

## **Debt and Economic Growth**

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**ABSTRACT:** This paper aims to study the effect of debt on economic growth of 19 developing countries over the period 1990-2011, through the use of a dynamic panel data model. The second part of this paper involves an empirical study of the effect that debt have on the contribution of investment to economic growth. The main statements issued from these two empirical tests stipulate a negative effect of the total external debt to GDP and external debt as a percentage of GNI ratio on economic growth and a negative interaction between these two debt' measures and investment.

**Keywords:** debt; investment; interaction; economic growth; dynamic panel.

**JEL Classifications:** C23; O43; O47

### **1. Introduction**

The external debt was an important stimulator of economic growth and a way to balance the budget. Moreover, public debt, especially foreign debt, has an independent existence outside the budget and public finances. So the debt is a universal phenomenon found in all countries. As a result, the inevitability of public debt is recognized accordingly. The loan is one of the main components of modern public finance. It is considered a temporary but complex resource. Indeed, this variable is closely related to the budget deficit. Economies that are at the initial stage of their development have a limited stock of capital and often offer more profitable investment opportunities than mature economies. What threatens by debt these countries? However, the accumulation of debt helped to finance many unprofitable, unrealistic and low efficiency projects that induced negative impact on growth. Indeed, the deterioration in the international economic environment of the eighty centuries (80) characterized by fluctuating exchange rates, the decline in commodity prices and rising interest rates, the debt of Africa become an obstacle to its development and full refund almost hypothetical.

It in this context that our research works whose main objective is to study the impact of external debt on economic growth in some developing countries. Thus, our problem looks as follows: What is the effect of the financing by external debt on economic growth? The methodology to answer this problem has led us to develop our work in two sections. The first is devoted to the empirical literature on the relationship between external debt and economic growth, while the second will focus on definitions' variables, their sources and the interpretations of the results of the econometric study. The econometric investigation conducted as part of this research provides a dynamic range of 19 developing countries over the period 1999-2011.

### **2. Empirical Literature**

Empirical studies show a correlation between external debt and economic growth are abundant. We will discuss in what follows some of them. Krugman (1988), Sachs (1989), Froot (1989) showed that the accumulation of debt and debt servicing are a tax on future production and discourages investment by crowding. In their work, Eichengreen and Portes (1986) were interested in identifying the determinants of the stock of debt of thirty countries at a given time (1955). Indeed, excessive debt and defaults tend to reduce the real rate of growth and the credibility of the state. Also, Claessens (1990), Warner (1992) and especially Borensztein (1990) identified the debt service as a

determinant which influences negatively the external debt through econometric models on debt data of the Philippines, the outstanding and the ratio of debt service on exports have generally an inverse effect on private capital formation and encourage the country into debt.

Oks and Van Wijnbergen (1995) were the first to investigate the influence of the uncertainty of payment of debt service on economic growth. They concluded, in the case of Mexico, the instability payment of debt service negatively affect private investment and hence economic growth. According to Cohen (1999), the slowdown in investment is explained by the debt service rather than by loans. Agenor and Montiel (1999) showed that an increase in future debt service may encourage governments to adopt inflationary policies or refrain to implement certain reforms. Deshpande (1997) examined the investment experience of 13 heavily indebted countries (Algeria, Argentina, Ivory Coast, Senegal, Togo, Nigeria) during the period 1971-1992. He says as a result of his research, the total amount of debt has an adverse effect on investment through two channels:

- A direct disincentive effect that comes from the fear of appropriation of funds (or investment returns) in order to pay the debt service
- An adjustment measures, taken to address (or avoid) the difficulties to service debt, as an indirect effect such as the reduction of imports (reduction of capital goods imported) and reductions in public sector investment required to reduce budget deficits.

Iyoha (1999) examined the impact of external debt on growth in African countries south of the Sahara from 1970 to 1994 using an econometric simulation model. He noted that the variables related to the external debt have a negative effect on investment, showing that an accumulation of outstanding debt discourages investment through two effects: the discouragement and eviction. From a simulation of relief debt policies in order to highlight the impact of this reduction on investment, he reached the following results:

- If the debt is reduced by 20%, the investment will grow by 18% over the study period.
- If the same reduction is applied, the GDP will grow by 1%.

