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FOREIGN DEBT AND DOMESTIC SAVINGS  
IN DEVELOPING COUNTRIES

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**Foreign Debt and Domestic Savings in Developing Countries**

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**Abstract**

This paper approaches the question of potential causality between foreign debt and domestic savings in the context of developing countries. Literature provides evidence in as far as foreign debt and development is concerned, but little attention was given so far to internal potential for capital formation. We provide a theoretical framework and test its relevance using 1975-2004 data for two groups of countries: sub-Saharan Africa and Latin America with the Caribbean. With the use of instrumental variables we find negative impact of foreign debt on domestic savings especially in the long run. The results are not susceptible to the choice of countries or outliers. However, the relationship between foreign debt and savings seems to depend on debt accumulation gaining significance only after passing a country specific threshold.

**Keywords:**

foreign debt, domestic savings, Latin America, Africa, MIU

**JEL:**

E21, E62, O11, O16, O42

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# 1 INTRODUCTION

Historically speaking, in about 1950's to 1970's, repeated deficits in the current account especially in developing countries were viewed as normal. Developing countries were basically advised by notable international financial organizations and some influential stakeholders to borrow from outside and create an enabling environment conducive for foreign investments. This was supposed to be a miraculous mixture for enhancing economic growth. However, little attention seems to be paid to the liability side of the current account deficit which increased the external indebtedness mainly in the sub-Saharan Africa (SSA) and Latin American and Caribbean (LAC). Up to 1980s and the default of servicing debt by Mexico this solution seemed to work perfectly. Today, we witness almost three decades during which developing countries were struggling with enormous foreign debt and developed ones implemented a number of (unsuccessful) debt relief programs. What are the internal economic consequences in developing countries?

Recent foreign debt literature on developing countries has focused more strongly on currency crises (frequently following the failure to service foreign debts) than on the question of likely interplay between foreign debt and domestic savings. This paper attempts to provide a theoretical link between foreign debt and domestic savings. Does the supply of foreign credit influence internal domestic behaviour? A positive answer to this question has far reaching consequences, actually affecting capital accumulation and thus growth in developing countries. Naturally, without internal ability of a country to accumulate savings, the long run perspectives of repayment seem feeble.

This study is delimited to Latin American and Caribbean (LAC) and sub-Saharan Africa (SSA). These two regions of the world comprise most of the countries classified as developing countries by World Bank, United Nations *etc.* Consequently, most of these countries are perceived as underdeveloped based on certain standards and indicators. However, the choice of these two regions also emanates from the fact that they form two very distinct groups with group-specific characteristics. As would be easily observed, LAC and SSA are quite distinct in terms of economic conditions, and location within the globe amongst others. At the same time, they are fairly homogenous within each of the two groups. Importantly, the two regions selected for the study had very different indebtedness paths. Upon regaining of independence in about 1820s for most LAC countries, they relied deeply on international capital flows to finance development projects. Foreign capital provided the opportunity for these countries to grow and protect themselves while at the same time creating likely huge debt burden on the blossoming economies. The experience of most LAC nations seems to be similar in relation to booms and bust cycles prior to and in the 1980's. After about 25 years of economic expansion that kicked off in about 1970's, LAC experienced serious credit crunch, debt crisis, and a prolonged economic recession. By contrast, the economic situation of SSA countries worsened greatly in the 1980's in terms of domestic factors like inflation, unemployment, rising fiscal deficits and capital flights and external factors such as declining primary commodity prices, unfavorable terms of trade, hike in global interest rates, dwindling capital flows etc. Amidst all these economic quagmires, the region accumulated huge foreign debt stock associated with heavy burden of debt service. Also, LAC mainly borrowed from private lenders like commercial banks while SSA countries were mainly indebted to international financial institutions for the periods under examination.

The purpose of this study has been to seek the link between foreign debt and domestic savings at least in the long run and other likely channels through which foreign debt may impact on domestic

savings. This paper is structured as follows. In the next section we briefly review relevant empirical literature. We then move to formulating a theoretical model allowing to directly link foreign debt to domestic savings decisions. We proceed to empirically test the relevance of this link. By the use of instrumental variables we demonstrate that not only this link is significant, but also seems to be causal.

## 2 LITERATURE REVIEW

The burden of debt service continues to increase for the Third World Countries despite numerous efforts at addressing the problem. The Baker and Bradley style initiatives in the forms of increase in lending or writing-down the debt and other initiatives from international financial institutions seems not to have addressed the problem. The increasing burden of debt service in some developing countries is one of factors that ignited our interest in attempting to ascertain the link between foreign debt and domestic savings. Froning and Schavey (2000) note that poor countries in the strict sense owe huge amount of overall debt and that most HIPC's were confronted with foreign debt that is more than twice their gross domestic products and debt servicing may end up consuming greater shares of government revenue and scarce foreign exchange. As this burden increases, these countries must allocate large portions of their budgets to servicing debt, which may result in higher taxes, more borrowings, and more likelihood of debt defaults.

At the same time Ndikumana and Boyce (2003) found that between 1970 and 1996 total capital flight from 30 sub-Saharan countries was in the neighbourhood of \$187bn (at 1996 value), which implies that for every dollar of foreign borrowing in the region, approximately 80 cents flowed out in the form of capital flight in the same year<sup>1</sup>. Had this money stayed in hosting countries, debt burdens would have been reduced considerably.

Many studies had been carried out on the effect of foreign debt on economic growth and in a number of cases on its effect on investment and to what extent does foreign savings replace domestic savings. However, there seems to be a gap in the literature of foreign debt as the issue of the impact of foreign debt on domestic savings has not been investigated on a cross-sectional level. A number of authors had cited mismanagement of borrowed funds and other flaws in the economic policies and programs in the developing countries as factors that account for ineffectiveness of capital inflows. Notable amongst these authors were Goldman and Olin (1987) who note that debt overhang exists in the Third World countries as a result of unproductive utilization of borrowed funds.

It seems that there is a tacit agreement of views amongst growth economists that savings constraints play a major role in pushing countries into huge foreign indebtedness. Tiruneh (2004) talking from the lens of debtors; the economic contention to borrow overseas is associated with the rising gap between national savings and domestic investment. Similarly, Root (1990), stress that the main growth and development hindrance of developing countries is the vicious circles of the saving – investment gap. The savings constraint signals the incapacity of third world countries to save adequate amount of resources to carry on with the desired level of investment that could lead to self-sustained growth. Foreign borrowing could be seemed from the lens of foreign savings which would then fill the gap generated by low domestic savings. At the same time, Aizenmann et al. (2007) remarks, that on

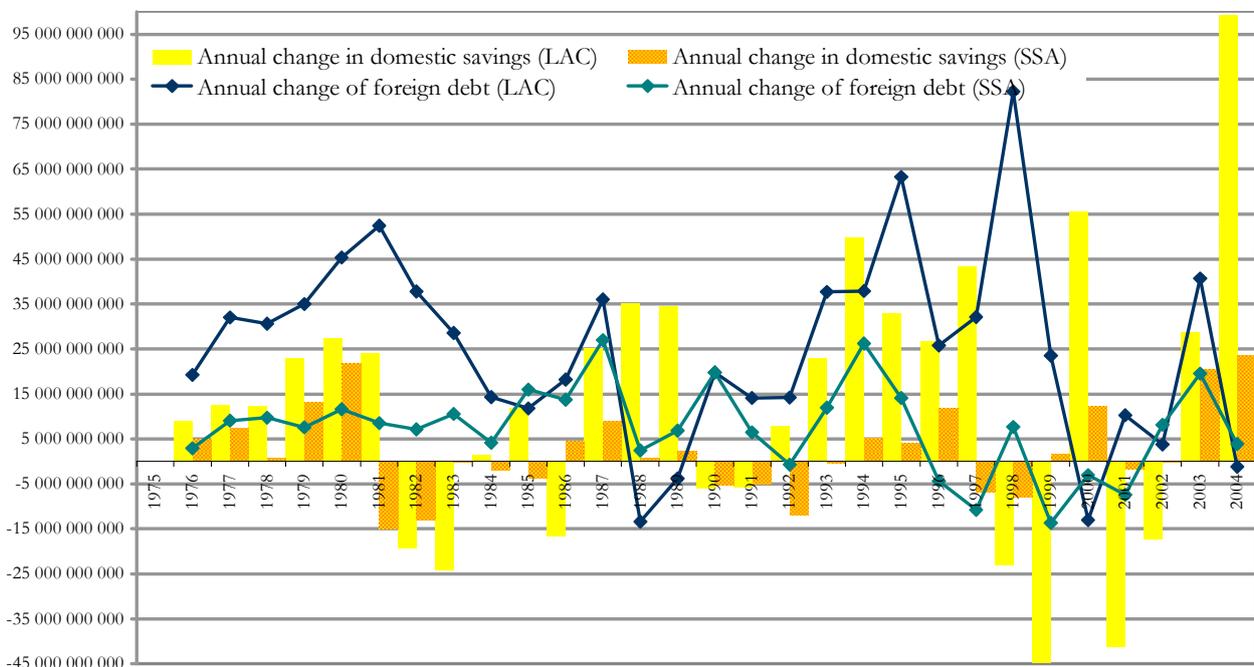
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<sup>1</sup> Similarly, Morgan Guaranty Trust estimates that, for the ten major Latin American debtors, capital flight totalled \$30.8 billion for the 1983-1985 periods.

