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Abstract

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Key Words: Sustainability, External Debt, Cointegration, Current Account, Exports, Imports

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Title

Sustainability of External Debt in Developing Countries: An Empirical Evidence

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Abstract

The paper attempts to investigate the issue of sustainability of external debt in developing countries for the period of 1980 to 2020. We have used the standard intertemporal approach of current account balance to examine the issue of external debt sustainability. The results of standard panel cointegration models reveal that external debt in developing countries is found to be sustainable for the given period since a strong cointegration between exports and imports is found in these countries. This cointegration between exports and imports necessarily implies that developing countries are satisfying their external constraint or the solvency condition which restricts them from lending or borrowing in international financial markets for indefinite time. Besides, strong cointegration also implies that developing countries are generating enough trade surpluses today which makes them unable to finance their future external debt thereby posing no issue for the sustainability of external debt.

Keywords: Sustainability, External Debt, Cointegration, Current Account, Exports, Imports

Introduction

Of the various important issues that governments face, the effects of the changes that occur in balance sheets because of allocation between monetary and non-monetary liabilities are of utmost importance and have remained under discussion among macroeconomists for a long period of time. The effects that occur due to the government structure of non-monetary liabilities (composition of public debt) did not receive as much attention prior to early 2000. Afterwards 2000 this situation and because of the credibility of fiscal policies, triggered

macroeconomic fluctuations due to bank balance sheet effects the topic gained significant attention among macroeconomists and gained prominence in policy discussions. Government debt which is also known as public debt or sovereign debt is defined as the total amount of financial liabilities that the government owes. If it is owed to domestic residents then it is classified as internal debt, otherwise it is external.

According to the statistics in the year 2020 the overall values of (Wikipedia contributors, 2024) government debt worldwide was $87.4 US trillion or 99% measured as the percentage of GDP. This surge in the government debt after the year 2007 is mainly attributed to the financial crisis worldwide of 2007-2008, and later due to the COVID-19 pandemic. Of the various reasons for government borrowing, nations borrow to absorb economic shocks. For instance, the government maintains services during the recessionary phase through deficit financing. In many cases the debt used to cover the costs of major shocks arising from various events is beneficial. The major events can take the form of the financial crisis of the year 2007-2008, the COVID-19 pandemic, World War (I &II), etc. If the government does not rely on deficit financing in the cycles of recession, then the government would have to increase taxes or decrease their spending which will further worsen the economic situation.

A different perspective of debt sometimes also called **"*Ricardian Equivalence*"** states that government debt has no effect on the economy if individuals are unselfish, and internalize debt burden on future generations. This proposition means that debt financing and tax financing will have the same impact if individuals anticipate that the government will impose tax in the future needed to repay their today's debt based on the financing of their expenditure through the issuance of debt today. Individuals in response today will start to save more bequests. Higher savings on the part of individuals will curtail today's consumption in the same proportion as the surge in debt, resultantly interest rates will be unaffected and no crowding out of private investment will take place.

Debt affects growth in two ways, first in the short run it can stimulate aggregate demand and have an impact on growth positively through the multiplier process, whereas in the long run, its effect is insignificant as debt crowds out private investment due to a rise in long-term interest rates that worsens economic performance (Elmendorf & Mankiw, 1998; Miller & Modigliani, 1961). This is the only channel by which in the long run fiscal burden may hamper the growth. On the other side, the deterioration of fiscal balance because of increased public debt hinders the path of economic growth though deficit helps in financing public capital (Adam & Bevan, 2005, Aizenman et al., 2007).