He concluded that the results of his research have proved that the debt relief would stimulate investment and encourage the resumption of economic growth in South Sahara Africa. In search of the link between debt and growth, Patillo et al. (2002) have produced a very interesting study on the issue. They depart from the statement of economic theory that believes that the loan contained within reasonable limits can help developing countries to strengthen their growth. According to IMF experts, the countries that are in the initial stage of their development have a limited stock of capital and offer more profitable investment opportunities than mature economies. As long as they use the borrowed funds to finance productive investment and resolve certain problems (macroeconomic instability, major shock ... etc), they can accelerate their growth that enable them to repay at maturity the debts. This is true in the context of theories based on, the more realistic, hypothesis that countries are not always able to borrow at will, because the market fears that they repudiate their debts.

They raise the question of why the accumulation of heavy debts hinders the economic growth. The answer to this question is contained in the theories of the «over debt» who believe that, if we can believe that the future debt will exceed the repayment capacity of debtor countries, the cost of service discourage domestic and foreign investment, penalizing, thus, growth. In fact, fearing that production is taxed at progressively by creditors to service the debt, potential investors reluctant to bear the immediate costs to increase future production. In other words, over the outstanding debt, the higher the likelihood of repayment is low.

They adopted a methodology based on multiple regression analyzes to determine whether debt and growth are linked, taking into account the types of growth determinants. They used panel data on average three years to 93 developing countries covering the period from 1969 to 1998 and averages over ten years to check the robustness of their conclusions regarding the effects of the cycle. Their study identified the following result: debt has an inverted U-shaped curve relationship with growth (curve LAFFER)

Patillo et al. (2002) will use this curve to explain the pressure of a certain level of debt on economic growth by providing the following reasoning: when a country opens up to foreign capital, the impact of debts on expansion will be positive in a first time. But as the debt ratio increases beyond a certain amount, while new loan growth slows even if the total outstanding debt continues to have a positive effect on growth. This amount can be considered as the debt level that maximizes growth. For 93 countries, the study shows that the debt seems to have an overall negative impact on growth when

the debt is 160 to 170% of exports, and 35 to 40% of GDP (net present value). The marginal impact becomes negative when it reaches about half of these rates. It also appears that the growth gap between countries with low debt (less than 100 % of exports and less than 25% of GDP) and the Heavily Indebted Poor Countries (over 367 % of exports and more than 95% of GDP) is on average more than 2% per year.

More recently, Pattillo et al. (2004) showed that the marginal impact of the net present value of external debt on economic growth becomes negative for ratios ranging from 5 to 50% of GDP. In addition, on a limited sample of low income countries Clements et al. (2003) show that debt service does not directly affect the rate of economic growth, but through the crowding out effect of debt service on public spending. Indeed, a reduction in debt service as a percentage of GDP of 8.7 % to 3 % increase in public investment from 0.7 % to 0.8 %, and therefore the economic growth rate of 0.1 % to 0.2 %. Considering the external debt as a burden on the economy, Idlemouden and Raffinot (2005) show that the payment service external debt tends to crowd out public spending leading to a decline in overall investment and its assets would affect the private incentives through increased tax burden economic agents. The empirical approach adopted by Cordella et al. (2005) (80 developing countries) has allowed them to identify a range within which the debt is observed. The negative impact of debt on growth is observed or for relatively low debt ratios, or for relatively high ratios. For countries with "good policies and institutions," the debt begins to act negatively on growth when it exceeds 15 to 30% of GDP. However, beyond ratios of 70 to 80%, the marginal effect becomes insignificant. These thresholds are higher than those calculated for the countries in which policies and institutions are «bad.» Although they differ in their levels of estimation methodologies and their samples, empirical studies generally confirm the theory of "over debt", showing a negative impact of debt on growth.

Direct estimations of the impact of debt reduction on economic growth were made by Depetris and Kraay (2005), Presbitero (2010) and Johansson (2010). None of these works confirms that debt reduction was effective in relation to its effects on economic growth. Indeed, Depetris and Kraay (2005) develop a database on the net present value of the debt reduction achieved by 62 low-income countries during the period 1989-2003. They found no significant effect of this variable on economic growth and investment. This result is confirmed by Presbitero (2010), which uses the same methodology, but over a longer period up to 2007. Johansson (2010) uses a growth regression and uses the current values of debt reduction developed by Depetris and Kraay (2005). His empirical results show no positive effect of reducing the debt on economic growth in a sample of 118 developing countries (40 low income countries) on period 1989-2004. The effects of interactions of this variable with measures reflecting respectively the weight of debt, institutional development and membership or not the HIPC group also proved insignificant. The effect of debt relief has proved positive and significant in a regression on investment only for countries not part of the HIPC.