average 90% of the capital stock in developing countries is self-financed and this fraction is fairly stable throughout 1990s. If this were true throughout the whole post-war period, foreign savings in the form of foreign debt may not have been contributing as anticipated in the long run accumulation of domestic investment in the developing countries. However, a foreign exchange constraint is also considered as one of the factors responsible for foreign indebtedness of some if not most of the developing countries. As stated by Easterly (1999), domestic saving is a necessary but not a sufficient condition for raising investment in developing countries to a desired level.

The emergency of debt crisis could be traced to the oil-price shocks of 1973-74 and 1979-80 and the concomitant recession of the world economy. Essentially, most of the indebted poor countries got indebted mainly during and after these periods (see Chart 1 below). This has been followed by major fall in the terms of trade of primary commodities to which Third World countries are particularly susceptible. Dymski (2002) even accuses international financial institutions in developed countries in the late 1970s and early 1980s for “pushing” credit on to less-developed countries because of their competition to get rid-of the accumulated petrodollars. On a similar line, Schwartz (1988) remarks the debt problem of 1980’s and 90’s differs from historical antecedents in at least two notes: first, international debt settlement involves not only the private creditors and debtors countries but also international agencies and creditors and creditor-country governments. Secondly, the creditors had been urged, if not coerced into lending and reluctantly did continued lending until it was obvious the troubled borrowing nations were incapable of servicing their debts. Ferraro and Rosser (1994) link the debt crisis of the 1980s to the irresponsible lending policies of the industrialized countries.

**Foreign debt and domestic savings in LAC and SSA**



**Chart 1.** Annual changes in foreign debt and domestic savings for SSA and LAC  
*Source:* own calculations based on WB WDI

A number of authors studied the impact of external debt on the domestic economies of the recipient countries though in most cases the scope was limited to examining the relationship between external debt and economic growth. Weisskopf (1972) recalled earlier attempts by Rahman (1967) and Griffin and Enos (1970) to apply statistical evidence to the question of the relationship between foreign capital inflow and domestic savings both of which supported the view that domestic savings was inversely associated with foreign savings.

Based on a 1962 cross-country data of 31 countries, Griffin and Enos (1970) as well as Rahman (1976) confirmed significant negative relationship between savings and foreign capital inflow with relation to the economy size. Weisskopf's work was an extension of these earlier studies as it not only related domestic savings to foreign capital inflow, but also recognized the potential influence of exports. However, these studies predominantly used data concerning developed countries and were rather shallow in exploiting dynamic context of these phenomena.

Hajivassiliou (1987), using data for 79 developing countries in the period 1970-82, and treating the demand for and the supply of loans separately, finds out that the demand for borrowing is positively determined by total debt service to export ratio, growth of GDP per capita, import to GDP ratio, interest and principal to export ratios and negatively by real GDP per capita (in contrast to both Eichengreen and Eaton (1986), who used GDP). Similar results were obtained by McFadden, et al (1983). Easterly (2002) on study of the determinants of indebtedness, whose empirical strategy was to regress an average of each policy indicator or macroeconomic imbalance (over the debt relief period, 1980-97) on the log of initial income, and a dummy for HIPC's for the whole sample of less-developed countries. The purpose was to find out the determinants of HIPC's indebtedness. His major conclusion is that HIPC's got indebted due to bad policies, on the one hand, and with the help of international financial institutions, on the other hand.

Borensztein (1990) suggests that debt overhang had an adverse effect on private investment in Philippines. Iyoha (1996) found similar results for SSA countries. He concluded that heavy debt burden acts to reduce investment through both the debt overhang and the 'crowding out' effect. However, Cohen's (1993) results point out the correlation between developing countries (LDCs) debt and investment in the 1980s and showed that the level of stock of debt does not appear to have much power to explain the slowdown of investment in developing countries during the 1980s. It is the actual flows of net transfers that matter. He found that the actual service of debt 'crowded out' investment.

Elbadawi et al. (1996) also confirmed a debt overhang effect on economic growth using cross section regression for 99 developing countries spanning SSA, Latin American, Asia and Middle East. They identified three direct channels in which indebtedness in SSA works against growth: current debt inflows as a ratio of GDP (which should stimulate growth), past debt accumulation (capturing debt overhang) and debt service ratio. The fourth indirect channel works through the impacts of the above channels on public sector expenditures. They found that debt accumulation deters growth while debt stock spurs growth. Using data for Cameroon, Mbanga and Sikod (2001) found that there exist a debt overhang and crowding-out effects on private and public investments respectively. Other studies that have found a negative effect of external debt on growth include Degefe (1992) and a number of studies use simulation analysis to show the impact of the debt burden indicators on economic growth under different scenarios (e.g. Ajayi 1991; Osei 1995 and Mbire and Atingi 1997).

However, most of the studies were focused on evaluating the impact of foreign debt on economic growth and by extension on investment and in most cases employed the use of capital inflows instead of looking at one of the elements of foreign inflows. Cunnigham (1993) investigated the link between debt burden and economic growth using 16 countries classified as heavily indebted countries during the periods 1971 to 1987. The findings showed that the growth of a country's debt burden had negative relationship with economic growth. The findings of Rockerbie (1994) suggested that the debt crisis of 1982 had major effects in relation to sudden reduction of domestic investment in the least developed countries<sup>2</sup>. Sawada (1994) inquired if heavily indebted countries burdened with foreign debt repayments stay solvent. A direct test of solvency situation was obtained from the inter-temporal

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<sup>2</sup> He employed OLS, nested and non-nested tests for each of the 13 countries selected for the study over the sample period of 1965 to 1990.

budget constraints to give lights on the sustainability of their policies<sup>3</sup>. His findings confirmed the presence of debt overhang in the highly indebted countries. Afxentiou and Serletis (1996) investigated impact of debt were investigated for four categories of developing countries namely 19 countries classified as indebted low income countries, 12 were classified as severely indebted middle income countries, 10 designated as moderately indebted low income countries and 14 treated as moderately indebted middle income countries<sup>4</sup>. The results showed that for the periods of 1970 to 1980 for the sampled countries, foreign debt does not affect economic growth negatively, but, in the 1980 to 1990, the relationship was negative

Unfortunately, all these studies are burdened with technical shortcomings. The study of Cunnigham (1993) study may not have captured all direct and indirect effects of debt burden on economic growth resulting from small number of countries employed for the study. Rockerbie (1994) may not capture the heterogeneities of different countries and major economic shocks in the world since he applied OLS which is generally believed to be biased with cross country regressions. Finally, the studies by Sawada (1994) as well as Afxentiou and Serletis (1996) may also have produced biased estimators, due to the estimation technique used.