Public Debt Sustainability in Developing Countries

Among many other issues that the developing world has faced during the last decade, the issue of sustainability of the public debt is of utmost importance issue. High Debt to GDP ratios not only hinder the path of growth, but there are various costs including the opportunity cost of debt which the economy is paying. In developing countries where the availability of resources is not ample to finance the developmental needs of the country, the only way to finance these expenditures is through borrowings. These borrowings are then channeled for the development of infrastructure, health and education, capital creation, etc. The fungibility of the debt remains always an issue in these economies most of the time. The purpose for which the debt is granted is not fulfilled due to which over time the debt servicing on this debt piles up day by day. Countries resort to financial institutions for borrowing even for interest payments on existing debt. In other words, the nonproductive use of debt piles up additional liabilities in the economy, and the economy is struck into a debt trap day by day. The excessive accumulation of the debt also creates problems for fiscal management and the majority of revenue drains out in the form of interest payments and debt servicing.

Macroeconomists usually deal with debt in the form of a ratio to GDP namely the "Debt to GDP" ratio which is a better measure to deal with debt instead of using debt in level /absolute form. All countries of the world are facing issues of debt in the management of their macroeconomic policies and sometimes small economies are not able to fulfill their debt obligations and are exposed to credit default, whereas big economies having more debt burden are not having problems in meeting their financial obligations. A higher Debt/GDP ratio is an alarming signal for the development of a

sustainable fiscal policy in a country. The question that comes to our mind is what level of debt is optimal for a country? The complexity of answering this question varies with an apparent puzzle where we see that countries like Japan resist a very high Debt/GDP ratio of over 200 percent, whereas on the other hand countries like Ukraine hold a default level of Debt profile, where Debt/GDP ratio remains over 30 percent (Debrun et al., 2018). To understand the reason for this difference we need to understand the concept of sustainability of debt in detail.

We can define public debt as sustainable if the government fulfills all its current and future financial obligations without going to default. Debt sustainability matters for any country as it not only hampers the economic performance of the country but also unsustainability finally leads to bank solvency in later stages. The cost of unsustainability is not only borne by the current generation, but it also falls on later generations. Debt does not matter, but the way it is utilized sometimes also called fungibility, and how a country's economic policies particularly fiscal and monetary policy manage this debt is of utmost importance.

Of many reasons that made countries default earlier, the major reasons were the inconsistency of their policies in terms of the cyclical nature of their business cycles, inconsistency of previous policies, weak governance structure, etc. So, the issue of sustainability of public debt is very important to understand and analyze. If we investigate the debt profile of countries, we can see asymmetries in public debt whereas the contribution of external debt and domestic debt are not equal. The lens to investigate sustainability then requires analyzing separately these two components of public debt while addressing sustainability issues. In this chapter of the thesis, our major focus is to investigate the sustainability of external debt in detail. Before looking into it we need to explore why the sustainability of external debt is important for countries.

External debt sustainability is important for several reasons as the level of development of a country, stability, and welfare all link with it. All countries of the world like to avoid financial crises in their countries. Particularly in developing countries, this is of utmost importance as extreme forms of financial crisis take the form of bankruptcy at later stages. The only way to avoid this is to avoid unsustainable levels of external debt. Apart from this, a sustainable level of external debt helps to contribute to economic stability and can promote growth if the funds are fully utilized for the purpose for which it is taken and proper fungibility is addressed. If the level of external debt outreaches the revenue generation capacity of a country, then the economy faces economic downturns, high levels of inflation, devaluation of the currency, etc which destabilize the economy. A sustainable level of external debt also affects the financial architecture of a country by improving the creditworthiness and expanding access to international financial markets on favorable terms which reduces borrowing costs and attracts foreign investments.

In developing countries over the last decades, developmental spending has been shrinking day by day since much of the funds are devoted to interest payments on debt. Unsustainable levels of external debt crowd out necessary social spending particularly on health and education due to which social expenditures are compromised which results in compromised fiscal stability. It also preserves the fiscal space of governments as sustainable debt levels provide room in the budget which helps them to respond to economic downturns, crises, or unanticipated expenditures that are likely to occur. One important effect of unsustainable levels of external debt is exchange rate risk. If the external debt level is sustainable then it will minimize the country's exposure towards exchange rates even foreign currency-denominated debt.