Nautet and Van Meensel (2011) theoretically identify three main channels through which an increase in the public debt can negatively affect economic growth in the long term. An increase in the public debt will decrease the volume of net savings at national level and therefore a higher interest rate. This leads to a fall in investment and a slowdown in the growth of capital stock. Any reduction in capital accumulation results in lower innovations and consequently a decline in labor productive Reinhart and Rogoff (2010) have recently analyzed the evolution of the public debt and the real rate of long-term growth for a sample of forty countries over the period spanning the last two centuries. An examination of their data reveals a weak relationship between government debt and long-term growth for debt levels below the threshold of 90 % of GDP. Beyond 90%, the median rate of growth decreases by one percentage point and the average growth rate decreases further. In the specific case of developing economies, the level of public debt held by foreign agents is lower. In that respect, when the public debt held by the rest of the world exceeds 60% of GDP growth decreased two points; when it exceeds 90% of GDP growth becomes negative. Both authors emphasize the «debt in tolerance» as explanation for this non-linear relationship: market interest rates rise when the economy reached the limits of tolerance for debt. Rate hikes lead to severe budget adjustments through tax increases and spending cuts or defects.

Kumar and Woo (2010) also explore the impact of high public debt on economic growth in the long term. They base their analysis on a range of advanced and emerging economies during the period from 1970 to 2007. The empirical results suggest an inverse relationship between initial debt and subsequent growth. When the debt to GDP ratio increased ten percentage points, the annual growth of

real GDP per capita decreased by about 0.2 percentage points per year, with a more muted impact in advanced economies. Only high levels of debt above 90 % of GDP have a significant negative effect on growth.

The adverse effects can be explained mainly by a slowdown in the growth of labor productivity due to less investment and slower growth of capital stock. Indeed, when the initial debt increases ten percentage points, investment declined by an average of about 0.4 percentage point. According to Nersisyan and Wray (2011), it is important to classify the debt as the currency in which it is denominated and in the exchange rate regime in force. Indeed, the sovereign debt of an economy with a non-convertible currency whose exchange rate is floating incurs no risk of default then the government has no constraints on its ability to spend. An economy that has abandoned its monetary sovereignty through the anchor of its currency to a foreign currency or the adoption of a foreign currency is constrained in its ability to finance public spending by issuing currency. This analysis, however, was heavily criticized by Irons and Bivens (2010), who argue in particular that for the United States, there are only very few data on a debt ratio above 90%, so that it is outliers that cannot be learned from generally valid conclusion. Checherita and Rother (2010) are also interested in the relationship between state debt and economic growth. They review 12 countries in the euro area over the period 1970 to 2011 and make a distinction between annual rates of growth over five years. These authors found in both cases an inverted-U relationship between economic growth and government debt, with a threshold value between 70 and 80%.

Panizza and Presbitero (2012), for their part, do not reject negative correlation seems to exist between public debt and economic growth, especially from high levels of debt. They recall, however, that this correlation does not imply causality. Their own empirical studies do support the existence of a correlation between the two variables, but they do not validate a causal effect of debt on growth. The link between debt and growth could simply be explained by the fact that economic growth leads to low levels of public debt.

As recalled Nersisyan and Wray (2011), the balance automatically becomes public deficit and the debt ratio increases during recessions. However, Panizza and Presbitero (2012) identify a specific channel through which high levels of public debt affects growth: a heavily indebted government may adopt restrictive policies to consolidate its finances, or such measures depress economic activity. In addition, the implementation of austerity measures in a recession increases the depressant effects of it and ultimately increases the burden of public debt. Then it is true that high public debt reduces growth, but according to a transmission scheme that escapes the neoclassical theorists.

On conclusion, the empirical literature on relationship between external debt and economic growth proves that a certain threshold external debts affect negatively economic growth in one way or another.

### **3. Estimation Methodology**

After this review of the empirical literature on the link between external debt and economic growth we are going to verify this relationship for the case of a sample of nineteen countries. In that follow why in this section, we present our analysis methodology before the presentation of the econometric results and their interpretations.