A number of studies investigated the causality between foreign debt and economic growth. Amoateng and Amoako (1996) studied the relationship between foreign debt servicing, exports, and economic growth for the sample of 35 African countries. The countries used for the study were categorized into sub-groups of 31 South of Sahara countries, 24 low income African countries and 11 middle income countries. They found a positive causality between GDP growth rate and foreign debt services. Deshpande (1997) tried to delineate the debt overhang hypothesis by investigating the investment experience of 13 severely indebted countries<sup>5</sup>. He attempted to explain that debt overhang as opposed by normal debt obligations is the actual amount of paid debt service is determined by debtor countries and creditors. He stressed that an increase in production and exports are utilized for debt payment to creditors. As a result, this gives a disincentive to investors. He also argued that adjustment measures, which were adopted by severely indebted countries have an impact on countries burdened by debt, since, investment crisis translates into a growth crisis. The sample period was 1971 to 1991 and he found negative relationship between foreign debt and investment.

Fosu (1999) applied augmented production function to study the impact of foreign debt on economic growth in sub-Saharan Africa for sample period of 1980 to 1990<sup>6</sup>. The results showed that there is negative relationship between outstanding debts and economic growth. Karagol (2002) attempted to study the short run and long run relationship between economic growth and foreign debt service with reference to Turkey within the sample period of 1956 to 1996. He employed multivariate co-integration techniques and used a standard production function model. The results suggest that there exists a negative relationship between debt service and economic growth.

Pattillo and Ricci (2002) use multiple regression analysis to test whether debt and per capita growth are related. They controls for standard determinants of growth such as lagged income per capita, the investment rate, secondary schooling, population growth etc<sup>7</sup>. To ensure that their results are not driven by time-specific effects or

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<sup>3</sup> He used annual time series data for the sample period of 1955 to 1990 and estimated the co-integration regression with the application of OLS approach.

<sup>4</sup> Dataset comprised 55 developing countries with the use of OLS (sample period 1970 to 1990). The period was divided into two sub-periods (1970 to 1980 for the era of debt overhang and 1980 to 1990).

<sup>5</sup> The countries selected for the study, Algeria, Argentina, Ivory Coast, Egypt, Honduras, Kenya, Mexico, Morocco, Peru, Philippines, Sierra Leone, Venezuela and Zambia.

<sup>6</sup> He applied OLS to investigate the effect of debt overhang hypothesis.

<sup>7</sup> The analysis used 3-year average panel data for 93 developing countries over the period 1969 to 1998. They also use 10-year averages to check the robustness of their findings to cyclical effects. In addition, they also applied four estimation approaches to test for robustness namely ordinary least squares; instrumental variables using lagged values as instruments to correct for potential endogeneity of debt, investment, schooling, openness, and fiscal balance; fixed effects to control for unobserved country-specific factors, such as institutional quality and history; and system-GMM (generalized method of moments) to correct for endogeneity and for the bias introduced by the lagged income variable in the presence of fixed effects.

the presence of outliers, they estimated most regressions with and without time dummies, as well as with the full sample and with a reduced sample from which outliers are eliminated. They found that debt does seem to have an inverted-U shape relationship with growth.

**Table 1.** Summary of empirical findings

Author/s	Year	Data/Observations	Method	Findings
Rahman	1967	Cross-country data of 31 least developed countries	OLS	Domestic savings was inversely related to foreign savings
Griffin and Enos	1970	Cross-country data of 1962-64 from 32 developing countries	OLS	Domestic savings was inversely related to foreign savings
Weisskopf	1972	Cross country of 44 least developed countries over 1953-1966 time span	OLS	Negative impact of foreign capital inflow on ex ante domestic savings
Eichengreen and Portes	1986	Annual cross-section from 1930-38 for 16 to 23 countries	OLS	Degree of openness and GDP per capital are positively correlated with government external debt
Hajivassiliou	1987	79 developing countries in the period 1970-1982	OLS	Demand for borrowing is positively related to total debt service, export ratio, growth of GDP per capita, and negatively by real GDP <i>per capita</i>
Cuningham	1993	1971-1979, 1980-1987 using 16 heavily indebted countries	Pooled and panel OLS	A negative relationship between economic growth and debt burden specifically for the period of 1971 to 1979
Rockerbie	1994	1965 to 1990, 13 least developed countries	OLS	Debt service had a negative relation with economic growth
Sawada	1994	1955-1990, HIPC's	OLS	Debt overhang confirmed
Afxentiou and Serletis	1996	1970 to 1990, 55 developing countries	OLS	For the periods of 1970 to 1980, foreign debt does not affect economic growth negatively, but, in the 1980 to 1990, the relationship was negative and for the periods of 1970 to 1990, curtailed influence of debt overhang noticed
Amoateng and Amorko	1996	1971 to 1982 and 1983 to 1990 periods, 35 less developed countries	Granger causality	Positive causality between GDP growth rate and foreign debt services
Deshpande	1997	1971 to 1991, 13 severely indebted countries	Panel OLS	Negative relationship between foreign debt and investment
Fosu	1999	1980 to 1990, for 35 Sub-Saharan countries	OLS	Negative relationship between outstanding debts and economic growth
Karakol	2002	1965 to 200, Turkey	Granger causality, VAR	Negative relationship between debt service and economic growth
Pattillo and Ricci	2002	93 developing countries over the period of 1969 to 1998	Multiple regression approach	Debt service does seem to have an inverted U-shape.

*Source:* Own compilation

Present study differs from the above cited in that we inquire the link between domestic savings and foreign debt. They seem to have supported the theory of debt overhang. Foreign debt and its direct linkage with economic indicators such as growth, investment, and of late savings have become one of the most active research areas over a number of decade *vis-à-vis* developing countries. Narwan and Baharumshah (2005) carried out an investigation on the casual relationship between foreign inflows and domestic savings in Malaysia between 1965 and 2000 with the application of co-integration and VECM methodology. Results of the study indicated that short term capital movements have a negative impact on domestic savings in the long run<sup>8</sup>.

<sup>8</sup> The authors recommended that it would be interesting to see more investigations and discussions regarding the linkage between capital flows and financial crises taken into account that their study was

Economic theory posits that reasonable levels of borrowings by developing country are expected to facilitate economic growth. Countries at starting stages of growth and development are confronted with liquidity constraints, but, are expected to have investment opportunities with rates of return that are greater than what obtained in the developed countries. On the assumptions that they employ borrowed funds for productive investments, do not pursue policies that distort economic incentives, do not suffer from major external shocks etc growth should increase and debt service would not pose problems. By implication this also suggests that reasonable levels of borrowings by developing country are expected to augment domestic savings.

In view of high stock of debt level in developing countries despite series of efforts at curtailing it as pointed above, the likely cases of debt overhang, the likely presence of huge debt service, the cases of capital flights, bank failures, poverty, and high level of illiteracy prevalent in some developing countries and the above quoted authors and studies in the past, we are inclined to formulate a theoretical model in the next chapter to demonstrate that foreign debt may have a negative impact on domestic savings at least in the long run. The theoretical predictions of the model would be tested empirically using data from LAC and SSA.

### 3 THEORETICAL MODEL

In most cases, developing countries confront obstacles emanating from liquidity constraints, foreign exchange constraints, external shocks etc. In line with this thinking, Chenery and Strout (1966) posited double deficit model which stressed on two constraints: inadequate domestic savings and then inadequate foreign currency. Toussaint (2006) quoting Oman and Wignarja summarises Chenery - Strout model as follows: “[...] the double deficit model hypothesises that while in the very first stages of industrial growth insufficient savings can constitute the main constraint on the rate of formation of domestic capital, once industrialisation is up and running, the main constraint may no longer be domestic savings per se, but rather the availability of currency required to import equipment, intermediary goods and perhaps even the raw materials used as industrial input. The currency deficit can thus exceed the savings deficit as the main constraint on development. To dissolve this double deficit, Chenery and Strout propose a panacea: borrow foreign currency and/or procure it by increasing exports [...]”.

Toussaint (2006) also quotes Griffin and Enos, who posited that turning to external inflows would further limit domestic savings: “yet as long as the cost of aid (e.g. the rate of interest on foreign loans) is less than the incremental output-capital ratio, it will be beneficial for a country to borrow as much as possible and supplement external for domestic savings”. In other words, given a target rate of growth in the developing country, foreign aid will permit higher consumption, and domestic savings will simply be a residual, that is, the difference between desired investment and the amount of foreign aid available.

