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The Effect of External Debt On Economic growth

– A panel data analysis on the relationship between
external debt and economic growth.

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Abstract

The impact of external debt on economic growth is a debatable issue between scholars since the onset of the debt crisis in 1980's. This thesis examines whether external debt affects the economic growth of selected heavily indebted poor African countries through the debt overhang and debt crowding out effect. This is carried out by using data for eight heavily indebted poor African countries between 1991 to 2010. The result from estimation shows that external debt affects economic growth by the debt crowding out effect rather than debt overhang. Moreover, in an attempt to mark out debt servicing history, the thesis found the selected countries are not paying (servicing) more than 95% of their accumulated debt.

Key Words: External Debt, Debt overhang, Debt crowding out, debt servicing and

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List of Abbreviations

DSEX	Debt service to export ratio
GDP	Gross Domestic Product
GNP	Gross National Product
HIPC	Heavily indebted poor Countries
IMF	International monetary fund
LDC	Less developed countries
OPEC	Organization of petroleum exporting countries
OLS	Ordinary least square
WB	World Bank

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Since 1980's debt crisis comes as a major macroeconomic problem for many developing countries. Following this, different studies are carried out to find out the cause, consequence and as a possible solution to the way out from the crisis.

For Krumm (1985) the likely cause of the crisis rooted back to the economical and political conditions of many poor countries in 1970's. During that period, many developing countries got an expanded access to private financial and other trade credits and spend more on public expenditure. Beside this many of the countries were not in a good position to hold out the second oil shock which happened in the late 1970's. During the early 1980's (1980 - 1983) the overall world recession following the oil shock and a response from lender countries (high interest rate, a decline in official lending and a delayed adjustment program...) makes the situation very difficult for many developing countries. As a result the economic condition of many sub-Saharan countries declines adversely.

As per Iyoha, M.A. (1999) empirical analysis: during 1980's, the average annual growth rate of real GDP in sub-Saharan Africa countries (SSA) was 1.7%, The annual per capita income declined at an average rate of 2.2% and terms of trade knock down by 9.1%. In line with the above fact a high population growth rate in the region resulted with -0.9 % annual average growth rate of real GDP per capita. Due to this the decade of 1980's is considered as "lost decade" for Africa in terms of development opportunities.

The World Bank report in 1994 generalized the possible factors for the poor economic performance in to domestic factors and external factors. As per the report: high population growth rate (which leads to a decline in per capita welfare), insignificant human capital development, poor infrastructure; which in turn affects private sector development and improper policies were categorized as domestic factors along with ethnic conflicts and political instability. In the other side, the successive oil price shock (1973 -1974 and 1978-1979), an alarming decrease in terms of trade and a recession in the industrialized countries which increased the interest rate categorized as external factors by the report. (World bank report 1994

For Agenor and Montel(1996), the original cause for the debt crisis was the excessive borrowing by the public sector to service their existing debt. This happened due to the reverse relationship between the safe real interest rate in the international market and the overall real GDP growth rate in the heavily indebted poor African countries (HIPCs). During most of the years in the decade of 1970's, the real long –term rate of interest in the developed world fell well short of the real growth rate of GDP by HIPCs. This opened a viable option for the public sector to service their existing debt through new borrowing, rather than generating their own resource for the same action (servicing debt).As a result many of the countries experienced a large fiscal deficit.

Krumma, 1985 argued that, if the available external loan improves the productive capacity of the borrowing country. It is unnecessary to take extra external loan to service the original debt.

According to (cline,1985): if marginal productivity of each available external debt is greater than or equal with the principal and the interest payment , external debt will have a positive impact on the economy of the borrowing country.

This in turn will require the foreign debt to be used in productive sectors and in basic infrastructures which can enhance the productivity of other sectors. Under this condition external debt servicing doesn't affect economic growth. But, if the borrowing country failed to service its debt, it will lose its' credit worthiness; and this in turn might affect the economic performance of the borrowing country by reducing the availability of foreign debt. (Mjema and musonda, 1994).

In general this thesis will try to empirically investigate the relationship between external debt and economic growth on selected eight heavily indebted poor African countries.

1.2 Statement of the problem

An economy which experienced a fiscal deficit can finance the public deficit by borrowing domestically from a private sector through financial institutions or from other international sources. Due to lack of a strong private sector and well established banking system the amount of money domestically available are very insignificant. In spite of this and other reasons, many poor countries borrow extensively from international lenders and other external sources.

External debt may be severe due to a number of reasons.

1. In some cases the size of the debt might be huge in relation with the economy size of the borrower and this leads to a possible capital flight and more it discourage private investment.
2. Servicing a debt by export earnings may affect economic growth by depleting available income from social service activities.
3. According to Ajayi (1991), the debt management systems also have a direct macro economic impact on the borrowing countries.

In general, external debt may affect economic growth in two ways:-

- a. Through the debt overhang effect:- a situation when an accumulated debt, discourage and overhang investment, mainly private investment; as private investors expect an increase in tax by government to pay the accumulated debt.
- b. Through debt crowding out effect, this is a situation when income from export is used to pay the accumulated debt. This in turn may affects investment.

1.3 Objective of the study

The main objective of this study is to undertake an empirical investigation about the effect of external debt on economic growth through the debt overhang and debt crowding out effect on the selected eight heavily indebted poor African countries.

1.4 Hypotheses of the study

It is hard to pre determined the effect of external debt on economic growth, i.e. it may have a positive or a negative effect. It may have a positive impact if it is used to improve the welfare of the society; or may affect economic growth negatively through the debt overhang and debt crowding out effect by discouraging investment and encouraging capital flight.

This study hypothesizes that a large sum of accumulated debt will negatively affect economic growth through the debt overhang and debt crowding out effect.

1.5 Methodology, data source and limitation of the study

The study uses secondary data for the period of 1991 to 2010. The major sources for data are the World Bank data base and respective countries statistics offices. The methodology for analysis is formulated based on Sala-i-Martin (1997) cross sectional economic growth model and Solow's growth theory.

The number of countries covered in the study is the first limitation for the study: Even if there are more than 26 African countries which are eligible for HIPC assistance, my study only took 8 of them. This is mainly due to lack of data on important variables; to overcome this problem and generalize the finding for the remaining countries, random effect approach is used in estimation.

Chapter two

Literature Review

2.1 Theoretical Literature

2.1.1 Solow Growth Model

This chapter will try to trace the basics of the Solow growth model, theories on external debt and the effect of external debt on Solow growth model.

Solow's growth model was published in 1956 as a seminar paper on economic growth and development under the title "A contribution to the theory of economic Growth". Solow won Noble prize in Economics in 1987 for his valuable contribution for the understanding of economic growth. The Solow growth model tried to give an answer for one of the great mysteries of growth economics i.e. why rich countries are so rich and why the poor ones are so poor?

Like that of many economics models, Solow growth model is built on assumptions:

- Countries will produce and consume only a single homogenous good (output)
- Technology is exogenous in the short run

And the model is developed based on Cobb - Douglass production function given by the form

$$Y = F(K, L) = K^a L^{1-a}$$

Where

Y = out put

K = Capital input

L = Labor input

a and $1-a$ are output elasticity's of capital and labor respectively., and " a " is a number between 0 and 1.

Mathematical manipulation of the above equation will give:

$$y = k^a$$

If the above production function is expressed with the corresponding output per worker, $y=Y/L$ and capital per worker, $k = K/L$. we will have this equation:

$$y = k^a$$

According to this equation,

A country that uses more capital per worker will produce more output per worker, subjected to the law of diminishing returns to capital per worker. (Charles I .jones 2002: 23).

The other important equation from the Solow growth model is the capital accumulation equation expressed in the form:-

$$\dot{K} = sY - dK$$

Where

\dot{K} = change in capital stock

sY = gross investment

dK = depreciation during the production process

And with mathematical manipulation Solow derives the capital accumulation equation in per worker terms i.e.

$$\dot{k} = sy - (n+d)k$$

As per the above equation, the change in capital per worker is a function of investment per worker, depreciation per worker and population growth. Of these three variables only investment per worker positively related with change in capital per worker.