#### **3.1 Choice of variables**

In reference to the review of the empirical literature outlined above and taking into account the availability of data and characteristics of the countries in our sample, we will decompose our variables into two groups. On the one hand the control variables like investment, trade openness and inflation. On the other hand the key variables: the ratio of total debt to GDP, external debt as a percentage of GDP, public and private debt guarantee and the total change in external debt:

$Y_t$ : the real growth rate of GDP per capita,  $Y_{t-1}$ : is the real growth rate of GDP per capita lagged,  $INV$ : The rate of investment,  $OPEN$ : The rate of trade openness,  $INF$ : The rate of inflation,  $DGDP$ : The ratio of total debt to GDP,  $DRNB$ : External debt as a percentage of GNI,  $DPPG$ : Public and private guarantee debt,  $SHTD$ : The short-term debt,  $CHTEXD$ : The change in total external debt. All data used for our estimates are annual and taken from the database: World Development Indicators 2012 of the World Bank.

### 3.2 Equation to estimate

In our model, the introduction of past growth rates among the explanatory variables allows us to test the persistence of the economic growth of countries in the sample under study since the previous economic growth can influence current economic growth. For this we use a dynamic model which is characterized by the presence of one or more lagged endogenous variables among the explanatory variables.

Thus, our equation to be estimated is as follows:

$$Y_{it} = \alpha Y_{i,t-1} + \beta X_{it} + v_{it} + \mu_i \quad (\text{For } i = 1, \dots, N \text{ } t = 1, \dots, T) \quad (1)$$

With  $Y_{i,t}$ : growth rate of real GDP per capita of the country  $i$  for the year  $t$ ,  $Y_{i,t-1}$ : growth rate of GDP per capita for the previous year ( $t-1$ ),  $X_i$ : exogenous variables (control variables) defined above,  $\alpha$ ,  $\beta$  parameters to be estimated,  $\mu_i$  individual heterogeneity [ $\mu_i \sim \text{iid}(0, \sigma_\mu^2)$ ] and  $v_{it}$  the error term [ $v_{it} \sim \text{iid}(0, \sigma_v^2)$ ].

### 3.3 Estimation results and interpretations

Estimates and econometric tests will be conducted on a dynamic panel sample of nineteen countries<sup>1</sup> over the period from 1990 to 2011. The estimation results of our model are summarized in the table 1.

**Table 1. Debt and economic growth: dependent variable real GDP per capita growth rate (Arellano-Bond dynamic panel data estimator)**

Variables /estimation	(1)	(2)	(3)	(4)	(5)
<b>L GDP</b>	-0,1191438 (-0,26)	-0,11477 (-1,23)	0,1051162 (0,35)	-0,127813 (-0,14)	-0,0607066 (-0,62)
<b>INV</b>	0,0856893 (1,49)	0,0844135 (1,48)	-0,0786118 (-0,88)	0,0204938 (0,35)	-0,0317399 (-0,36)
<b>OPEN</b>	0,0290856 (2,53)	0,0300723 (2,54)	0,600512 (2,02)	0,0257202 (1,20)	0,0263367 (0,89)
<b>INF</b>	-0,0001087 (-1,04)	-0,000091 (-0,93)	$-3,64e^{-07}$ (-0,00)	-0,0001106 (-1,20)	-0,0000651 (-0,60)
<b>DGDP</b>	-0,0282278 (-2,79)	–	–	–	–
<b>DRNB</b>	–	-0,275272 (-2,79)	–	–	–
<b>DPPG</b>	–	–	$-1,26e^{-12}$ (-0,93)	–	–
<b>SHTD</b>	–	–	–	0,0109046 (0,36)	–
<b>CHTEXD</b>	–	–	–	–	$-2,41e^{-13}$ (-0,16)
<b>T-Sargan</b>	9,294484	9,334311	10,02031	9,166498	6,8432
<b>AR(2)</b>	0,9674	0,9499	0,4383	0,6581	0,7445

The estimation results show that: The growth rate of real GDP per capita lagged (that represents the growth rate of the previous year) and the inflation rate are generally not significant, which means that these two variables have no effect on economic growth in these countries. As against the variable «trade openness» is statistically significant, and its effect is positive (expected sign) on economic growth in these countries. Indeed, any increase in the rate of trade openness by 1% leads to an increase in average 0.15 percentage point of economic growth in these countries. The latter relationship is explained by the importance of the export countries in the sample that's positive for growth. The positive impact of an increase in export earnings leads to economic growth has been demonstrated in many empirical studies including those of Oju and Oshikoya (1995).