Here, we consider a continuous two period endowment economy with capital. This approach to modelling foreign debt followed the framework of money-in-the-utility-function (MIU) as postulated by Sidrauski (1967) and refined in (Walsh, 2003). Essentially, we assume that it is the government that decides on foreign borrowings, unlike the MIU models, where households determine their choices on

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based on Malaysian economy which is one of the economies that have witnessed small capital account control.

how much money they want to hold, here the decision goes in two stages: first government decides about foreign borrowings and then households adjust their saving behaviours.

We assume that private domestic residents and foreign domestic residents cannot borrow or lend abroad. Taking a representative country, the model is a two stage game between the government borrowing efforts and representative household's adjustment of saving efforts. In the framework below, we also assume that government and the household jointly derive utility from consumption ( $C_t$ ) and flow of services financed with foreign borrowings ( $E_t$ ). The demand for infrastructural services is always positive.

On a related development, assuming that government can only issue foreign debt ( $E_t$ ) in per capita terms taking into accounts the saving behaviours of households. Representative household earns nominal interest ( $i$ ) on savings and adjust saving efforts in accordance with burden of taxes on their earnings. To capture the political consequences that foreign governments may choose to impose on the home government upon default, we assume that foreign debt ( $E_t$ ) is borrowed from foreign independent governments. Government borrows mainly to finance infrastructure amenities and other governmental needs. Over time, government repays the principal and interests on the loans via the channel of uniform tax rate across all citizens.

Nevertheless, without explicitly introducing taxation into the model, we assume that the burden of debt service is passed to the citizens *via* taxation and that directly or indirectly saving behaviours of households are affected. Therefore, in the first stage, the government engages in foreign borrowings to finance infrastructural amenities and in the second stage, the representative household taken into account the borrowing decisions of government and the likely implications of taxation arising from it, decides on efforts. Amidst, high debt service, households tend to save less and vice versa since increasing burden of taxation translates into lower income for households somehow, all things be equal.

Finally, based on the initial wealth, level of foreign borrowings at time  $t-1$ , capital stock at time  $t-1$  and savings at time  $t-1$  have to be equal to consumption at time  $t$ , capital stock at time  $t$ , foreign borrowings at time  $t$ , debt servicing at time  $t$  and savings at time  $t$ . Therefore, we jointly maximize the utility of the government and the representative household to obtain the equilibrium level of domestic savings conditional on the assumptions of the model.

### 3.1 FORMALIZATION

We follow the basic neoclassical approach and the structure of MIU framework to model how agents derive utility directly from consumption of goods and indirectly through flow of services yielded through infrastructure projects that were financed by foreign borrowings. Given suitable restrictions on the utility function, such an approach can guarantee that, in the long run that the rational economic agents would be in Nash equilibrium.

To develop the model of Foreign Debt-Domestic Savings (henceforth FDDS), we would ignore uncertainty, any labour-leisure choice, paying attention to the implications of the model to domestic savings, foreign debt, capital stock, and consumption. In the framework of the model, first the government decides about foreign borrowings and then households adjust. For sake of simplicity, as noted earlier, we assume rational expectations on the side of the government and the households. This implies that they should be in Nash, because it is not optimal for households to have wrong expectations

about government decisions and it is not rational for government to have wrong expectations about household decisions.

Suppose that the utility function of the government (that acts as a social planner) that take into account rational expectations of economic agents take the form:

$$U(C_t, E_t)$$

where  $E_t$  is the flow of services yielded through infrastructure projects that were financed by foreign borrowings and  $C_t$  yields utility directly. Utility is assumed to be increasing in both arguments, strictly concave and continuously differentiable. The demand for infrastructure services is always positive if we assume that  $\lim_{E \rightarrow 0} U_E(C, E) = \infty$  for all  $C$  where  $U_E = \partial u(C, E) / \partial E$ .

The government taking into consideration the expected rational responses of the households is viewed as choosing time paths for foreign borrowings and the representative household also choosing time paths for consumption subject to budget constraints to be specified below, with total utility given by

$$W = \sum_{t=0}^{\infty} \beta^t U(C_t, E_t), \quad 1.1$$

where  $0 < \beta < 1$  is a subjective rate of discount.

Equation (1.1) implies notions of the utility provided by infrastructure services financed by foreign borrowings and utility derived from consumption of goods and services. If the marginal utility from infrastructure service is positive, then, (1.1) implies that, holding constant the path of real consumption for all  $t$ , the individual's utility is increased by an increase in the flow of infrastructure services funded through foreign borrowings.

To complete the specification of the model, we assume that rational economic agents in this case, the representative household can earn a nominal interest rate  $i_t$  on savings. Physical capital produces output according to standard neoclassical production function. Given its current income and its assets and the decisions of government on foreign borrowings, the representative household allocates its resources between consumption, gross investment in physical capital, and gross domestic savings.

If the rate of depreciation of physical capital is  $\delta$ , the aggregate economy-wide budget constraint takes the form:

$$Y_t + E_{t-1}(1 + i_t) + (1 - \delta)K_{t-1} + S_{t-1}(1 + i_t) = C_t + K_t + E_t + T_t + S_t, \quad 1.2$$

$$Y_t = \text{Output } (K_{t-1}^\alpha L_t^{1-\alpha})$$

$$E_{t-1} = \text{Debt at time } t-1 \quad \text{and} \quad T_t = \text{Debt servicing at time } t$$

$$K_{t-1} = \text{Capital Stock at } t-1$$

$$S_{t-1} = \text{Savings at } t-1$$

The timing implicit in this specification of the model assumes that it is the representative household access to infrastructure services provided with foreign borrowings at the end of the period, after having purchased consumption goods, that yield utility.

The aggregate production function relates output  $Y_t$  ( $K_{t-1}^\alpha L_t^{1-\alpha}$ ) to the available capital stock  $K_{t-1}$ :  $Y_t = F(K_{t-1}, L_t)$ . Assuming that this production function is linear, homogeneous with constant returns to scale, output per capital at time  $t$  will be a function of the per-capital stock:  $y_t = f\left(\frac{k_{t-1}}{1+\ell}\right)$

where  $L_t$  has been normalized to  $(1+\ell)L_{t-1}$  where  $\ell$  is the population growth rate. There is also an assumption that output is produced in period  $t$  using capital carried over from period  $t-1$ . The production function is assumed to be continuously differentiable and to satisfy the usual Inada conditions ( $f_k \geq 0, f_{kk} \leq 0, \lim_{k \rightarrow 0} f_k(k) = \infty, \lim_{k \rightarrow \infty} f_k(k) = 0$ )

Dividing both sides of the budget constraint by population  $L_t$ , the per capital version becomes:

$$\frac{Y_t}{L_t} + \frac{E_{t-1}(1+i_t)}{(1+\ell)\ell_{t-1}} + \frac{(1-\delta)K_{t-1}}{(1+\ell)\ell_{t-1}} + \frac{S_{t-1}(1+i)}{(1+\ell)\ell_{t-1}} = \frac{C_t}{L_t} + \frac{K_t}{L_t} + \frac{E_t}{L_t} + \frac{T_t}{L_t} + \frac{S_t}{L_t} \quad 1.3a$$

$$\omega_t \equiv y_t + e_{t-1} \frac{(1+i_t)}{(1+\ell)} + k_{t-1} \frac{(1-\delta)}{(1+\ell)} + s_{t-1} \frac{(1+i_{t-1})}{(1+\ell)} = c_t + k_t + e_t + \tau_t + s_t \quad 1.3b$$

Equation (1.3a) represents a standard identity, transformed to account for *per capita* terms. Naturally, in each agent owns certain initial stock of assets (the origins of  $K_t$  at time zero). In our setting, consumption cannot exceed the earnings and inflows (foreign or home). The government problem taking into account the rational expectations of representative household is to choose paths for  $e_t$  and  $\tau_t$ . The representative household decides on  $c_t, k_t, s_t$  taking into account the decisions of government. Jointly they they maximize (1.1) subject to (1.3b). This problem relates to dynamic optimization, and it is suitable to formulate the problem in terms of the value function. The value function gives the maximized value of utility the government and the representative household can achieve by behaving optimally, given its current state. The state variable for the problem is the agent's initial resources  $\omega_t$ . The value function, defined as the present discounted value of utility if the agents optimally choose consumption, capital holdings, savings, foreign borrowings is given by:

$$V(\omega_t) = \max\{u(c_t, e_t) + \beta V(\omega_{t+1})\} \quad 1.4$$

where the maximization is subject to the budget constraint (1.3b) and

$$\omega_{t+1} = y_{t+1} + e_t \frac{(1+i_{t+1})}{(1+\ell)} + k_t \frac{(1-\delta)}{(1+\ell)} + s_t \frac{(1+i_{t+1})}{(1+\ell)}; y_{t+1} = f\left(\frac{k_t}{1+\ell}\right).$$