The Solow Diagram and the production function

The Solow diagram can be drawn using the two key equations of the Solow model in terms of output per worker and capital per worker. These equations are

$$y = k^a$$

and

$$\dot{k} = sy - (n+d)k$$

The diagram consists of three curves, the first one, $y = k^a$, is the production function curve. The second curve which has the same shape with the production curve is the investment per person curve, sy . It is translated down by a factor “ s ”. The third curve $(n+d)k$ is the linear sum of depreciation per worker, “ dk ” and population growth, “ nk ” ;both variables will decrease the amount of capital per person in the economy. By no coincidence, the difference between the investment per person curve and the third curve is the change in the amount of capital per worker. If the difference between the two curves is positive, the change will be positive and the economy will increase its capital per worker and capital deepening occurs. When this per worker change is zero but the actual capital stock K is growing (because of population growth), we say that only capital widening is occurring. The steady state point is the point at which the change in capital worker equals zero, this happen when the investment rate, “ sy ” equals with $(n+d)k$. (Charles I .Jones 2002: 28-29).

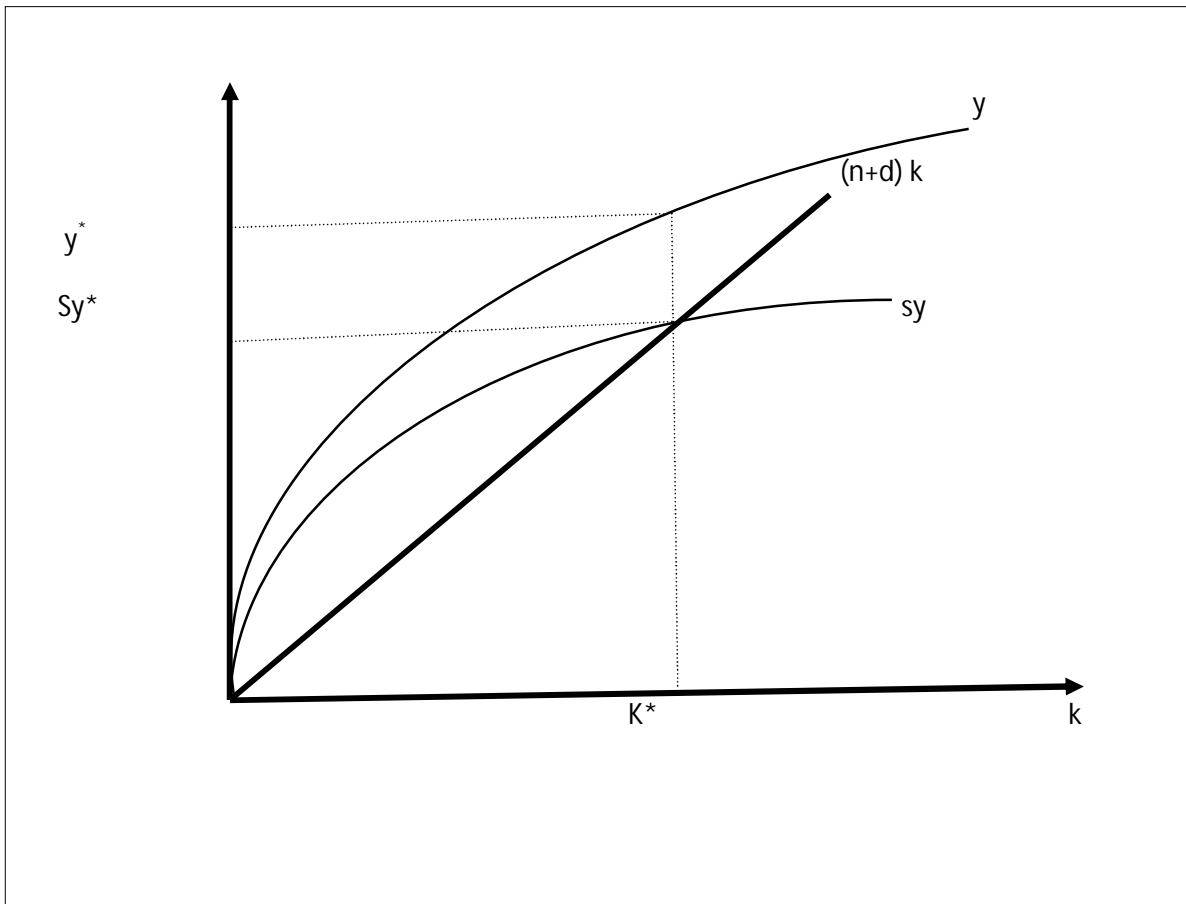


Figure 1: Solow production curve

The corresponding steady state quantity of capital per worker and steady state quantity of output per worker can be expressed:

$$k^* = (s/n+d)^{1/(1-a)}$$

$$y^* = (s/n+d)^{a/(1-a)}$$

Where:-

k^* = steady state quantity of capital per worker

y^* = steady state quantity of output per worker

Based on the above equation Solow concludes that: keeping other things constant countries that have a higher saving and investment rate become richer; because they can accumulate a large amount of capital per worker, and this will let them to produce more output per worker. In the other hand countries that exhibit a high population growth rate will tend to be poorer. (Charles I.Jones 2002:32)

Change in investment rate and the Solow growth model

If investment rate increases in an economy that already arrived at its steady- state value, the $s'y$ curve shifts upward to $s'y'$ (the production curve also shifts upward). Following this the economy will reach to a new and higher steady - state capital stock per worker value.

Population Growth rate and Solow growth model

If population growth rate increases in an economy that already arrived at its steady-state value , the $(n+d)k$ curve shifts upward to $(n'+d)k$. And this will result in to a new and lower steady - state capital stock per worker value.

Technology and the Solow growth model

To trap the effect of technological change on the overall production function, Solow include a new coefficient called “labor augmenting” or “Harrod –neutral” and labeled it with “A”. And the new equation will be:-

$$Y = F (K, AL) = K^a (AL)^{1-a}$$

To enjoy a sustained economic growth in per capita income there should be a technological progress. And a technological progress occurs when “A” increases over time – a unit of labor is more productive when the level of technology is higher. (Charles I .Jones 2002: 36).

2.1.2 External Debt and concepts in external debt

External debt is that part of the total debt in a country that is owed to creditors outside the country. The debtors can be governments, corporations or private households.

According to the World Bank definition:-

*“Total external debt is a debt owed to non residents
Repayable in foreign currency, goods or services”*

When we trace back countries debt crisis history, we found Mexico as a pioneering country. In 1982 the Mexican government announced it's inability to service its forthcoming debt from the total 80 billion US dollar owed to international lenders. This taken as the first debt crisis in history; and many scholars regarded it as the first sign of the international debt crisis.

In October 1983; 27 countries, 16 from Latin America including Brazil, Mexico, Argentina and Venezuela rescheduled their debt. Subsequently many less developed countries (LDCs) announced their inability to fulfill their debt obligation. This created major loan defaults and failure on the world largest banks.

The origin of this debt crisis can be attributed to Different factors, and can be seen best by categorizing and studying in a chronological order with the following time periods.

- First period, 1973 -1978 and
- Second period 1979 -1982.

First period (1973 -1978)

¹The quadrupling of crude-oil price following the Egypt -Israel war of the October 1973, created many dis-order in the international market.

To absorb the effect, producers in the industrialized world increased market price both in the domestic and international market. This created inflationary pressure around the industrialized world; and leaves many of the developing countries on a serious balance of payment problem. (As they were not in a position to with stand the increase in crude oil price and imported goods). Current account deficit in LDCs increased from 8.7 billion US\$ in 1973 to US\$ 42.9 billion in 1974 and US\$ 51.3 billion in 1975.

¹History of the Eighties-Lesson for the future, Federal Deposit Insurance Corporation, 1996

As a result many of them started to borrow from banks on the international capital market. This produced a room for major banks to re-channel the fund that they collected from a dollar based oil exporting countries to budget deficit oil importing countries.

Indebtedness rose significantly from US\$ 130 billion in 1973 to US\$ 336 billion in 1978. even in that condition, most countries experienced healthy economic growth and didn't face difficulties in servicing their debt.

Second period (1979 -1982)

¹The major event on this period was the decision made by the Organization of Petroleum Exporting Countries (OPEC), which made a more than double rise in the price of crude oil. From US\$ 13 per barrel to US\$ 32 per barrel, this termed as the second oil shock.

The response from the industrial world for the second oil shock was much more similar; at the end of 1979 a tight monetary policy adopted by US is followed by other industrialized countries: UK, Germany, France, Italy and Japan. This further worsens the condition of LDC that continued on their intense borrowing from the developed world at a higher interest rate.

For instance LIBOR, London Inter Bank Offered Rate rise from 9.5 in the mid 1978 to 16.6 until mid – 1981. The corresponding outstanding debt increased from 336 billion US\$ in 1978 to 662 billion US dollar in 1982.

The increase in interest rate along with other factors contributed to the severe world recession of the 1981 to 1983. This posed another problem for LDCs as the price and volume of their export fall and reduced their export earnings.