A sustainable level of external debt paves the path for meeting developmental goals in the long run. It helps countries to allocate their resources to those projects that help in reducing poverty and contributing towards diversification which will help to achieve sustainable growth. Finally, one most important implications of a sustainable level of external debt is that it helps countries avoid debt traps. Developing countries today are more exposed to debt traps where their level of external debt is increasing day by day just because of insufficiency of their reserves to service debt due to which they find themselves in debt trap day by day.

Statement of Problem

Of various other sustainable development goals known as SDGs established by the United Nations, quality education, no poverty, good health, and well-being are the ones that are directly linked with fiscal management of the economy. All developing

countries today are facing issues in fiscal management due to decreased revenue and increased expenditures. Often to finance the fiscal gap they need to borrow either through domestic sources or rely on international financial institutions. The debt profile of all the developing countries shows a sharp positive trend year by year due to which they are exposed to debt trap situations where all the above-mentioned SDGs are compromised. In the year 2022, the public debt globally reached a record level of $92 trillion. Of this, the share of developing countries was 30%. Of this total increase the share of external debt has increased from 19% to 29% in the year 2021. This significant pile-up of debt is affecting the level of development in these countries as the majority of their revenues are drained down to service their debt liabilities and fewer resources remain available to meet their developmental goals result we see is that the growth rate of these countries lies far below than developed countries. There is a need to investigate reasons for external debt pile up in developing countries which is posing an issue for external debt sustainability in these countries. This paper examined the issue of sustainability external debt in developing countries by using a panel data set from 1980 to 2020.

The rest part of the paper is synthesized as follows, Chapter 2 provides a brief literature review, Chapter 3 discusses the Data and Methodology used in the study, Chapter 4 gives Results and Analysis, and Chapter 5 Concludes and suggests Policy Recommendations.

Literature Review

The debt dynamics of developing countries differ from developed ones in several aspects. For instance, if we investigate the phase of the economic growth catching-up process, we often observe that the position of developing countries is of the form where the growth levels and level of debts are positively correlated with each other. We can explain this relation simply in the term "briskier growth" which refers to the path of declining debt trajectory provided debt accumulation is backed up by a thorough roadmap. The problem of public debt is more severe when debt growth outgrows the growth in revenue and debt servicing exceeds the threshold. To avoid these issues certain aspects are important which are, for instance first for successful debt reduction we need a consolidation of the fiscal side of the economy and a mix of policies (monetary or fiscal) that support growth. Second, for consolidation of fiscal policies instead of myopic measures, there is a need for comprehensive structural reforms. Third, keeping in account the fact that reduction in debt is time-consuming.

Before analyzing the importance and issue of debt sustainability in detail there is a need to uncover the theoretical literature on debt. The section will first discuss the theoretical literature of debt in detail followed by the empirical literature founded on it. After that, the sustainability of debt is discussed in detail.

The existing work done so far in the literature on the sustainability of public debt apart from public debt can be traced back to the late 80s and 90s to the seminal work of (Hamilton & Flavin, 1986; Kremers, 1988; Wilcox, 1989; Tehran & Walsh, 1988). All these studies were done to analyze fiscal sustainability for the case of the US economy and find out different results. For instance, Hamilton and Flavin (1986) used annual data from year 1962 to 1984 on government debt. And deficits and conclude that both series were found to be stationary hence it is expected that the government balance its budget in the long run and there will be no issue for sustainability. However, the findings were not found to be universal. Later on, two papers given by Kremers (1988) and Wilcox (1989) found opposite results and criticized the earlier findings of Hamilton and Flavin (1986) that this study neglected the higher order degree autocorrelation in the two series as a result of which their findings conclude that both series are non-stationary.