Consequently,

$$V(\omega_t) = \max\left\{u(c_t, e_t) + \beta V\left\{\left(\frac{k_t}{1+\ell} + e_t \frac{(1+i_{t+1})}{(1+\ell)} + k_t \frac{(1-\delta)}{(1+\ell)} + s_t \frac{(1+i_{t+1})}{(1+\ell)}\right)\right\}\right\}$$

Using (1.3b) to express  $k_t = \omega_t - c_t - e_t - \tau_t - s_t$  and substitute into (1.4) to make the maximization unconstrained on  $c_t, e_t, \tau_t, s_t$

$$V(\omega_t) = \max \left\{ u(c_t, e_t) + \beta V \left\{ \frac{f(\omega_t - c_t - e_t - \tau_t - s_t)}{(1+\ell)} + e_t \frac{(1+i_{t+1})}{(1+\ell)} + \frac{(1-\delta)}{(1+\ell)} (\omega_t - c_t - e_t - \tau_t - s_t) + s_t \frac{(1+i_{t+1})}{(1+\ell)} \right\} \right\}$$

The first order necessary conditions for this problem are:

$$c_t : u_c(c_t, e_t) - \frac{\beta}{1+\ell} V_\omega(\omega_{t+1}) [f_k(k_t) + 1 - \delta] = 0 \quad 1.5$$

$$e_t : u_e(c_t, e_t) - \frac{\beta}{1+\ell} V_\omega(\omega_{t+1}) [f_k(k_t) - (1+i_{t+1}) + 1 - \delta] = 0 \quad 1.6$$

$$s_t : -\frac{\beta}{1+\ell} V_\omega(\omega_{t+1}) [f_k(k_t) + 1 - \delta - (1+i_{t+1})] = 0 \quad 1.7$$

together with the transversality conditions

$$\lim_{t \rightarrow \infty} \beta^t \lambda_t x_t = 0, x = k, e \quad 1.8$$

where  $\lambda_t$  is the marginal utility of period  $t$  consumption.

The envelope theorem implies

$$\lambda_t = \frac{\beta}{1+\ell} V_\omega(\omega_{t+1}) [f_k(k_t) + (1-\delta)] = V(\omega_t) \quad 1.9$$

that is:

$$\frac{u_c(c_t, e_t)}{u_e(c_t, e_t)} = \frac{f_k(k_t) + 1}{\left[ f_k(k_t) - \frac{(1+i_{t+1})}{(1+\ell)} + 1 \right]}$$

The first order conditions have clear-cut interpretations. Since resources  $w_t$  must be divided between consumption, foreign borrowings, and savings each must yield same marginal utility at an optimum allocation. Using equations (1.5), (1.6), (1.7) and (1.9) can be written as

$$u_e(c_t, e_t) + \beta u_c \frac{(c_{t+1}, e_{t+1})}{1+\ell} = u_c(c_t, e_t) \quad 1.10$$

which states that the marginal benefit of additional foreign borrowings at time  $t$  must equal the marginal utility of consumption at time  $t$ . Similarly, equation (1.5) for capital holdings implies that net marginal return from additional capital holdings must equal the marginal utility from consumption. Equation (1.6) for foreign debt implies that the net marginal benefit of capital holdings augmented by benefits enjoyed from services rendered with foreign borrowings must equal the net marginal benefit of foreign borrowings. Equation (1.7) for savings implies that net marginal return from capital holdings augmented by interest earned *via* domestic savings must equal the net marginal benefits from domestic savings.

Equations (1.5) to (1.7), together with the budget constraints (1.3), characterize the government decisions for foreign borrowings and representative household adjustment of domestic savings behaviours at each point in time. Equilibrium also requires that the demand for infrastructure services

provided with foreign borrowings equals the supply of foreign borrowings by the government (assumed to be exogenous).

### 3.2 STEADY-STATE EQUILIBRIUM

Here, we consider the properties of this economy when it is in steady-state equilibrium with population growing at the rate  $\ell$ . Let the superscript SS denote values evaluated at the steady state. The steady-state values of consumption and savings must satisfy the first order necessary conditions for the government and the representative household decision problem and the economy-wide budget constraints, and the specification of the exogenous rate of foreign borrowings and debt services. These conditions can be written as

$$\text{In SS } V_{\omega}(\omega_t) = V_{\omega}(\omega_{t+1}) = V_{\omega}(W^{ss}) \quad 1.11$$

$$\Rightarrow 1 = \frac{\beta}{1+\ell} [f_k(k^{ss}) + (1-\delta)] \quad 1.12$$

$$\frac{1+\ell}{\beta} - 1 + \delta = f_k(k^{ss}) \quad 1.13$$

$$\frac{1+\ell}{\beta} - 1 + \delta = \alpha k^{ss\alpha-1} \quad 1.14$$

This equation defines the steady-state capital-labor ratio  $k^{ss}$ . If the production function is Cobb-Douglas, say  $f(k) = k^{\alpha}$ , then  $f_k(k) = \alpha k^{\alpha-1}$  and we have

$$k^{ss} = \left( \frac{\alpha\beta}{1+\ell - \beta + \beta\delta} \right)^{1/1-\alpha} \quad 1.15$$

The steady state of capital ( $k^{ss}$ ) depends on the production function, the depreciation rate, population, and the subjective discount rate. The steady state level of consumption per capital is determined by the known level of steady state capital. If we assume that  $f(k) = k^{\alpha}$ ,  $k^{ss}$  is given by (1.15)

$$c_t : u_c(c^{ss}, e^{ss}) - \frac{\beta}{1+\ell} [f_k(k^{ss}) + 1 - \delta] V_{\omega}(\omega^{ss}) = 0 \quad 1.16$$

The steady state consumption per capital depends on the parameters of the production function, the rate of depreciation, the subjective rate of time discount and population

$$e_t : u_e(c^{ss}, e^{ss}) - \frac{\beta}{1+\ell} [f_k(k^{ss}) - (1+i^{ss}) + 1 - \delta] V_{\omega}(\omega^{ss}) = 0 \quad 1.17$$

Similarly, the steady state level of foreign borrowings per capital depends on the parameters of production function, subjective rate of discount, depreciation, interest earned on borrowed funds and population.

$$s_t : -\frac{\beta}{1+\ell} [f_k(k^{ss}) + 1 - \delta - 1 + i^{ss}] V_{\omega}(\omega^{ss}) = 0 \quad 1.18$$

On a related ground, the steady state level of savings per capital depends on the parameters of production function, subjective rate of discount, depreciation, interest on savings and population

$$\tau_t : -\frac{\beta}{1+\ell} [f_k(k^{ss}) + 1 - \delta] = 0 \quad 1.19$$

and the debt service per capital depends on parameters of the production function, subjective rate of discount, depreciation and population.

$$BC : \omega^{ss} = f(k^{ss}) + e^{ss} \frac{(1+i^{ss})}{1+\ell} + k^{ss} \frac{(1-\delta)}{1+\ell} + s^{ss} \frac{(1+i^{ss})}{1+\ell} = c^{ss} + k^{ss} + e^{ss} + \tau^{ss} + s^{ss} \quad 1.21$$

Since, we are particularly interested on savings behavior of representative households amidst foreign borrowings decisions by government; we solve for the steady state gross domestic savings given below as:

$$s^{ss} \left(1 - \frac{1+i^{ss}}{1+\ell}\right) = f(k^{ss}) + e^{ss} \frac{(1+i^{ss})}{1+\ell} + k^{ss} \frac{(1-\delta)}{1+\ell} - c^{ss} - k^{ss} - e^{ss} - \tau^{ss} \quad 1.22$$

$$s^{ss} \left(\frac{1+i^{ss}}{1+\ell}\right) = f(k^{ss}) - k^{ss} \frac{(\delta+\ell)}{1+\ell} - c^{ss} + \frac{i^{ss}-\ell}{1+\ell} e^{ss} - \tau^{ss} \quad 1.23$$

$$s^{ss} = \left(\frac{1+\ell}{\ell-i^{ss}}\right) f(k^{ss}) - (1+\delta+2\ell)k^{ss} - \frac{(1+\ell)}{(\ell-i^{ss})} c^{ss} - e^{ss} - \frac{(1+\ell)}{(\ell-i^{ss})} \tau^{ss} \quad 1.24$$

Equation (1.24) defines the steady-state values of savings, which are linked positively to output and negatively to consumption, foreign borrowings and debt services at least in the long run.