Furthermore the recession forced the industrialized world to adopt a more protectionist approach on imported goods which reduced LDCs export earnings.

Due to a high US interest Rate and borrowing, bankers are more willing to lend money to US than LDCs and more a rapid appreciation of US Dollar also make the situation worse for LDCs as their real debt- service repayment increase because of this. When we see the fraction of GNP dedicated to interest payment on loans: we found sub-Saharan African countries next to Latin America. i.e. 3.5 in 1980 to 5.6 in 1983 on Latin America countries followed by sub - Saharan African countries as this fraction increased from 1.7 to 2.2 between 1980 and 1983.

¹History of the Eighties-Lesson for the future, Federal Deposit Insurance Corporation, 1996

In general the debt crisis is highly related with the inability of most developing countries, to service their debt. For instance, in this period (1979-1982) Latin America countries debt increased more than double from \$159billion to \$327billion. This makes Latin American countries the most affected by the crisis.

Francisco L. Rivera-Batiz and Luis A. Rivera-Batiz, mentioned three possible reasons why Latin America countries are seriously affected by the debt crisis.

First, loan to Latin America countries was mostly offered by private creditors, as those countries are high income countries relative to other developing countries. Due to this, Latin America countries were more affected by the increase in market interest rate in the late 1970's and early 1980's. As a result, compared with other developing countries that took loan from official lenders, Latin America countries faced a higher interest payment.

The second reason mentioned by Francisco L. Rivera-Batiz and Luis A. Rivera-Batiz was countries policy towards international trade. Most developing countries mostly follow either of the following three trade policies: Inward-oriented (Import substitution), natural resource oriented and industrial export –oriented.

Inward –oriented or import substitution trade regimes are countries that encouraged production of goods and services that can compete and substitute imported goods with the aim of discouraging import. The ultimate objective of this trade policy is to stabilize the current account balance (CAB) by reducing import expenditure. But with the aim of discouraging imports and encouraging import substitute goods domestically, countries that follow this trade policy mostly weaken the export side.

In the other hand Natural –resource export oriented countries tried to increase the export side of the countries by exploiting natural resource like Gold, copper, natural gas and crude oil. But this can't guarantee the increase in overall export as in many of the cases the export of manufactured goods is discouraged in this kind of trade regimes.

The third, manufactured (industrialized) –export oriented countries adopt trade policy that promote the production of export centered manufactured goods by liberalizing the manufacturing sector.

From the above mentioned trade policies manufactured –export oriented are able to create source of income which helps heavily indebted countries to service their interest burden payment.

The third reason which can explain why Latin America countries are more affected by the debt crisis is the use of the fund. As per some economists, in most of the heavily indebted

poor countries the debt are wasted with corruption, excessive hiring of human resource and to build up military power and the like.

Due to the above mentioned reasons most LDCs in general and Latin America countries in particular found themselves with record level of indebtedness and debt service repayments, with a poor performance in overall economic activities to create income domestically.

2.1.3 The effect of External Debt on Investment and Economic growth

The effect of external debt on investment and economic growth can studied best by having a better understanding on the issue of debt overhang, a term which is directly related with investment and economic growth. Different economists define debt overhang in different ways.

For Krugman (1988) debt overhang is:-

“A situation in which the expected repayment on foreign debt falls short of the contractual value of the debt”

Eduardo Borensztein (1990) defines debt overhang as:-

“A situation in which the debtor country benefits very little from the return to any additional investment because of the debt service obligations ”

In line with issue of debt overhang, policy makers that focused on debt crisis tried to find out whether the problem is a solvency or a liquidity problem. (Agenor and montiel,1996)

As per Ajayi(1991), a liquidity problem is a short term problem faced by countries to service the forthcoming debt based on the initial contract. i.e. when countries failed to service current obligation. In the other hand a solvency problem is a long run problem faced by countries when their total liabilities are beyond their ability to pay at anytime.

For Kletzer(1988) most developing countries were solvent. For him the present value of their respective resources (calculated based on discounted value of their real outflows) are much lower than their total debt obligations.

Kletzer(1988) findings might be a bit old to judge the present status of the heavily indebted poor countries in general and the countries under this study in particular. As an alternative measurement, if we take External debt as a percentage of GNI (External Debt %of GNI) as a measure of ability to pay and see the situation for the countries under this study, ability to pay are improved, as a high ratio means that a particular country would face difficulties in generating enough income to service its external obligations. And the reverse is true for a low External Debt %of GNI.

	country	External Debt %of GNI 1991	External Debt %of GNI 2010
1	Benin	62.7	18.4
2	Ethiopia	68.7	24.12
3	Madagascar	156.5	26.6
4	Mali	107.3	26.1
5	Mozambique	183.6	43.7
6	Senegal	66.19	28.5
7	Tanzania	137.3	37.6
8	Uganda	85.8	17.9

Table 1: External debt GNI ratio in 1991 and 2010

Source: World Bank data base

As per the result from the above table and the presumption we made to take the external debt GNI ratio as a test for ability to pay, it is hard to accept Kletzer (1988) findings (liquidity vs solvency). But, at the same time, we don't have any reason that we infer from the table to reject the result as well. Therefore, it is hard to determine the present status of the selected countries debt situation prior, whether it is a liquidity or solvency problem. But as we can infer from the table ability to pay are improved significantly in the year 2010 compared with year 1991.

Moreover, when we move back and compare the Investment GDP ratio of 15 heavily indebted countries in the period 1971-81 (investment GDP ratio of 24 percent) with the period 1982-87 (investment GDP ratio of 18 percent); the latter period decreases by 6 in terms of percentage. For researchers like Eduardo Borensztein (1990), this is mainly due to foreign debt. This in turn negatively affected economic growth followed by a decline in domestic investment and significant capital outflows. It has been hypothesized also foreign debt as the disincentive to invest.

In the other way for Savvides (1992), if a debtor country failed to pay its foreign debt, the condition can be linked to the country economic condition. This kind of countries benefit little from the increase in output or export income; as part of the income is used to pay forthcoming debt. This way the debt overhang can be treated like a marginal tax rate on the country, which lowers return on investment and a hindrance to domestic capital formation. Even in the condition all external debts are owned by government, debt overhang has a negative effect on private saving and investment. In the other side government become preventative; to formulate policies that promote domestic capital formation or to decrease domestic consumption for a higher future economic growth, as the benefit goes to creditors in the form of debt payments.

In an attempt to found the effect of foreign debt on Investment; Eduardo Borensztein (1990) classified the effect of foreign debt on investment in two. i.e “Debt overhang” and “credit rationing” effect.

For him, Debt overhang is a condition when the debtor country failed to service its foreign debt obligation fully with the existing resources, and undertake a negotiation with creditors to determine actual debt payment; this time the payment linked to the economic condition of the debtor country. As a result, part of the increase in output will be used to pay the forthcoming debt. This in turn creates a disincentive on private investment and poses a hindrance on the government to pursue the right policies. For Borensztein, debt overhang create an adverse effect on private investment and become strong when private debt used as measure of debt overhang.

According to Borensztein, the second way that foreign debt affects investment is through the credit rationing effect. This is a condition faced by countries that failed to get a new loan because of their inability or willingness to pay.

Classens and Diwan(1990) also categorized the effect of external debt on investment and economic growth in to two. First, debt servicing might put away (take) the limited resource of poor countries that could be used in public spending. More specifically, resources used to service the accumulated debt may crowd out public investment and also private investment Due to complementarities between private and public investment.

Second, external debt might affect economic growth through the debt overhang effect; this is the case when debt servicing discourages current as well as future investment plans.

For Ajiya(1997), the disincentive effect on investment comes when indebted countries failed to service their debt based on the contractual obligation. Therefore it is not vital to measure debt overhang based on the amount of accumulated debt. He also suggested that, to maintain a stable and unaffected trend in production and investment, a high debt service export ratio should be serviced regularly. Heavy debt servicing put many countries on a fiscal deficit, which will lead to numerous problems:

First, servicing a debt may demand an increase in tax to raise resources. The expectation of a higher tax may discourage investment; this is the case for debt overhang.

Second, as payments are made using foreign exchange; most indebted countries transfer domestic resources to foreign exchange. To raise large sum of foreign exchange, countries might used aid income. And this will in turn affect overall economic performance.

Third, when Poor countries faced a high debt service payment request, they might be forced to reduce spending on public investment. This in turn related to the crowding out effect of foreign debt.

In general due to a heavy debt service payment and a reduction in government expenditures growth will be retarded.