A seminal work done by Bohn (1990) shed light on sustainability stochastic framework under both policy rules that is tax smoothing and balanced budget policies. He finds out that the sustainability of policy rules should not be taken as light even in the stochastic framework. It is sensitive to assumptions regarding the debt management. If there is no uncertainty, then both policies are sustainable. It is also observed that if there is an upper bound on the feasible tax rates that limit debt servicing then both policies are not sustainable. The findings of the study also point out that the non-sustainability of policy rules with safe real debt becomes valid for debt financing methods (general) provided debt policy favors perfect tax smoothing being the unique exception.

Much of the work that is done so far in the literature on public debt sustainability done so far has given importance to public debt sustainability. The debt sustainability framework developed by IMF classified debt threshold for countries taking public debt as a whole. It is important to discuss here that the share of internal as well as external debt in total public debt differs from country to country. For instance, (World Bank Group, 2021) "World Bank reports that the debt burden rose by 12% to a record $860 Billion in the year 2020 in low-income countries", whereas external debt stocks in these countries increased by 5.3% in the year 2020 to $8.7 Trillion. This huge difference in the magnitude of internal and external debt implies a deeper analysis in understanding the sustainability of internal and external debt apart from dealing them together in the domain of public debt. Similarly, the factors affecting internal debt are quite different from those of external debt. There is room available in the domain of public debt where future studies can be extended, for instance, there are very few studies done so far for internal debt sustainability as much has been done on aggregate level of debt, apart from the internal debt thresholds have not been constructed so far in the literature. On the other sides, there are numerous studies that have been done so far in the domain of external debt sustainability which are as follows,

For developing countries, academicians, macroeconomists researchers, etc., the issue of external deficit sustainability gained considerable and significant attention. There is not a second thought over the importance of debt sustainability for governments since it requires them to adopt reasonable policies that ensure macroeconomic stability. Because of the utmost importance of this issue a very comprehensive literature has been written since the 1990s. Mostly, time series methods were employed to investigate whether the external deficit is sustainable or not. Most of the focus in the literature surrounds the United States and other industrialized countries: For instance, the case of the United States (Tehran & Walsh, 1988; Wickens & Uctum, 1993; Ahmed & Rogers, 1995; Fisher, 1995; Leachman et al., 2000; Christopoulos & Lledesma, 2009), United States and Canada (Otto, 1992; Wu et al.,1996) and, for G7 countries (Liu & Tanner, 1996). All of these studies found that for most of the developed countries, external deficits are not sustainable. A scant literature is seen for the case of developing countries (Sawada, 1994; Coakley & Kulasi, 1997; Baharumshah & Lau, 2007; Boengiu & Triandfal, 2011). All these studies applied similar econometric tests for assessing external debt sustainability. The results find that conditions for external sustainability conditions are not fulfilled in the majority of these countries. Recently some studies employed panel unit roots and cointegration tests to investigate the issue of external sustainability, for instance, Wu et al. (2001).

Some studies employed panel unit root tests within a SURE (seemingly unrelated regression.) model. For instance, the sustainability of external debt in the case of 12 Latin American countries was observed (Holmes, 2006). A different method namely the quantile regression model was employed to investigate the "mean reverting" behavior of sustainability of external debt for 19 Asian countries

A recent study done by Navarro and Sapena (2020) developed a “probabilistic approach” to model external debt sustainability. This study used an IMF data set for investment position and balance of payment and used VAR (Vector Auto Regressive Model) for 38 countries. For each country to estimate repayment capacity for each country they also employed "Monte Carlo Simulations". It was noted that a large portion of the projected distribution is skewed to the right which means that there is currency devaluation in countries. These findings also suggest that the capital flight is benefitting developed countries at the cost of developing countries.