### 3.3 APPLICABILITY AND LIMITATIONS OF THIS FRAMEWORK

The model is devised to capture the economic happenings of developing countries employing some simplifying assumptions. Here, the issue of failed states may easily come into mind following the incapacity of some national governments in the Third World to provide for basic needs of the citizens. Khor (2002) notes that: “[...] many, if not most, developing countries, can be categorized as having failed to generate growth or development of the type or rate to satisfy the basic food, employment, housing and education needs of the majority of people. True, a large part of the blame must be placed on the political, commercial and intellectual elites of these countries. But the failure can also be attributed to factors largely beyond the countries’ control, such as falling commodity export prices, the debt burden and inadequate aid and technology transfer [...]”.

*De facto*, for the sake of simplicity this model implicitly assumes that the government is benevolent. In this sense, government engages in foreign borrowings in view of some of the reasons already put forward in the literature such as liquidity constraints, foreign exchange constraints, infrastructure needs etc. This implies that government basically tries to maximize her utility from foreign borrowings taken into account available wealth in the country such as endowments, capital stock, investment potentials etc. Indeed, this is a general equilibrium type of model, which may be considered inappropriate in the case of some developing countries – failed states in particular. However, there is little experience on theoretical modeling of the out-of-equilibrium situations. Even the transition or adjustment paths approaches assume that the evolution occurs along the steady-state

relationships of the main variables. Therefore, even if there are grounds to consider this type of modeling distant from the actual situations, technical issues make it the only possible approach.

Secondly, this model implicitly assumes there is a kind of game between the government and the citizens (the households). In line with the available resources and needs such as consumption, tax payments; etc. “typical household” decides how much to save based on decisions about foreign borrowings by government to maximize their utility. This “game-like” approach evokes two important elements. Firstly, in countries with low level of education and little transparency of the government’s decision (as frequently is the case in some developing parts of the world) information necessary to make these decisions would not be available to the households. Their understanding of the consequences of government’s decisions bring may indeed be limited. On the other hand, empirical research should account for endogeneity, since in this model it is a theoretical mechanism of the bi-directional relationship and not only a statistical artifact (property of the data).

Nevertheless, the assumption of rational expectations may be too strong for developing countries, because the adjustments may occur not immediately but as a result of a continuous process. The channels through which the burden of foreign borrowings affect household behavior (including hikes in tax payments, gradual decline in infrastructural amenities, declining prices of primary commodities, higher inflation etc.) are the same as in the case of other gradual adjustments that happen in the economy. As a result, to some extent, households would adjust their behaviours directly or indirectly as government engages – among others – in foreign borrowings.

This model may actually turn out to be applying equilibrium approach to the out-of-equilibrium situations but that seems to be the best we could get at since we do not know the transition paths to equilibrium. The model may also be limited by incidences of national conflicts, some level of irrationality, manifestations of some aspects of failed state etc, but, overall, the model tries to capture the channel through which foreign borrowing decisions of government may influence the adjustment of savings by households.

Therefore, this model would be well suited for testing the impact of foreign borrowings on the domestic savings in developing countries. Panel data analysis would be employed in the test, since, as already pointed out in the literature, the use of econometric approach based on panel regression for cross section of developing countries would assist to control for heterogeneity of different countries and different influences of variegated shocks that developing countries selected for the study may have faced.

## **4 EMPIRICAL MODEL**

The basic prediction of the theoretical model derived in the previous section can be summarised as follows: debt should be inversely related to domestic savings because households adapt to the government choice of foreign debt taking when deciding about their consumption spending, consequently savings too. In this section, we apply the methodology based on panel regression approach to investigate the relationship between gross domestic savings and foreign debt. Basically, the dependent variable throughout the regressions will be the savings rate (domestic savings as a percentage of GDP). The independent variables include: foreign debt as a percentage of GDP, net foreign debt inflows outstanding as percentage of GDP, Imports as a percentage of GDP, real interest

rate, total debt service, multilateral debt as percentage of GDP, GDP *per capita*, foreign direct investment as percentage of GDP, sub-Saharan Africa (SSA) dummy and fixed capital formation.

The theoretical model essentially implies that foreign debt and domestic savings are interlinked, which translates in econometric terms into endogeneity (by assumption and not by data properties). Therefore, the findings of panel GLS, let alone pooled OLS cannot provide reliable estimators. To this end we have employed instrumental variables approach (IV) to the panel analysis. Seeking potential instruments to foreign debt we have performed a number of tests and – based on both theoretical underpinnings and statistical properties of the data – we chose to use lagged net foreign debt as a share of GDP to instrument for foreign debt. As we demonstrate, results are essentially unaffected across specifications, which implies that potential endogeneity consequences may indeed be of relatively small magnitude.

In the first stage we take annual data. To avoid the noise associated with natural economy cyclicity, we also analyzed five-year averages. To account for long-term equilibrium, we considered thirty-year averages. Finally, some of the variables were regressed as logs so as to derive elasticity interpretations of the findings.

The panel data approach is important when analyzing issues pertaining to indebtedness. Hajivassiliou (1987) notes except the traditional advantage of the panel data approach, developing countries seem to differ from each other due to colonial histories, political and financial institutions and degree of creditworthiness. The problem of heterogeneity might be reduced by allowing country-specific factors. The time-specific dummy may help to control for swings in international economic policies and debt relief initiatives over time.

The data come from the World Bank (World Development Indicators for economic data, 2007). A number of variables were transformed from current prices to 2000 US\$ constant prices. The variables involved includes: foreign debt, total debt service and gross domestic savings. The period covered was 1975 to 2004. The Tables A1 and A2 in the appendix section report summary statistics and description of the variables used.

## 4.1 RESULTS AND ANALYSIS

Turning attention to the results of the regressions in Table 4.1, they indicate that foreign debt has negative impact on domestic savings at least in the long run. This is consistent with the results obtained from the panel regressions. This finding corroborates the results obtained by Pattillo and Ricci (2002), who find an inverted-U shape relationship with growth, which implies that foreign borrowings augment domestic savings at the onset, but, over time with increase in burden of debt service, higher global interest rates, and other macroeconomic failures like bank failures, huge domestic debt and negative external shocks, the impact of foreign debt on domestic savings may turn negative. Our findings also corroborate the conclusions of the Elbadawi et al. (1996), who find that in the presence of debt overhang in developing countries citizens in these countries may have lower savings ratio compared to their counterparts in the developed countries.

Our results also support the predictions of the model formulated based on the game between the government that engages in foreign borrowings and the representative household that adjusts behaviour in line with prevailing economic situations induced by foreign borrowing decisions. This

suggests that representative household tends to lower domestic savings efforts in the face of huge foreign borrowings by the government.

There are number of channels through which domestic savings could be affected and these effects may be strong or weak in view of prevailing level of accumulated foreign debt and debt service obligations. As reported in Table 4.1, in all the specifications, imports and real interest rate have negative impacts on domestic savings while gross domestic product in *per capita* terms has positive impact on domestic savings. These findings are not far from intuitions and economic theory. As the import penetration of a country increases in the face of weak foreign currency and convertibility problems, one would essentially expect likely decline of domestic savings efforts as people spend more of their earned resources buying goods and services from the outside. On the other hand, economic theory posits that when the real rate of interest is low, demand will shift from domestic saving efforts to investment and consumption. The negative relationship between domestic savings and real interest rate therefore suggests that the real rate of interest is low in LAC and SSA in the period covered in this study.