As a general conclusion on the issue of foreign debt, investment and economic growth; Osei (2000) suggested the ratio of total external debt to income (GNP) and the ratio of total debt service to exports of goods and services as a good measure of debt burden, as they help to counter debt overhang and debt crowding out effects respectively. The higher the ratio, the greater the burden.

2.2 Previous studies

Different empirical studies are carried out since the onset of the debt crisis in the early 1980's. The main objective of these studies centered mainly on the effect of external debt on investment and /or economic growth. The result from the studies showed both positive and negative effects of external debt on investment and economic growth. Some of these studies are stated below chronologically.

Bauerfreund (1989) attempted to found the cost of foreign debt on the Turkish economy by adopting a computable general equilibrium model. He tried to explain the concept of debt overhang using a multi sector, non-linear general equilibrium model by evaluating two debt overhang measures. The two debt overhang measures are set by Sachs (1986) and Feldstein (1986) independently. According to Sachs (1986), when indebted countries faced a high debt service payment, they are forced to levy a tax on the private sector, with the aim of transferring resources to the public sector. Due to an increase in tax, return from investment decrease on the private sector. As a result, overall investment will decrease. For Feldstein (1986) Debt payment also needs a transferring of resources to foreign exchange. After using these two measures on the Turkish economy; Bauerfreund finds a negative effect of external debt payment on investment in 1985. He also pointed out poor internal and external economic policies as the main causes for the debt overhang problem.

Opposite to Bauerfreund finding, Warner (1992) got a positive relationship between external debt and investment. The analysis was carried out on 13 less developed countries over the period 1982-1989, using least square estimation. For Warner: a decline in export prices, high international interest rate and sluggish economic growth in the developed world were the major reasons that puts back the growth rate of investment in most indebted countries. To trap the debt effect, Warner forecast investment on the debt crisis period (1982-1989) by incorporating the above three effects in the model without the debt crisis effect.

According to him if the debt crisis effect is critical, the forecast that incorporate increase in export price, high international interest rate and recession in the developed world couldn't track investment; but would track investment if debt crisis is not critical. In other words, if debt crisis effects are important, then this investment forecast which ignores debt crisis should be greater than actual investment.

Finally he runs a panel regression on both forecasted models. The one which encompass debt crisis as a dummy variable took a positive coefficient for the debt crisis dummy variable, which is opposite to external debt theories.

In 1994, Rokerbie criticized Warner(1992) and pointed out the following short comings:

First, he failed to perform a nested and a non-nested test two compare the competing models he developed to forecast investment.

Secondly he failed to incorporate debt variables in the investment equation as these variables are expected to be endogenous in the model.

Third, structural changes like domestic polices and world economic conditions happened in 1982 were expected to be the cause for the debt crisis that has occurred in most indebted countries on the same period. This may weaken the effectiveness of a forecasting equation estimated using sample period of 1960-1981.It is with this reason; Warner's hypothesis is Destabilized by the use of a dummy variable for the period 1982 - 1989.

After the above suggestions, Rokerbie runs an ordinary least square estimate for the 13 countries over the same period 1965 – 1990. The estimated result goes well with debt theories; i.e the debt crisis of the 1982 affects the investment condition of the countries under study. The study encompasses variables that represent domestic monetary and fiscal policies, debt stock and flows and more world economic condition.

According to Cohen (1993) the level of debt can't explain the decrease in investment in the highly rescheduling countries. He estimated the investment equation of 81 developing countries using ordinary least square method for three different periods: 1965-1973, 1974-1981 and 1982-1987. As per his result external debt didn't affect the GNP growth rate of the 81 countries.

Afxentiou and Serletis (1996) attempted to find the statistical relationship between foreign debt and Productivity on 55 developing countries that faced debt service problem. They categorized the 55 countries in to four based on per capita income and the level of debt. 14 out of the 55 countries are categorized in one group as indebted middle income countries, 10 as moderately indebted low income countries, 12 as severely indebted middle income countries and the rest 19 as indebted low income countries.

The time for the analysis was 1970-1990 and it is classified in two sub periods: the first period (1970 – 1980) which is characterized by an alarming growth in foreign debt and the second period (1981 -1990) was the era of debt servicing problem.

The analysis is carried out on both time periods using the four categories. For a better analysis, each group is treated as a separate specific case and the effect of six debt indicators on the growth of its per capita income is investigated. As per the result from the first period (1970-1980), there was no a negative relationship between indebtedness and national productivity in all the four groups or at all income levels. According to them on this period developing countries used the foreign debt to overcome the shock from the oil price increase. The result from the second group showed a negative relationship between indebtedness and productivity on two groups of the severely indebted developing countries. This is the period where debt forgiveness and Rescheduling began. According to Afxentiou and Serletis(1996), the foreign loan was misused by indebted developing countries. And they faced a debt service problem when they were asked to pay their debt obligation based on the contractual agreements.

Deshpaned (1997) try to examine the debt overhang hypothesis after empirical investigating the investment experience of 13 severely indebted poor African countries.

Algeria	Honduras	Morocco	Sierra Leone
Argentina	Kenya	Peru	Venezuela
Ivory Cost	Mexico	Philippines	Zambia

Egypt

According to him Debt overhang can't be explained by the normal debt obligation; rather it can be explained best with the actual amount paid, which is determined by creditor and debtor countries. Due to this fact, debtor countries used the increase in production and the income from export to service their debt.

After all, the result from a panel data regression using OLS estimation for two independent consecutive time periods (First period: 1975 -1983; Second period: 1984-1991) yields a negative effect of external debt on Investment.

Fosu (1999) tried to explain the effect of external debt over economic growth on sub-Saharan Africa countries by applying an augmented production function. He used the debt crisis period, 1980-1990 for the analysis.

The main aim of Fosu was to examine the debt overhang hypothesis directly. The hypothesis which states foreign debt imposes a negative effect on countries economic growth even without or hardly affecting the level of investment.

As per his result, the debt variables which are included in the model took a negative coefficient on the period 1980-1990.

In general as I mentioned in the beginning of this sub topic a number of empirical researches are tried to reveal the exact relationship between external debt and economic growth. As the content of the empirical literature review (previous studies) showed the findings differ in terms of geographical or economical area covered, methods adopted during analysis and more on the result they came up with. Therefore, no one can tell prior the exact relationship between foreign debt and economic growth without adopting (making) the necessary economic analysis.

2.3 Solow Growth model and External debt

There is no a well published theoretical framework that gives light on the relationship between Solow growth model and external debt. But some empirical works on External debt used Solow growth model as a base to investigate its impact on economic growth.

As we saw in the theoretical part, the Solow growth model is built on a closed economy which uses labor and capital as means of production. Under this situation the implication of foreign debt on growth can be seen using its effect on the public saving which in turn used as investment in a closed model.

Before we move to see the general effect of external debt on Solow's growth model; it is better to see expected individual effect of debt overhang and debt crowding out effect on Solow growth model.

According to the debt overhang hypothesis, government, in an attempt to pay the accumulated debt, raises tax rate on the private sector (as means of transferring resource to the public sector). This will discourage private sector investment; and more government public spending on infrastructure decreases (Road construction, Telecom, Electric power supply....) as the available resource are used to pay debt obligation. As a result, overall investment (private and public investment) will decrease in the country. This will shift both the investment and production function curves in Solow growth model downward.

On the other hand, when countries are forced to pay part of their external debt they used their income from export and in some cases transfer resources including foreign aid and foreign exchange resources to service their forthcoming debt; this is the case for debt crowding out effect. Those countries which transfer income from export which can be used in investment towards debt payment will discourage public investment. This in turn will decrease economic growth and will shift both the investment and production function curves in Solow growth model downward, as the decrease in investment and production shown with inward movement of both curves.

As we can infer from the above two paragraphs and the theoretical part of this essay the specific as well as the combined effect of debt crowding out and debt overhang effects will affect investment and economic growth negatively. Following this and the general hypothesis we set in chapter one, we expect a negative impact of foreign debt on Solow's investment and production function. And this can be shown using the inward movement of both investment and production curves. (See figure 2 below).