An attempt to explore debt indebtedness both in terms of sovereign and private debt for the case of the Romanian economy keeping in consideration the unpredictable macroeconomic environment and unfavorable global and regional context can be seen in the work of Zaman and Georgescu (2015). The study mainly focused on exploring the current and long-term challenges of external debt sustainability for Romania by doing qualitative and quantitative assessments. The results of the study explain that inter-conditional ties are present between various forms of debt for instance short vs long-term, domestic vs external debt, and public vs private debt. The double increase in external debt between 2007 to 2013 led to a significant increase in debt servicing (about 17.8% of GDP in year 2013) that deteriorated the financial environment of the

economy and growth. This surge in external borrowing resulted in inefficiencies which lowered the development much below what was expected. Apart it is also seen that debt rolls year by year and easy government borrowings break intergenerational ethics.

Similarly, a different approach to modeling external debt sustainability for the euro region can be seen in the recent work done by Semmler and Tahri (2017) to investigate the issue of sustainability of external debt three Euro economies including, Germany, Italy, and Spain were taken. To investigate the debt effect on investment and consumption first, it analyzed the causes, sources, and adjustment of the deficit of the current account. Afterward, the study introduced a new empirical measure of debt sustainability, in contrast to using the external Debt/ GDP ratio it used debt over assets. A uniqueness of this study was that it used an inter-temporal model of finite time horizon that was solved numerically through the Non-linear Model Predictive Control (NMPC) method to assess the dynamics of external debt sustainability. In the calibration of the model for these countries, the study also measured debt sustainability and showed that periphery economies move towards a slow debt crisis with the exception of Germany.

The literature on public debt sustainability models encompasses three different approaches of investigation namely unit roots, cointegration, and use of fiscal reaction functions. Different studies have adopted different methodologies for investigation but in most of the literature, we see the notion of fiscal reaction function. The idea was given in the novel study of Bohn (1998) where he argues that for the sustainability of debt, there is a response from primary surplus in the form of fiscal reaction shown by the behavior of government to accumulate enough primary surpluses to facilitate debt. We can find out the application of this notion in much of the subsequent literature. There are numerous other studies that were based on the work of Bohn (1998) some of which are as follows,

A stylized framework to assess fiscal policy for a set of 16 OECD countries for the years 1969 to 2002 can be seen in the work done by Balassone and Francese (2003). The findings reveal that there is evidence of asymmetry in the conduct of fiscal policy over the business cycle which provides a sizeable contribution of debt accumulation in these countries. Similarly for the explanation of fiscal sustainability for a set of 15 Euro countries work done by Afonso (2005) can be considered a pioneer study for the case of European countries. For the assessment of fiscal sustainability, conventional cointegration tests with and without structural breaks were employed between tax revenues and expenditures of government. The unpleasant results of the study showed that with few exceptions fiscal policy is unsustainable in EU governments stems the risk of becoming inherently heavily indebted though the debt to GDP ratios seem to be stabilizing.

Some other studies for European cases can be seen in the work of Prohl and Schneider (2006). This study attempts to explore the sustainability of fiscal policy for 15 EU member countries. The study used panel cointegration and error correction frameworks approach. The data spans for this study are from 1970 to 2004. The results of this study reveal that there is consistency between inter-temporal budget constraint and fiscal policy that refers to fiscal policy being sustainable in these 15 EU member countries. The procyclicality of fiscal policy and debt sustainability concerns for a set of Latin American countries can be seen in the study of Alberola and Montero (2007). Findings show that the procyclical nature of fiscal policy in the region has a destabilizing effect on economic activities.

For the sustainability of fiscal policy in a set of developing countries including Peru, Philippines, South Africa, Thailand, and Venezuela a study by Ghatak and Fung (2007) employed competing econometric methodologies. Data spans for this analysis are 1997 to 2000. The findings of the study reveal that the budget surplus condition was not found binding for countries like Peru, the Philippines, South Africa, Thailand, and Venezuela. In addition, the study also applied Bohn's (1998) fiscal reaction function approach. Under this approach, it was found that budget surpluses showed weak fiscal sustainability. Moreover, the debt dynamics results reveal that there is a need for taking corrective measures to revert non-sustainable trends of Debt/GDP ratios.