<sup>1</sup>The countries of our sample: Tunisia, Egypt, Mali, Niger, Congo Dem Rep., Ethiopia, Angola, Gambia, Bangladesh, Jordan, Mauritania, Algeria, Malawi, Guinea, Ghana, India, Sri Lanka, Cote d'ivoire, El Salvador,

The non-significance of the "investment" variable means that's primary engine of economic growth is blocked in these developing countries. This can be justified by the importance of external debt in these countries which diverts significant investment to fund the repayment of debt and consequently the investment mechanism is blocked. Regarding the two key variables in our model, the total external debt to GDP and external debt as a percentage of GNI ratios are statistically significant and negatively affect growth. In fact if we increase this ratio to 10%, the growth rate of GDP will fall by 0.28 percentage point.

The debt ratio measures the proportion of external debt service covered by the gross domestic product. It is extremely important because it helps to monitor the level 'debt and as such, it is often used as a benchmark in strategies for debt management. The result is consistent with that of Patillo et al. (2002). Repayment of external debt (principal plus interest) has the effect of diverting resources that should be used for investment. With debt service, investments decrease with logical implication as a regression of real economic growth.

For the second variable, if the external debt as a percentage of GNI increased by 10% growth decrease of 0.27 percentage point. This result consolidates the results already obtained by several researchers who have shown empirically that the external debt penalizes economic growth by blocking the main channels and growth engines such as investment. Indeed, Kumar and Woo (2010) analyzed the impact of high debt on economic growth of a group of advanced and emerging countries over the period 1970-2007. The main results to which they led is that when the debt to GDP ratio increases by ten percentage points, the annual growth of real GDP per capita decreased by about 0.2 percentage point per year. As against, other key variables such as private and public guaranteed debt, short-term debt and total change of external debt are not statistically significant. Others factors not mentioned above may also influence economic growth. They may be economic (fiscal deficit, terms of trade, domestic credit ... etc.) And non-economic (population, good governance or risk countries... etc.). They have not been included in the modeling for reasons of data availability and / or technical problems.

### **3.4 Interaction between debt and investment**

The theoretical literature shows the existence of an interaction between external debt and investment. Indeed, Nautet and Van Meensel (2011) identify three main theoretical channels through which an increase in the public debt can negatively affect economic growth in the long term. The first channel among them is that of investment. The authors explain that an increase in public debt will decrease the volume of net savings at national level and therefore a higher interest rate. This leads to a fall in investment and a slowdown in the growth of capital stock. A small capital accumulation results in lower innovations and consequently a decline in labor productivity. Clements et al. (2003) show that debt service does not directly affect the rate of economic growth, but through the crowding out effect of debt service on public spending. Indeed, a reduction in debt service as a percentage of GDP of 3 % to 8.7 % increase in public investment from 0.7 % to 0.8 %, and therefore the economic growth rate of 0.1 % to 0.2 %. Considering the external debt as a burden on the economy, Idlemouden and Raffinot (2005) show that the payment service external debt tends to crowd out public spending leading to a decline in overall investment and its assets would affect the private incentives through increased tax burden economic agents. We will therefore examine the effect of debt on economic growth through investment. For this reason, we introduce an interaction term in the equation to estimate:

$$Y_{it} = \alpha Y_{i,t-1} + \beta X_{it} + I * DEBT + \varepsilon_{it} \text{ (For } i=1, \dots, N \text{ and } t=1, \dots, T)$$

With:

$X_{it}$ : is a vector of control variables already defined.

\*DEBT: interactive variable.