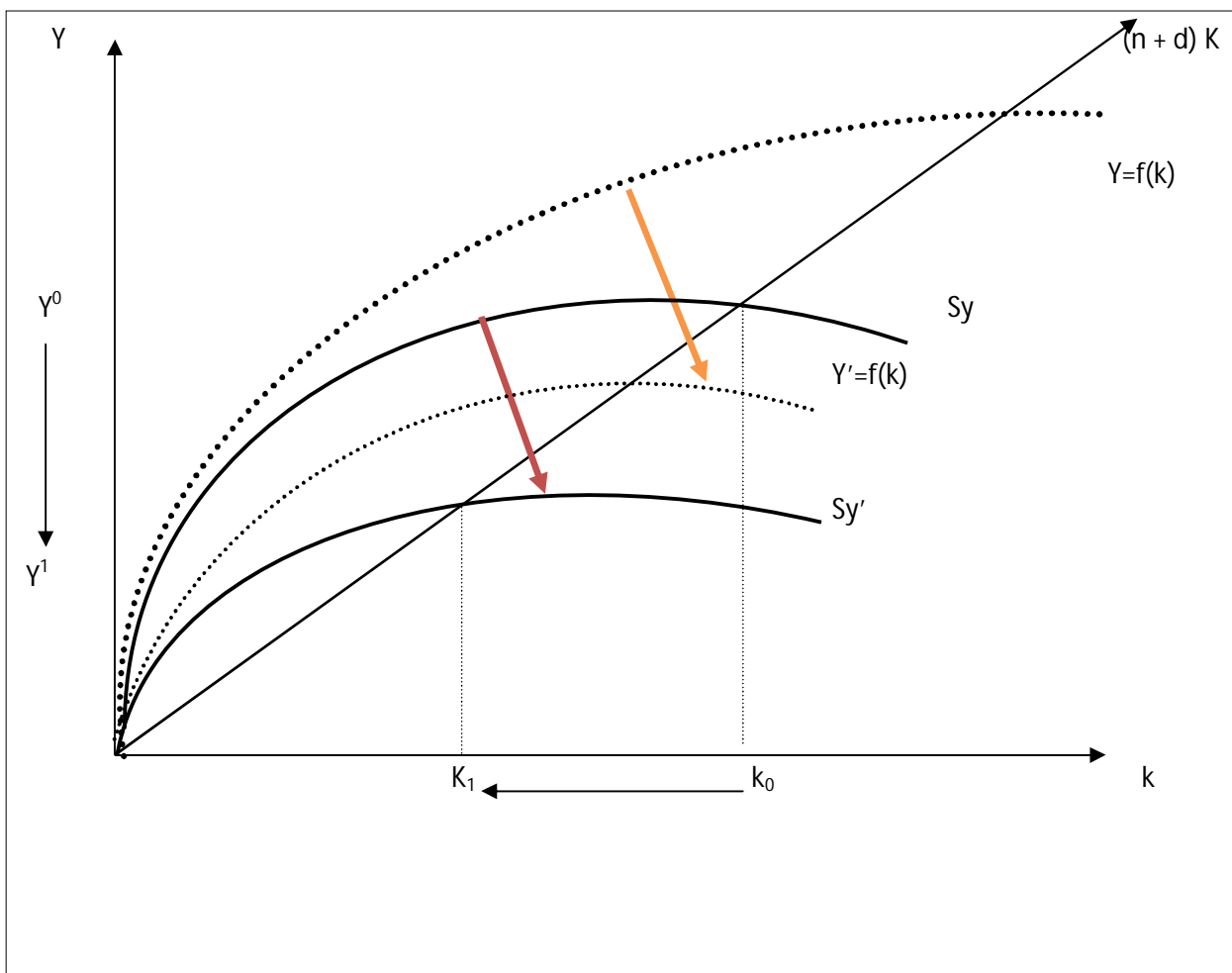


Figure 2: External debt and Solow's production curve

Chapter Three

3.1 Data

The data for the topic under question covered eight heavily indebted poor African countries selected based on a number of criteria's like: - GDP per capita, geographical location, debt structure (i.e. their total external debt and debt service), political stability (in terms of stable government) and beside all data availability also considered (Table 3).The empirical investigation is carried out with annual data over the period 1991 to 2010. The study is bounded with this time period due to the fact that the effect of debt that many African countries incurred during the major debt crisis in 1980's following the global oil shock and world economic recession, is best dealt in this time period.

According to the IMF definition and category all the selected eight countries are among the countries which received continuous debt relief in 1999, 2005 and 2007, to help them towards the millennium development goals that they are intended to achieve by 2015.

Variables selected to analyses under the topic are Growth rate of real GDP; initial per capita GDP, Growth rate of investment, population growth rate, trade balance (the difference between Export and Import), Net total debt service, a ratio of net debt service to Export and the ratio of external debt to GNI. The main data source for the variables was World Bank data base supplemented by IMF and respective countries statistics offices.

It should be noted that the Net total debt service variable is calculated by taking the difference of Total debt service and Total debt relief for each year, for years that are without debt relief the total debt service can be taken as the Net total debt service. Beside this, due to statistical insignificance during estimation in various steps and methods, the variable marginal productivity of capital and total external debt are omitted from analysis.

Sr.no	Country	External Debt %of GNI 1991	External Debt%of GNI 2010	GDP per capita 2010	TotalDebt relief 1991-2010	Geo.loca	population	Total external debt	Total Debt Service
1	Benin	62.7	18.4	780	-1,707,162,930	West	9.1m	25769456000	908,989,000
2	Ethiopia	68.7	24.12	400	-11,375,157,150	east	84.7m	142,597,086,000.00	2,703,582,000
3	Madagascar	156.5	26.6	430	-4565230770	south	21.3m	72661597000	1,731,673,000
4	Mali	107.3	26.1	610	-3665999600	west	15.8m	54565252000	1,621,542,000
5	Mozambique	183.6	43.7	470	-6744296010	south	23.9m	106768084000,00	1,764,941,000
6	Senegal	66.19	28.5	1070	-3646792080	West	12.8m	72284175000	4,770,773,000
7	Tanzania	137.3	37.6	540	-8002502760	east	45m	140276482000,00	3,274,575,000
8	Uganda	85.8	17.9	510	-4624687620	east	34.5m	66208819000	221,5252,000

Table 2 : over all information of selected countries

3.2 Model and Data specification

The main aim of this empirical investigation is to determine the relationship between external debt and economic growth.

According to Sala-i-martin (1997), “economic theories are not enough to pin point the exact determinants of growth. As a solution for this problem they suggest a cross-sectional regression model of the form:-

$$\gamma = \alpha + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n + \varepsilon$$

Where γ is the vector of the rates of economic growth, and x_1, \dots, x_n are vectors of potential explanatory variables which can vary from researcher to researcher.”

“The methodology usually used by empirical growth analysts consists of simply “trying” the variables that are thought to be potentially important determinants of Growth”

Based on the above suggestions, this study uses log of INTGDP (case for convergence), Growth rate of investment, Population growth rate and trade balance mainly from Solow’s growth model; and the debt burden measuring variables: the ratio of external debt to Gross national income, debt service export ratio and net total debt service to investigate the exact relationship between external debt and economic growth.

Following the advantages suggested by Baltai, the study uses panel data, as they give

“More informative data, more variability, less collinearity among variables and more degrees of freedom and more efficiency”.

The estimation is carried out by employing random effect approach on successive models developed to address the research question. The main reason that I pursue random effect approach is to treat the selected variables as a sample from the whole group of heavily indebted poor African countries. ¹conceptually a variable effects might be treated as random effect if we can think of the levels of the variable that we included in the study as a sample drawn from some larger (conceptual) population of levels that could (in principle) have been selected. In this case the result from the estimation can be generalized for the 26 countries which are categorized by IMF as countries that reached post-completion point. (I.e. countries that have qualified for are eligible or potentially eligible and may wish to receive HIPC initiatives assistance).

The grand (General) econometric model for the study is:-

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \text{Int GDP}_{i0} + \beta_2 \text{INV}_{it} + \beta_3 n_{it} + \beta_4 \text{TB}_{it} + \beta_5 \text{DSEX}_{it} + \beta_6 \text{EDY}_{it} + \beta_7 \text{NTDS}_{it} + u_{it}$$

Where:-

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \text{RY} = \text{the economic growth for country } i \text{ between year } t \text{ and year } t+1$$

β_0 = intercept

Int GDP_{i0} = is log of the initial per capita GDP in 1991 for respective countries

INV_{it} = is the growth rate of investment

n_{it} = is population growth rate

TB_{it} = trade balance (Export - Import)

DSEX_{it} = is Debt service export ratio

EDY_{it} = Ratio of Total external debt to GNI

NTDS_{it} = Net total Debt service

u_{it} = error term

To counter the effect of the various variables on economic growth and see the relationship between external debt and economic growth, we sub divided the general econometric model into eight sub models.