A study done on the Turkish economy by Budina and Wijnbergen (2008) investigated several quantitative approaches for the sustainability of fiscal policy with the aim of using them in a user-friendly environment that would reflect modern developments in the Turkish economy. This analysis was based on the basic version of the steady-state consistency approach which was combined with

dynamic simulations to explore debt dynamics. To tackle uncertainty the study used two methods namely stress tests and stochastic simulations. The result of the study suggests that there will be a quick decline in the Debt to GDP ratio if we observe fiscal adjustment which is persistent with primary surplus. In addition, the simulations showed that if the fiscal strategy is maintained then there will be a considerable margin (about 95%) that debt will fall below 50% by the end of the period and (50%) chance that it will fall below 29%.

Another study highlighting the role of fiscal policy in public debt sustainability can be seen in the work of Neaime (2014). The study is parametric in nature where the focus of the study is public debt sustainability and its implications for public solvency over the last four decades. The findings of this study imply that the sustainability of fiscal policy is strong in Tunisia whereas weak in the case of Egypt. Besides, the size of public debt was reduced because of proper fiscal reforms and privatization schemes (introduced in the 90s). Tahir and Tahir (2012) investigated the behavior of the central government and economic conditions in Pakistan after the FRDLA (Fiscal Responsibility and Debt Limitation Act). In addition, the study also examined how provinces behaved after the 7th NFC award and the 18th Amendment. The findings of this study suggest that the debt burden in Pakistan started repressing growth validating Reinhart et al., (2012) conclusion.

In a nutshell, we can conclude that the existing literature that has been done so far in the domain of public debt sustainability has mostly focused on advanced economies including economies in European economies, G8 countries, the African region, Latin America, Industrialized economies, and OECD countries. There is a significant room that is available in the literature where the analysis can be extended to developing countries. Apart, the issue of public debt sustainability is widely discussed in general terms, but it needs a detailed in-depth analysis keeping in consideration the importance of the role that domestic and external debt plays in overall debt sustainability.

Data and Methodology

This section of the paper discusses in detail the data and methodology adopted to analyze external debt sustainability in developing countries. Starting with the description of the data the methodology for external debt sustainability has been discussed in detail.

Data Description

The study has used panel data of Emerging and Developing countries. For most of the countries we found missing data or insufficient observations available for the analysis. From preliminary data analysis the study took annual data on [1]60 emerging and developing countries from year 1980 to 2020. The data description of the variables used in the study are as below,

Table 1

Data Description

Variable	Description of Variables	Data Source
External Debt	External debt is defined as the debt which is owed to nonresidents repayable in currency, goods, or services. It includes public, publicly guaranteed, and private non-guaranteed long-term debt, short-term credit, and IMF credit.	International Debt Statistics.
Exports of Goods and Services	Exports of goods and services include the sum of all goods exports, export of services, and primary income receipts.	World Development Indicators
Imports of Goods and Services	Imports of goods and services include the sum of all goods imports, import of services, and primary income payments.	World Development Indicators

[1] "The countries include "Albania, Algeria, Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Chad, China, Colombia, Comoros, Congo Republic, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Eswatini, Gabon, Guatemala, Honduras, India, Indonesia, Iran, Jamaica, Jordan, Kenya, Madagascar, Mauritania, Mauritius, Mexico, Morrocco, Nicaragua, Nigeria, Pakistan, Paraguay, Philippines, Peru, Romania, Russian Federation, Rwanda, Sierra Leone, Senegal, South Africa, Sri Lanka, Sudan, Togo, Thailand, Tunisia, Turkiye, Uganda, Venezuela, and Zimbabwe"

Variable	Description of Variables	Data Source
Current Account Balance	The current account balance is defined as the sum of the net exports, net primary income, and net secondary income.	World Development Indicators