The results of estimating this equation are given in the table2. We can conclude from this table that the interactive variables  $GDPD * INV$  and  $DEXTRNB * INV$  are statistically significant. This means that the two variables measuring external debt (DEBT / GDP and DEBT / GNI) affect negatively the relationship between investment and economic growth. That is to say, the external debt to GDP has a negative effect on the relationship between investment and economic growth of the countries in our sample and this relationship is explained by the negative impact of external debt on investment. The same is valid for the other variable debt: foreign debt as a percentage of GNI. Countries in our sample are, in most cases, sub-Saharan Africa. These are directed outward debt to finance its consumption needs or to repay old debts. These results consolidate those already found by

several other studies on the effect of external debt on investment and hence economic growth. Indeed, Deshpande (1997) examined the investment experience of 13 countries, that their debts are considered the most great in the world, in the period 1971-1992. As a result of his research, he shows that the total amount of debt has an adverse effect on investment through two channels:

- A direct disincentive effect that comes from the fear of appropriation of funds (or investment returns) in order to pay the debt service

- An adjustment measures taken to address the problems of debt servicing, such indirect effect through the reduction of imports (reduction of capital goods imported) and decrease in public sector investment required to reduce deficits budget. Iyoha (1999) explained the impact of external debt on growth in African countries south of the Sahara from 1970 to 1994 using an econometric simulation model. He noted that the variables related to the external debt have an impact on investment, showing an accumulation of outstanding debt discourages investment through two effects: the discouragement and eviction. From a simulation of reduce debt policies in order to highlight the impact of this reduction on investment, he reached the following results:

- If the debt is reduced by 20%, the investment will grow by 18% over the study period.

- If the same reduction is applied, the GDP will grow by 1%.

**Table 2. Interaction between external debt and investment: Period 1990-2011**  
**Dependent variable: real GDP per capita growth rate**  
**(Arellano-Bond dynamic panel data estimator)**

Variables /estimation	(1)	(2)	(3)	(4)	(5)
<b>L GDP</b>	-0,0218935 (-0,27)	-0,016004 (-0,20)	-0,210300 (-0,57)	-0,019468 (-0,08)	-0,05817 (-0,60)
<b>INV</b>	0,0349631 (1,22)	0,1199154 (1,47)	-0,231432 (-0,60)	-0,005205 (-0,15)	-0,0354177 (-0,41)
<b>OPEN</b>	0,0349631 (1,22)	0,0383739 (1,32)	0,0300014 (1,26)	0,0044257 (0,12)	0,0276159 (0,95)
<b>INF</b>	-0,0000533 (-0,45)	-0,000042 (-0,35)	-0,0001297 (-2,43)	-0,000203 (0,56)	-0,0000586 (-0,55)
<b>DGDP*INV</b>	-0,1301562 (-5,54)	–	–	–	–
<b>DRNB*INV</b>	–	-0,128594 (-6,54)	–	–	–
<b>DPPG*INV</b>	–	–	$1,07e^{-11}$ (1,35)	–	–
<b>SHTD*INV</b>	–	–	–	0,5918885 (0,56)	–
<b>CHTEXD*INV</b>	–	–	–	–	$-1,54e^{-12}$
<b>T-Sargan</b>	9,096934	8,955005	8,099465	8,73865	6,880071
<b>AR(2)</b>	0,6685	0,6568	0,8877	0,7880	0,7386

He concluded that the results of his research have removed that the debt' reduce would stimulate investment and encourage the resumption of economic growth in South Sahara Africa.

#### 4. Conclusion

As part of this research, we have tried to contribute to the resolution of the basic question: Is there a link between the country's external debt and economic performance that it realizes? To do this, we use a dynamic panel data model on a sample of 19 developing countries during the period 1999-2011. The most important results that we have drawn from this empirical study is that external debt negatively affects economic growth of countries in our sample. Indeed, the ratio of external debt as a percentage of GDP and the debt ratio as a percentage of GNI have negative and statistically significant coefficients, which justify the negative effect exerted by the debt on economic performance countries, especially developing countries. With the aim to study the effect of external debt on the relationship

between investment and economic growth in these countries, we spent another econometric investigation to study the interaction between external debt and growth economic.

The main result of this second study is a negative interaction between external debt and investment in these countries. We conclude, without confirmation, that these analyzes allowed us, even in part, to show the existence of a relationship between external debt and economic performance of countries. It is important to note that, despite the importance of empirical evidence which leads this work, shortcomings could be raised: Other possible mechanisms of the relationship studied were not considered. Due to lack of data we did not use other variables measuring external debt. The problem of causality has not been processed. The relationship between external debt and economic growth could be better understood once its underlying mechanisms remain to be analyzed and the techniques used to quantify are improved. In light of the current debate concerning more generally the problem of external "over debt" especially for developing countries, these fields of investigation could be more analyzed in future works.

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