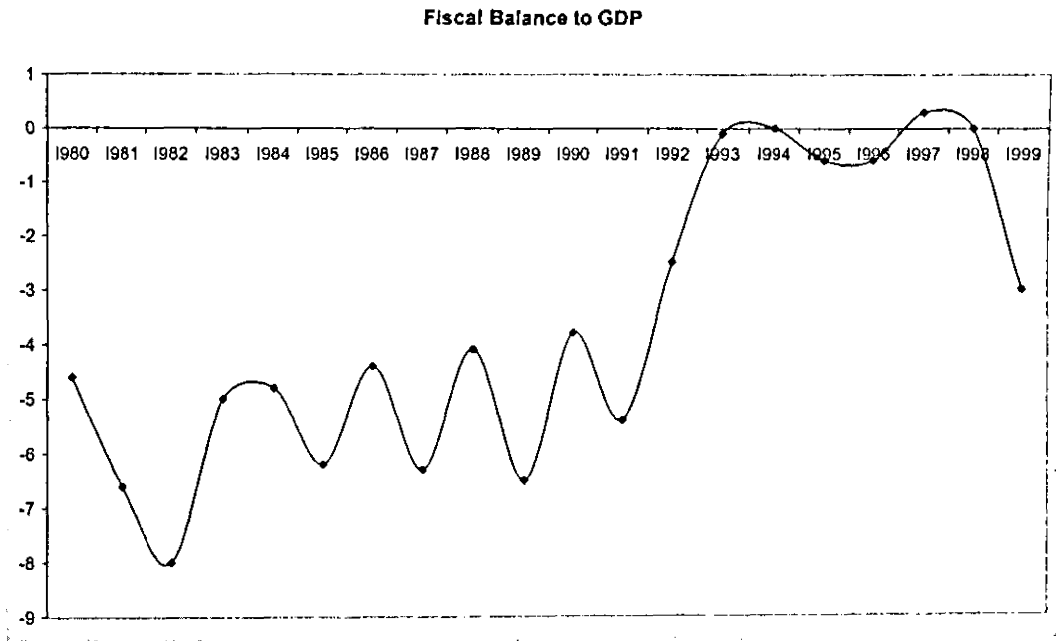


Figure 8: Total of Imports and Exports as a ratio of GDP 1975—1999



Table 8: Debt Dummy Thresholds

	Debt/Exports	Debt/GDP
Quintile 1	106.8	0
Quintile 2	173.4	48.1
Quintile 3	229.5	62.6
Quintile 4	251.4	71.2
Quintile 5	310.4	87.3

Table 9: Time Series data of Growth and Debt Variables⁹

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
GDP per capita growth	0.42	-2.73	-1.46	5.54	3.08	3.71	1.31	0.10	-2.00	-2.14	-1.69	0.76	3.55
Nominal Debt (% of Exports)	135.13	134.84	106.81	145.28	173.43	168.72	183.25	209.43	242.50	216.21	266.60	246.79	339.98
External debt (% of GDP)	41.18	45.09	38.54	42.89	45.28	48.12	48.62	54.48	62.63	58.71	70.77	65.93	75.45
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
GDP per capita growth	2.39	2.70	1.30	0.89	-1.65	-3.71	-2.47	-0.13	1.72	1.56	-0.35	-0.65	
Nominal Debt (% of Exports)	310.39	306.31	316.70	338.80	320.74	305.72	271.34	251.41	229.54	221.81	245.90	250.71	
External debt (% of GDP)	71.21	73.66	87.25	98.24	90.60	155.93	106.58	85.33	77.32	63.95	61.52	62.64	

Source: World Development Finance Database, World Bank

⁹ For consistency, all figures used in the paper are from the same database, namely the World Development Finance database

Table 10: Time series data for Control Variables 1975—1999

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Real GDP per capita (international prices 1985)	837.00	804.00	843.00	898.00	931.00	911.00	870.00	860.00	836.00	833.00	794.00	857.00	881.00
Population growth rate	3.72	3.67	3.71	3.72	3.76	4.22	3.67	3.58	3.52	3.51	3.52	3.50	3.46
Gross domestic investment (% of GDP)	18.14	20.24	23.66	29.76	18.13	24.51	22.91	18.24	18.26	17.31	22.14	18.02	20.77
Total trade (% of GDP)	64.34	64.21	66.55	67.62	57.36	67.00	59.52	53.68	50.48	53.84	51.68	51.46	47.78
Terms of Trade Growth	0.10	-0.13	-0.25	0.15	0.08	0.08	0.12	0.07	0.06	-0.13	0.12	-0.12	0.09
School enrollment, secondary (% gross) ¹⁰	13.00	15.00	17.00	18.00	18.00	19.60	18.60	19.10	21.20	21.00	21.30	21.40	23.30
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
Real GDP per capita (international prices 1985)	902.00	914.00	911.00	902.00	914.00	891.45	890.29	905.61	919.74	916.34	908.63	923.08	
Population growth rate	3.41	3.35	3.27	3.14	3.02	2.89	2.77	2.64	2.55	2.45	2.36	2.27	
Gross domestic investment (% of GDP)	20.16	20.61	19.70	17.90	13.70	17.71	16.43	17.53	16.84	15.43	14.45	15.29	
Total trade (% of GDP)	49.06	53.50	57.57	55.97	54.00	76.10	70.84	71.46	69.83	66.22	56.75	55.59	
Terms of Trade Growth	-0.04	0.06	0.04	-0.10	-0.14	-0.14	-0.36	0.29	-0.16	0.01	-0.06	0.10	
School enrollment, secondary (% gross)	23.00	26.00	24.10	27.90	27.30	25.70	24.80	24.40	24.3	24.9	24.4	24.7	

Source: World Development Finance Database, World Bank

¹⁰ Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Estimates are based on the International Standard Classification of Education (ICSED). Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers.

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