The main variables which are used to test the hypothesis are EDY_{it} (Ratio of external debt to GNI) and DSEX_{it} (Debt service export ratio); which measures the debt overhang and debt crowding out effect respectively. Based on the theoretical model in the previous section, both EDY_{it} and DSEX_{it} are expected to have a negative coefficient in the analysis.

Model 1

This model is mainly developed just to see the direct effect of investment on economic growth. Moreover it can also test Solow's important variables (investment and population growth) effect on economic growth. The equation:-

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \text{Int GDP}_{i0} + \beta_2 \text{INV}_{it} + \beta_3 n_{it} + \beta_4 \text{TB}_{it} + u_{it}$$

Model 2

Here net total debt service is included in model one to see the direct effect of Debt service on economic growth.

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \mathbf{Int\ GDP}_{i0} + \beta_2 \mathbf{INV}_{it} + \beta_3 \mathbf{n}_{it} + \beta_4 \mathbf{TB}_{it} + \beta_5 \mathbf{NTDS}_{it} + u_{it}$$

Model 3

Here the ratio of debt service to export is included in model one to see the effect of debt service – export ratio on economic growth. (This variable help us to counter the crowding out effect of external debt on external debt) .

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \mathbf{Int\ GDP}_{i0} + \beta_2 \mathbf{INV}_{it} + \beta_3 \mathbf{n}_{it} + \beta_4 \mathbf{TB}_{it} + \beta_5 \mathbf{DSEX}_{it} + u_{it}$$

Model 4

Here the ratio of total external debt to GNI is included in model one to see the effect of external debt-GNI ratio on economic growth. (This variable help us to see the debt overhang effect of external debt on economic growth)

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \mathbf{Int\ GDP}_{i0} + \beta_2 \mathbf{INV}_{it} + \beta_3 \mathbf{n}_{it} + \beta_4 \mathbf{TB}_{it} + \beta_5 \mathbf{EDY}_{it} + u_{it}$$

Model 5

In this model both debt service-export ratio and total external debt-GNI ratio is included in model one to see the combined, debt overhang and crowding out effect of external debt on economic growth.

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \mathbf{Int\ GDP}_{i0} + \beta_2 \mathbf{INV}_{it} + \beta_3 \mathbf{n}_{it} + \beta_4 \mathbf{TB}_{it} + \beta_5 \mathbf{DSEX}_{it} + \beta_6 \mathbf{EDY}_{it} + u_{it}$$

Model 6

In this model debt service-export ratio and net total debt service is included in model one to see the combined effect of net total debt service and crowding out effect of external debt on economic growth.

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \text{Int GDP}_{i0} + \beta_2 \text{INV}_{it} + \beta_3 n_{it} + \beta_4 \text{TB}_{it} + \beta_5 \text{DSEX}_{it} + \beta_6 \text{NTDS}_{it} + u_{it}$$

Model 7

This model debt included total external debt –GNI ratio and net total debt service in model one. And it can give a good picture to see the combined effect of net total debt service and the debt overhang effect of external debt on economic growth.

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \text{Int GDP}_{i0} + \beta_2 \text{INV}_{it} + \beta_3 n_{it} + \beta_4 \text{TB}_{it} + \beta_5 \text{EDY}_{it} + \beta_6 \text{NTDS}_{it} + u_{it}$$

Model 8

This grand (general) model uses all the variables that we selected for the analysis and it can give us the combined effect of all variables on economic growth.

$$\frac{y_{it+1} - y_{it}}{y_{it}} = \beta_0 + \beta_1 \text{Int GDP}_{i0} + \beta_2 \text{INV}_{it} + \beta_3 n_{it} + \beta_4 \text{TB}_{it} + \beta_5 \text{DSEX}_{it} + \beta_6 \text{EDY}_{it} + \beta_7 \text{NTDS}_{it} + u_{it}$$

3.3 Description of variables

Economic Growth

Economic growth is the dependant variable in the analysis and represented by the growth rate of real GDP per capita. The data is taken from World Bank data base.

Initial per capita GDP

Initial per capita GDP represent the log of real GDP per capita. It is used to demonstrate convergence (catch-up effect). Convergence is a hypothesis that states: growth will be higher in countries where initial per capita income is lower than countries where initial per capita income is higher and it predicts that both category economies will converge to a given per capita income. In this empirical analysis, even if the selected eight countries belong to the same group in terms of the debt situation (i.e. all are heavily indebted poor countries), they are different in terms of per capita income. Therefore we will expect a result which is in line with the convergence hypothesis. The data for the analysis is taken from World Bank data base.

Growth rate of investment

According to Solow growth model investment has a positive and direct effect on economic growth. He showed this using the capital accumulation equation, as per this equation the investment per worker, “ s_y ” (as it is mentioned on the literature part) increases the capital accumulation and this will in turn induce economic growth. As this study bases theoretical on Solow growth model .it is viable to expect a positive and direct relationship between investment and economic growth. The data for this variable is collected from different sources like Investment and statistical office of respective countries and World Bank data Base.

Population growth rate

Population growth rate is one of the main variables on the capital accumulation equation developed by Robert Solow. According to the equation, population growth rate reduces capital accumulation.

“If there were no new investment and no depreciation, capital per worker would decline because of the increase in the labor force (population)” *Charles and jones, page 26*

Following this we expect a negative effect from population growth rate. The data is collected from the World Bank Data base and Investment and statistical office of respective countries.

Trade balance

Trade balance or net export can be defined as the difference between export and import on a given period, usually one year. If exports exceed imports, the country is said to run a trade surplus. If exports are less than imports, the country is said to run a trade deficit. A country which is in trade surplus doesn't necessarily enjoy economic growth and a country on trade deficit doesn't necessarily fail in terms of economic growth. The study will expect a positive effect of trade balance on economic growth, regardless of the trade balance situation the countries experience. The data for this variable is from World Bank Data base.

Ratio of External debt-GNI (a proxy variable for debt overhang)

From 1980's onwards the disincentive effect of external debt on investment and growth, which is debt overhang, is considered as one of the major cause for the poor performance of many developing countries.

To counter this effect I included the usual debt overhang measure, total debt to income ratio in the econometrics model. In general a higher ratio shows a higher debt burden; in this study we expect a negative impact from total debt GNI ratio on economic growth. The variable for analysis is calculated using total external debt and Gross national income (GNI), both are extracted from the World Bank Data base.

Debt service export ratio (a proxy variable for debt crowding out)

Along with the debt overhang effect, the debt crowding out effect is also studied by different researchers like Krugman (1988) and Sachs (1989). This is the case when indebted poor countries transfer resources, including foreign aid and foreign exchange resources to service their accumulated debt.

The equivalent ratio which can trap the crowding out effect is the total debt service export ratio. The study expects a negative impact of the ratio on economic growth. The data are taken from the World Bank data base.

Net total debt service

Net total debt service is calculated by subtracting the Annual total debt relief from Annual total debt service. It may take a positive value in some years where debt relief is higher than total debt service. The many reason to include net total debt service in the econometrics model is to trap the effect of the debt relief the debt they paid or serve. The study expects a negative impact of the net total debt service on economic growth. The data for the variable is calculated by extracting the direct values of total debt service and total debt relief from the World Bank data base.

3.4 Pre estimation statistics

Before inferring conclusion from estimation results, it is important and vital to undertake some statistical tests. This paper tries to take the stationarity, heteroskedasticity tests.

3.4.1 Stationarity test

It is common and essential to check the stationary of a data to get rid of making a spurious regression and inferring a misleading conclusion from a non stationary data.

The use of panel data unit root tests has become very popular among empirical researchers with access to a panel data set. It is by now a generally accepted argument that the commonly used unit root tests like the Dickey- Fuller (DF), augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests lack power in distinguishing the unit root null from stationary alternatives, and that using panel data unit root tests is one way of increasing the power of unit root tests based on a single time series. (G. S. Maddala and Shaowen Wu)

For the purpose of this dissertation, the one developed by Levin –Lin-Chu (2002) is used to test unit root. According to Christopher Nell and Stefan Zimmermann’s (2011) paper on panel unit root test, the major equation on Levin –Lin-Chu (2002) unit root analysis was:-

$$\Delta y_{it} = \rho_i y_{i,t-1} + \sum_{L=1}^{\rho_i} \theta_{iL} \Delta y_{it-L} + \alpha_{it} + \epsilon_{it}$$

Leaving the successive steps following the above equation, the main hypotheses for the test is:

H0: each time series contains a unit root ($\rho_i = 0$)

H1: each time series is stationary ($\rho_i < 0$)

A check for stationary on all the variables under study , using the Levin, Lin and Chu (2002) tests shows (see Table 4) that: the null hypothesis should be rejected for all variables at different level of significances expressed in terms of $< t >$ value . This can lead us to the alternative hypothesis, which is a condition for stationarity.