**Table 4.1.** Results of the empirical analysis

Variables	OLS	Panel analysis		Panel GLS	Panel IV analysis (2SLS)	
		Fixed effects	Random effects		Fixed effects	Random Effects
Foreign debt as % of GDP	-0.004 (-2.63)	-0.007* (-1.76)	-0.007* (-1.92)	-0.007** (-2.20)		
Lagged net foreign debt as percentage of GDP (instrument)					-0.02** (-2.33)	-0.02** (-2.43)
Imports as % of GDP	-0.14*** (-9.58)	-0.09 *** (-4.04)	-0.09 *** (-4.51)	-0.10 *** (-11.19)	-0.14*** (-5.79)	-0.14*** (-6.14)
Real interest rate	-0.04*** (-3.44)	-0.03*** (-4.17)	-0.03*** (-4.24)	-0.03*** (-4.95)	-0.03*** (-3.87)	-0.029*** (-3.89)
GDP <i>per capita</i>	0.004*** (19.19)	0.004 *** (7.77)	0.004 *** (8.85)	0.003*** (25.01)	0.003*** (0.81)	0.003*** (8.14)
FDI as % of GDP					0.01*** (6.01)	0.013*** (6.59)
SSA (dummy)			0.51 (0.19)	-1.01** (-2.49)		0.72 (0.39)
Constant	12.43*** (15.37)	10.84 *** (8.49)	10.30*** (4.09)	12.3*** (22.50)	13.4*** (9.44)	12.50*** (6.50)
N	1368	1368	1368	1368	1096	1096
R <sup>2</sup>	0.27					
R <sup>2</sup> within		0.072	0.07		0.12	0.11
R <sup>2</sup> between		0.32	0.32		0.30	0.30
Wald statistic (p-value)	0.00	0.00	0.00	0.00	0.00	0.00

Note:

\*\*\*, \*\* and \* indicate levels of significance at 1%, 5% and 10% respectively. In the brackets t-statistics reported.

Hausman test confirmed no systematic difference between fixed and random effects estimators (both in the case of GLS and in the case of 2SLS estimations). Therefore, random effects specification is preferred for its higher efficiency.

Thus, we may conclude that foreign debt on average has contemporaneous impact on domestic savings *via* the channel acting as complementary source of capital for investment. However – as many cases demonstrate - borrowed funds are rarely spent productively, this increases over time the likelihood of debt defaults and unsustainable high debt service payments. These elements contribute to inflating the interest rates; encourage capital flights leading to bank failures, currency crises, poor

economic fundamentals *etc.* Therefore, gradually the impact of foreign debt on domestic savings turns to be negative. This pattern predicted by the theoretical model has indeed been confirmed empirically.

To ensure robustness of regression results obtained, the regressions were done based on 30 year average and 5 year average to capture some elements of dynamics in the time series. The results obtained from these specifications are available in Table 4.2.

**Table 4.2:** Results of the empirical analysis: 5 year and 30 year averages

Variables	Five-year averages			Thirty-year averages		
	Panel GLS (PCSE)	Panel IV analysis (2SLS)		Panel GLS (PCSE)	Panel IV analysis (2SLS)	
		Fixed effects	Random effects		Fixed effects	Random Effects
Foreign debt as % of GDP	-0.01*** (-4.03)			0.05*** (31.55)		
Net foreign debt inflows outstanding as % of GDP		-0.40*** (-12.89)	-0.40*** (-13.1)		-1.48*** (-7.46)	-1.34*** (6.22)
Imports as % of GDP	-0.20*** (-12.28)	-0.13*** (-4.23)	-0.13 (-4.56)	-0.17*** (-36.68)	-0.22*** (-6.61)	-0.18 (-5.72)
Real interest rate	-0.02 (-1.23)	-0.11*** (-4.01)	-0.11 (-4.13)	-0.05*** (-6.51)	-0.07*** (-2.95)	0.007 (0.44)
GDP per capita	0.009*** (31.8)	0.008*** (11.13)	0.008*** (11.49)	0.004*** (63.76)	0.005*** (14.1)	0.004*** (11.75)
FDI as % of GDP	-0.15 (-0.23)			-0.10 (-0.43)		
SSA (dummy)					0.80 (0.96)	-0.58 (-0.84)
Total debt service					-1.38*** (-10.49)	-7.89*** (-7.82)
Multilateral debt service as a share of GDP					-0.05 (-1.49)	-0.14*** (-4.33)
Fixed capital formation					3.07*** (7.73)	
Constant	-39.4*** (-19.5)	8.74*** (5.49)	9.05*** (3.25)	9.31*** (33.58)	13.3*** (8.41)	20.34*** (14.88)
N	730	730	730	168	168	168
R <sup>2</sup>						
R <sup>2</sup> within		0.31	0.31		0.44	0.44
R <sup>2</sup> between		0.34	0.35		0.45	0.45
Wald statistic (p-value)	0.00	0.00	0.00	0.00	0.00	0.00

Note:

\*\*\*, \*\* and \* indicate levels of significance at 1%, 5% and 10% respectively. In the brackets t-statistics reported.

Hausman test confirmed no systematic difference between fixed and random effects estimators (both in the case of GLS and in the case of 2SLS estimations). Therefore, random effects specification is preferred for its higher efficiency.

Essentially, these results did not differ significantly from what we have in Table 4.1. Results obtained from estimations based on 30 year average and 5 year average helped to confirm the impact of foreign debt on domestic savings over the long term and cleared of short term shocks. Importantly, these results were obtained despite numerous efforts within the Structural Adjustment Programs, *i.e.* already after the implementation of policies tactically designed to achieve removal of subsidies, privatization, capital account liberalization, low inflation target, devaluation of currency *etc.* This implies that domestic savings may be low amidst increase in consumption spending and contraction of income earning openings in the developing countries as predicted by the model and confirmed with data.

Again, we also see that fixed capital formation has positive impact on domestic savings in the developing countries. This implies that as the capital stock increase through accumulation and probable increase in new machines and technologies and likely improvement in productivity creates new investment opportunities thus creating potential portfolio for savings allocation.

Finally, the role of FDI seems to be quite puzzling. It is significant and positive in annual analysis, but loses significance in long term results. The channels should be similar to those associated with capital formation as described above. However, FDI flows seem to be highly correlated with debt flows, which on statistical grounds may result in the insignificance of the estimators. Most foreign direct investment inflows went to LAC overall and SSA attracted some inflows mostly in the 1990's (mostly for only). This finding suggest that gains from foreign direct investment inflows on average assisted LAC to meet up with some demands of debt service. The picture for SSA is not quite clear as the level of FDI inflows were much lower in the 1970's and 1980's, but, on average, the result suggests some positive spillovers of FDI inflows to the region though relatively small as compared with LAC. This result indicates a case of complementarities between foreign direct investments and domestic savings.

Last, but not least, taking the logs specification on a long-term relation allows to estimate response of domestic savings (elasticity) to the changes in foreign debt. For 30 year averages for analysed countries on average, 1 percentage point change in the ratio of foreign debt to GDP may result to a decrease of 7.8% in gross domestic savings as a ratio of GDP<sup>9</sup>. This is a strikingly high number, if one considers that OECD countries' savings rate oscillate around 20-30% thresholds.

## 5 CONCLUSIONS

Abbas (2005) remarks that there are calls for retiring whatever little domestic debt poor countries are left with. Some stakeholders remind that every major growth episode in recent history (U.S., Europe, East Asia) has been driven by domestic and not foreign savings, and that viable states have always relied more on their own taxpayers and savers (including overseas nationals) than on foreign aid and foreign debt. In a fairly recent empirical investigation, Aizenman et al. (2004) confirm the importance of domestic finance for most emerging economies, thus challenging the view that sustained reliance on foreign finance is a viable option for least developed countries (LDCs). In light of this, it is difficult to see how African Poverty Reduction and Growth Facility (PRGF) projections of 70-80% reliance on foreign finance over 30-40 year horizon can be consistent with the notion of viable African states.

This study suggests a theoretical model for a causal and negative link between foreign indebtedness and domestic savings. Data seem to favour the theoretical specification suggested in the theoretical model, corroborating some of the earlier research conclusions. We find strong negative relationship. This relationship is robust across the specifications (panel data and instrumental variable approach) as well as historically different paths of Latin America and Africa. The sensitivity analysis suggests that there is indeed a strong magnification effect – a 1% increase in foreign debt share may result in as much as 7.8% reduction in domestic savings efforts (as a share of GDP).