Thus all variables are stationary except the INTGPD, which is the log of initial GDP at 1991 in all observations for all cross-section (countries),and can’t experienced a time trend as it is constant with in time for each countries.

Variable	t Value
RY2	-5.8410
INV	-9.3664
n	-8.1680
TB	-5.6793
DSEX	-6.5840
EDY	-6.2968
NTDS	-7.0614

Table 3: t value for stationary test

3.4.2 Heteroskedasticity

To control a possible occurrence of heteroskedasticity, I used the option robust in estimation.

3.5 Regression Result

	Model							
Explanatory Variable	1	2	3	4	5	6	7	8
INT GDP	-8.15 (5.87)	-8.35 (5.98)	-7.9 (5.76)	-8.14 (5.86)	-7.94 (5.76)	-8.17 (5.91)	-8.43 (6.00)	-8.26 (5.94)
INV	0.241 (3.59)	0.243 (3.62)	0.22 (3.22)	0.24 (3.59)	0.22 (3.22)	0.22 (3.23)	0.24 (3.63)	0.22 (3.24)
n	0.35 (-5.09)	-0.361 (-5.22)	-0.31 (-4.54)	-0.35 (-5.06)	-0.31 (-4.5)	-0.33 (-4.7)	-0.36 (-5.2)	-0.33 (-4.67)
TB	0.126 (1.87)	0.132 (1.96)	0.14 (2.06)	0.12 (1.84)	0.13 (2.03)	0.14 (2.17)	0.13 (1.93)	0.14 (2.14)
NTDS		0.08 (1.15)				0.09 (1.33)	0.87 (1.24)	0.101 (1.45)
DSEX			-0.14 (-2.03)		-0.14 (-2.04)	-0.15 (-2.14)		0.151 (-2.18)
EDY				0.022 (0.34)	0.03 (0.44)		0.04 (0.58)	0.05 (0.73)
Number of observation	160	160	160	160	160	160	160	160
Within R²	17.67	18.28	20.76	17.77	20.88	21.63	18.54	21.93
between R²	76.17	76.6	73.55	76.01	73.57	73.93	76.34	73.98
overall R²	30.45	31.05	32.26	30.50	32.35	33.04	31.00	33.28

Table 4: Regression result

3.5.1 Interpretation of Regression result

This chapter shows the estimation results on each model and the corresponding test statistics employed in the estimation.

Model 1 result

The result from the first model shows that all the variables in the model except TB (trade balance) are statistically significant. As we hypothesized based on Solow's growth model, growth rate of investment has a positive and direct effect on economic growth and the growth rate of population is negatively related with economic growth. Other things keep in constant; a 1% increase in growth rate of investment will increase economic growth by 0.24%. And a 1% increase in population growth rate will reduce economic growth by 0.34%, keeping other things constant.

The other thing that, this model prevails is the relationship between the log of INTGDP and economic growth. The z value from estimation for the variable INTGDP is -5.87 which shows that a high statistically significance negative relationship between INTGDP and economic growth. This also supports the neo classical growth model hypothesis (Solow (1956), Cass (1965), Koopmans (1965)), which stated a country per capita growth rate is inversely related to its starting level of income per person. I.e. countries with lower level of initial per capita income grow more than countries which has higher level of initial per capita.

In the other hand, contrary to economic growth theories the TB (trade balance) variable in this equation is statistical insignificant. Generally, the result from this model is in line with the theories that I use in the model.

Model 2 Result

The main difference between this model and model 1 is: this model includes NTDS (net total debt service) variable, to counter the direct effect of debt service on economic growth.

As we can see from the estimation result the NTDS variable is positively related but statistically insignificant with economic growth. The positive relationship arises because of the dominance of the debt relief over debt service payment. As NTDS is calculated by subtracting debt relief from total debt service. But estimation using total debt service variable supports the negative relationship between TDS and economic growth (which is not included in this study).

Moreover, the presence of NTDS doesn't affect the statistical significance of log of INTGDP, investment growth and population over economic growth, rather makes the trade balance variable, TB, slightly significant.

Model 3 Result

In this model, DSEX is added to counter the direct crowding out effect of debt on economic growth. As the result from estimation shows all the variables are statistically significant, including the new variable DSEX. This can indicate how servicing a debt affects the economic growth rate. If we take the coefficient on the variable DSEX (which is -0.14) by letting other things constant, for a 1% increase in debt service- export ratio, the economy growth rate reduces by 0.14%. This means, the countries under the study, were using income from export to pay their accumulated debt, rather than investing in developmental activities.

The other important result from this model is the one from the variable trade balance (TB). In the second model the TB variable was slightly significant, and totally insignificant in the first model. Here the TB variable is statistically significant and also has positive relationship with economic growth. Keeping other things constant, a 1% increase in a trade balance will increase the economic growth rate by 0.14%.

As it was in the previous equations, the variable log INT GDP, INV and n are also highly significant.

Generally, the result from this model is consistent with the second hypothesis that this paper tries to test. Therefore we should accept the hypothesis: external debt servicing has a negative impact on economic growth through the crowding out effect.

Model 4 Result

Here the ratio of total external debt to GNI is included in the first model to see the direct effect of external debt – GNI ratio, which helps us to see the debt overhang effect on economic growth. The result from estimation shows that the EDY variable is statistically insignificant and doesn't have any effect on economic growth. This is against what the debt overhang hypothesis states, according to the debt overhang hypothesis: an accumulation of too much debt in an economy will reduce the economic growth of a country by reducing both private and public investment. But, the result from estimation is against this hypothesis. This implies that the countries under the study didn't experience the debt overhang problem for the last two decades. But, as the result from model 3 shows, they were experiencing the crowding out effect of debt. It should be noted that this model and the above models are estimated by taking separately the variables that measure crowding out effect and debt overhang effect of debt on economy growth.

When we see the result from other variables in the model, except the trade balance variable (TB), all are statistically significant and agree with the neoclassical growth theories. In general as per the result from this model we should reject our first hypothesis (Debt overhang hypothesis).

Model 5 Result

This model contains two of the basic variables that will give a solution for the research question. EDY (External debt-income ratio) give us a sign whether or not debt overhang is a problem for the selected countries and DSEX (Debt service – Export ratio) in the other hand counter the possible crowding out effect of debt servicing in an economy.

When we see the result from the regression, the EDY variable is still statistically insignificant. This dignifies that the selected countries were not experiencing debt overhang, for the last two decades. In the other hand DSEX variable is statistically significant and have a negative impact on the growth rate of the economy. For a 1% increase in DSEX, the growth rate of the economy declines by 0.14%. This implies that the countries were using income from export to serve their accumulated debt.

Like that of the previous four models the variable INTGDP, INV and n are still statistically significant and are not affected (loses their significances) by the new variables that I include in the model.

The very interesting result that I got from this model is about the significance of the trade balance variable. TB is insignificant when it is followed by EDY and/or NTDS and significant when it is followed by the variable DSEX. (Model 5 and Model 3). According to this model, for a 1% increase in the TB variable the dependant variable, RY increase by 0.13%.

In general as per the two separate hypotheses this paper tries to test, we should reject the first that states about debt overhang. And accept the second which states about the crowding out effect.

Model 6 Result

Here the direct measure of debt overhang net total debt service, NTDS is used along with DSEX. The estimated value for DSEX is negative and significant. For a 1% increase in DSEX, the economy growth rate will decline by 0.15%. In the other hand, the variable NTDS is positively related but statistically insignificant with the economy growth rate, RY. The positive sign may emanate from the nature of the variable NTDS. NTDS is calculated by taking the difference of total debt service and Total debt relief. In this case if countries got a substantial

amount of debt relief than the debt they paid (service) the net total debt service variable will take positive value and also may show a positive relationship with economy growth rate.

As it was shown in model 3 and model 5, TB (Trade balance) got statistical significance when it is followed by DESX. Consistent with this presumption, TB is statistically significant in this model also. And the other variables (INTGDP, INV and n) are also statistically significant as they were in the previous models.

Model 7 Result

In this equation NTDS and EDY are added to the first equation. In the previous models that we use these two variables separately, we found insignificant relationship between either of the two variables and the economy growth rate. Here like that of the previous result both variables are statistically insignificant with the economy growth rate. The other variables in the model are still statistically significant except the variable TB.

Model 8 Result

This model includes all the variables that we used in the study, and can be regarded as the general model. Therefore, the result from estimation can be taken as a general solution for the research question we formulated in chapter one.