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<sup>9</sup> Detailed results are reported in Table A4 in the appendices.

In addition, this finding also supports the prediction of the model that attempted to visualize the game between government and the citizens amidst foreign borrowings. National governments in developing countries have a tendency to pass the burden of debt service to the citizens – either direct *via* taxation or indirectly through other channels such as suspension of subsidies, elimination or curtailment of free education *etc.* Rational citizens' response (conscious or unconscious) is to lower the savings rate – myopia turns to be optimal. This is partly associated with increase in spending without corresponding increase in income, and other factors such as gradual erosion of confidence of the people on some core sectors of the economy such as the banking industry, the labor market *etc.*

Basically, this study may not have covered all the relevant channels through which savings could be influenced in the short and long run horizons. Again, apart from foreign debt, some other relevant variables may influence domestic savings as well. Here, issues of capital flights, bank failures, poor debt management policies, poor economic fundamentals, exports, *etc* easily come to focus.

Also, the time period covered by this study was not terribly long, while indeed dynamic context has not been explored (with a high number of countries this would have been technically difficult). However, in the future the most interesting cases of countries should be explored with the use of the time series techniques, which could allow to estimate the direct responses and the duration of adaptation. Countries like Brazil, Mexico in LAC as well as Nigeria and South Africa in SSA can be considered as front-runners and thus require individual attention<sup>10</sup>. Studies initiated on case study of individual countries would help to untangle the peculiarities of individual countries *vis-à-vis* the incidences and implications resulting from huge foreign borrowings and the likely impact on domestic savings.

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<sup>10</sup> Outliers identified by this study include Eritrea, Rwanda, Sao Tome and Principe, Gabon, Cayman Islands, Nicaragua, Guyana, Virgin Islands and Lesotho.

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## 7 APPENDIX

**Table A1: Summary statistics**

	No. of obs.	Average	St. dev	Min	Max
<b>Gross domestic savings as % of GDP</b>	2080	11.93	14.80	-86.5	72.9
<b>Foreign Debt as % of GDP</b>	2020	86.87	109.60	3.329158	1598.675
<b>Net Foreign Debt inflows outstanding as a % of GDP</b>	1655	2.07	35.68	-639.1024	626.3458
<b>Imports as a % GDP</b>	2020	43.00	25.03	2.982036	173.4846
<b>GDP per capita</b>	2216	1966.00	2607.49	56.5202	18448.45
<b>Real interest rate</b>	1588	6.97	25.61	-98.14515	789.799
<b>Fixed capital formation (in US\$ millions)</b>	1628	<b>6.01e+09</b>	<b>1.96e+10</b>	<b>7016677</b>	<b>1.31e+11</b>
<b>FDI (in US\$ millions)</b>	2055	<b>4.83e+08</b>	<b>2.16e+09</b>	<b>-2.06e+09</b>	<b>3.28e+10</b>
<b>Total debt service (in US\$ millions)</b>	2019	<b>1.59e+09</b>	<b>6.19e+09</b>	<b>0</b>	<b>7.64e+10</b>

*Source:* own calculations based on data from WDI

**Table A2. Description of variables**

<b>Name of Variable</b>	<b>Description</b>
<b>Gross Domestic Savings as a %GDP</b>	Gross domestic savings are calculated as GDP less final consumption (total consumption) expressed as a percentage of GDP
<b>Foreign Debt as a% GDP</b>	Total external debt as defined by WDI deals with is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Annual foreign debt expressed as a percentage of GDP
<b>Net Foreign Debt inflows outstanding as a % of GDP</b>	Net foreign debt inflows outstanding calculated as current foreign debt in period time t ( $E_t$ ) minus previous year value of stock of foreign debt inflows ( $E_{t-1}$ )
<b>Fixed Capital Formation in millions</b>	Fixed capital formation as defined as WDI (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings.
<b>Foreign Direct Investment as percentage of GDP</b>	Foreign direct investment net inflows as a ratio of GDP, calculated as FDI net inflows in US dollars over the current GDP in US dollars for each country.
<b>Imports as percentage of GDP</b>	Value of goods and services received from rest as reported by WDI as a ratio of GDP
<b>Gross Domestic Product <i>per capita</i></b>	GDP <i>per capita</i> as reported by WDI
<b>Real interest rate</b>	Lending interest rate adjusted for inflation (GDP deflator)
<b>Total debt service</b>	Total debt service defined by WDI as the sum of principal repayments and interest actually paid in foreign currency, goods, or services on long-term debt, interest paid on short-term debt and repayments (repurchases and charges) to the IMF.
<b>Multilateral debt service as percentage of GDP</b>	Multilateral debt service is the repayment of principal and interest to the World Bank, regional development banks, and other multilateral agencies as percentage of GDP. (WDI)

**Table A3:** List of countries classified as LAC and SSA according to World Development Indicators

<b>LAC</b>	
1.	Antigua and Barbuda
2.	Argentina
3.	Aruba
4.	The Bahamas
5.	Barbados
6.	Belize
7.	Bolivia
8.	Brazil
9.	Cayman Islands
10.	Chile
11.	Colombia
12.	Costa Rica
13.	Cuba
14.	Dominica
15.	Dominican Republic
16.	Ecuador
17.	El Salvador
18.	Grenada
19.	Guatemala
20.	Guyana
21.	Haiti
22.	Honduras
23.	Jamaica
24.	Mexico
25.	Netherlands Antilles
26.	Nicaragua
27.	Panama
28.	Paraguay
29.	Peru
30.	Puerto Rico
31.	St. Kitts and Nevis
32.	St. Lucia
33.	St. Vincent & the Grenadines
34.	Suriname
35.	Trinidad and Tobago
36.	Uruguay
37.	Venezuela
38.	Virgin Islands (U.S)
<b>SSA</b>	
1.	Angola
2.	Benin
3.	Botswana
4.	Burkina Faso
5.	Burundi
6.	Cameroon
7.	Cape Verde
8.	Central African Republic
9.	Chad
10.	Comoros
11.	Congo, Dem. Rep
12.	Congo, Rep
13.	Cote d'Ivoire
14.	Equatorial Guinea
15.	Eritrea
16.	Ethiopia
17.	Gabon
18.	Gambia, The
19.	Ghana
20.	Guinea
21.	Guinea-Bissau
22.	Kenya
23.	Lesotho
24.	Liberia
25.	Madagascar
26.	Malawi
27.	Mali
28.	Mauritania
29.	Mauritius
30.	Mayotte
31.	Mozambique
32.	Namibia
33.	Niger
34.	Nigeria
35.	Rwanda
36.	Sao Tome and Principe
37.	Senegal
38.	Seychelles
39.	Sierra Leone
40.	Somalia
41.	South Africa
42.	Sudan
43.	Swaziland
44.	Tanzania
45.	Togo
46.	Uganda
47.	Zambia
48.	
49.	Zimbabwe

*Source:* World Bank, WDI (2007).

**Table A4.** Results of the empirical analysis using logs

Variable	Five-year averages		
	Panel analysis		
	Panel GLS	Fixed	Random
Log of foreign debt as % of GDP	0.10* (1.95)	-0.13** (-2.22)	-0.14** (-2.44)
Log of imports as % of GDP	-0.44*** (-4.53)		
Log of multilateral debt as a share %GDP		-0.27*** (-2.93)	-0.27*** (-3.05)
Log of GDP <i>per capita</i>	0.58*** (11.02)		
Log of FDI as % of GDP	0.17*** (8.30)	0.22*** (10.48)	0.22*** (10.86)
SSA	2.09*** (6.82)		
Constant	-5.20*** (-8.87)	-0.84** (-2.14)	-0.87** (-2.17)
N	680	786	786
R <sup>2</sup> within		0.13	0.13
R <sup>2</sup> between		0.22	0.23
Wald statistic (p-value)	0.00	0.00	0.00

*Note:*

\*\*\*, \*\* and \* indicate levels of significance at 1%, 5% and 10% respectively. In the brackets t-statistics reported.

Hausman test confirmed no systematic difference between fixed and random effects estimators. Therefore, random effects specification is preferred for its higher efficiency.



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