The estimated value for EDY and NTDS are still statistically insignificant. So we should reject the first hypothesis of the significant relationship between EDY and/or NTDS, and economy growth rate (the case for the debt overhang effect on economy growth). But the variable DSEX is statistically significant and has a negative relationship with economy growth. So we should accept the second hypothesis of the significant and negative relationship between DSEX and economy growth rate (a case for the crowding out effect of debt). For a 10% increase in debt service export ratio, the economy growth rate declines by 1.5%.

Other variables that are used in the model: INTGDP, INV, n and TB are statistically significant and also have the expected relationship with economy growth, that the neoclassical growth theory formulated. The variable TB as we presume before is statistically significant when it is accompanied by DSEX. A 1% increase in the TB will increase economic growth by 0.14%.

CHAPTER FOUR

4.1 Analysis

The main objective of this study was to get the exact relationship between External debt and countries economic growth, using the two major debt burden measures: Debt overhang (measured by the ratio of external debt to GNI) and Debt crowding out effect (measured by Debt service export ratio) along with the net total debt service variable. To meet the above objective the paper hypothesizes a negative relationship between External debt and economic growth through the debt overhang and crowding out effect.

The result from estimation on successive modeling of the above variables together with Robert Solow growth model variables shows a significant and negative relationship between economic growth and the variable DSEX (The ratio of debt service to export). In the other end the variable EDY (The ratio of External debt to GNI) founds to be statistically insignificant with economic growth. This finding is supported by previous empirical analysis by Rockerbie (1994) and Fosu (1996). Rockerbie founds a significant and negative relationship between debt service obligation and economic growth. Fosu in the other hand states that < Debt overhang is less important than the direct effect of debt hypothesis. It means that debt service payments reduce output growth directly by reducing productivity >

The general Econometric model also includes INTGDP, growth rate of investment, and population growth rate and trade balance from neo classical growth model, mainly from Solow growth model. The results from estimation are totally consistent with Solow growth model. I.e. there is a high statistical significance between the above variables and economic growth. In the other hand the variable NTDS (net total debt service) which is included to counter the possible effect of debt relief on economic growth found to be statistically insignificant with Economic growth; this can possibly show how the debt relief these countries got is negligible.

To push the analysis one step further, it is good to compare the debt burden measuring variables: Total external debt, Total debt service and Total debt relief on the last twenty years for the selected eight countries. (See the graph below)

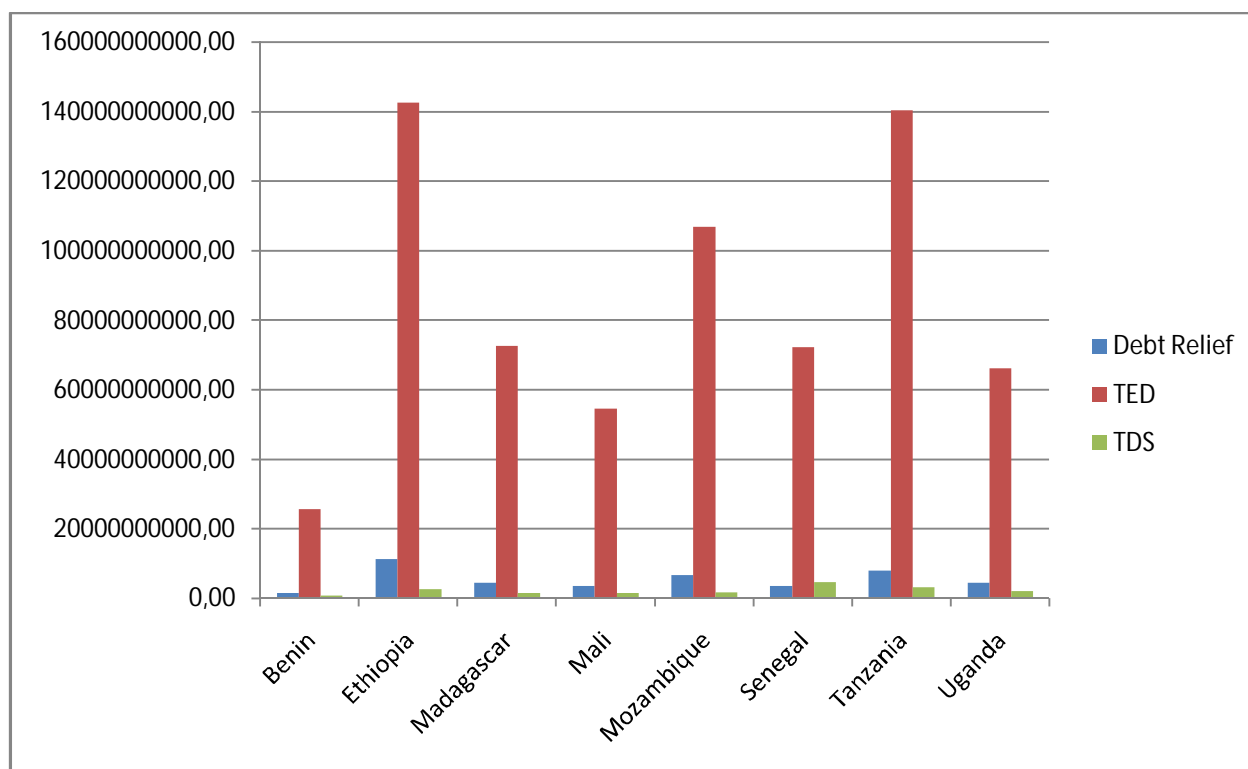


Figure 3: Total external debt, Total debt service and Total debt relief

As one can see from the above graph the countries didn't pay a significant amount (more than 95% of their debt) of their total debt and receive a negligible amount of debt relief in the last two decades in comparison with their respective total external debt. If these is the case, what will be the implication for the insignificance of the debt overhang variable, EDY and the significance of the debt crowding out variable, DSEX.

- The debt payments on the last twenty years are very small (negligible) compared to the total external debt (Graph). Reasonable (Rational) private investors can easily learn this and didn't feel or expect any policy which deters investment, like an increase in rate of tax in anticipation of debt servicing by government. Moreover, the campaign by different groups, to make those countries (Heavily indebted poor countries) free of debt will give another freedom for private investor. Governments who took the debt in the other hand didn't face a pressure from lenders and/or are really incapacitated to service their debt, but, they still borrow to finance their budget deficit rather than increasing tax and servicing their debt. All these things possibly make the debt overhang hypothesis failed to work on the selected countries.

- The significance of the DSEX variable should be taken seriously because as we saw above in the graph ,the countries didn't pay a significant(more than 95% of their debt) amount of their debt, but they still affected by debt servicing. If the lenders forced governments to pay (service) more, the heavily indebted poor African countries economic growth will deteriorate even further, as the debt service export ratio (DSEX) is negatively related with economic growth.

4.2 Conclusion

In this study, the impact of external debt on economic growth is empirically investigated on selected (Eight) heavily indebted poor African countries. The findings from prior studies strongly vary from researcher to researcher in terms of statistical method used, Geographical area and time period covered. This paper is built in the way that contemplates all the differences shown in previous studies.

Moreover it distinguishes itself from previous studies in three ways. First, it uses the seminal work of Barro (1991) on possible variables that affect economic growth, together with Solow's economic growth theory in econometrics modeling. Second, it uses Random effect approach in data analysis. Third it uses net total debt service (calculated by taking the difference of total debt relief from total debt service) to counter the effect of debt relief.

The study has been implemented with annual data over the period between years 1991 and 2010. It is performed on eight selected heavily indebted poor African countries.

As per the result, the impact of external debt on economic growth is statistically significant in terms of debt crowding out effect over the selected eight countries in particular and over all the heavily indebted poor African countries in general in a restricted sense. This is the case when indebted poor countries transfer resources, including foreign aid and foreign exchange resources to service their accumulated debt.

In the other hand, the effect of external debt on economic growth is found to be statistically insignificant in terms of debt overhang effect. This result is against the debt overhang hypothesis and the presumption we made on Solow theory of economic growth, which states that an accumulated debt act as a tax on future output, discouraging productive investment plan of the private sector and adjustment efforts on the part of government (Debt overhang hypothesis) and this in turn will shift inward both investment and production curves in Solow's production function.

Beside this, the study also reveals that, the total amount of debt relief the countries in the study received is negligible and didn't help the countries towards a better economic growth.

Despite the above result all the variables used in analysis: log of initial GDP, population growth rate, investment growth rate and trade balance are in line with Solow's economic growth theory.

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