Note.
Data of all variables are taken as percent of GDP

Methodology

The standard approaches for the sustainability of the current account in the economic literature rest on whether the country satisfies its inter-temporal external constraint. Husted (1992) provided a simplified framework for this. According to this a representative agent is free to lend and borrow in international markets with the given interest rate in the world. The representative agent facts the budget constraint as,

$$C_o = Y_o + B_o - I_o - (1 + r_o)B_{t-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where $C_o, Y_o, Bo, and\ I_o$ represent the country's total consumption, output, borrowing in international markets, and investment in the current period. r_o is the initial interest rate and $(1 + r_o)B_{t-1}$ represents the initial external debt. Equation (6) must hold for every period, so if we iterate the equation forward it gives the intertemporal budget constraint, Husted (1992)

$$B_0 = \sum_{t=1}^{\infty} \delta_t TB_t + \lim_{n\to\infty} \delta_n B_n \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Where TB refers to "trade balance" which equals $TB_t = X_t - M_t = Y_t - C_t - I_t$ where X_t represents exports $and\ M_t$ represents imports, δ_t represents the "discount factor". For sustainability, the sufficient condition requires that as $n \to \infty$ the present values of external debt in the future asymptotically converge to zero. The condition can also be represented as,

$$\lim_{n\to\infty} \delta_n B_n = 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Equation 3 resembles the transversality condition for government solvency in the case of public debt sustainability. This condition implies there is a restriction on lending/borrowings in financial markets and any country cannot borrow/lend infinitely to finance its trade account surplus/deficit. If the value of B_0 is positive, it shows that the country is bubble financing the external debt whereas the negative values imply the country's welfare level could be raised by lending less which implies a Pareto inferior decision. It is natural to ask then what makes the last term of equation (2) zero, for this a testable empirical model needs to be investigated.

For this, we can rewrite equation no (1) assuming a time-invariant world interest rate say r with unconditional mean. The equation can be rewritten as

$$Z_t + (1 + r)B_{t-1} = X_t + B_t \dots\dots\dots\dots\dots (4)$$

Where Z_t represents $M_t + (r_t - r)B_{t-1}$.

Following Hakkio and Rush (1991) equation (4) can be represented as using forward iteration,

$$M_t + (r_t - r)B_{t-1} = X_t + \sum_{j=0}^{\infty} \varphi^{j-1}(\Delta X_{t+j} - \Delta Z_{t+j} + \lim_{n\to\infty} \varphi^{t+j} B_{t+j} \dots\dots\dots (5)$$

After several manipulations, the following testable equation can be tested.

$$M_t - X_t = \sum_{j=0}^{\infty} \varphi^{j-1}(\Delta X_{t+j} - \Delta Z_{t+j}) \dots\dots\dots\dots\dots\dots (6)$$

For stationarity of external constraint, both sides of equation 6 must be stationary at the first difference, thus we need to examine the stationarity of both exports and imports. If they are found to be first difference stationary, then there must be a cointegrating relationship which results in current account stationarity. In a nutshell for assessing sustainability, we can check the cointegration of exports and imports. Assume the X and Z series are non-stationary series of order 1 then.

$$X_t = \alpha_1 + X_{t-1} + e_{1t} \dots\dots\dots\dots\dots\dots\dots (7)$$

$$Z_t = \alpha_2 + Z_{t-1} + e_{2t} \dots\dots\dots\dots\dots\dots\dots (8)$$

Whereas α represents drift parameters with e_{1t} and e_{2t} represent stationary error processes. In this case, we can represent equation (10) as follows,

$$X_t = \alpha + MM_t - \lim_{n\to\infty} \varphi^{t+j} B_{t+j} + e_t \dots\dots\dots\dots\dots\dots (9$$

Whereas $MM_t = M_t + (r_t - r)B_{t-1};\ \alpha = \left[\left(\frac{(1+r)^2}{r}\right)\right][\alpha_2 - \alpha_1)$

and $e_t = \sum \varphi^{j-1} (e_{2t} - e_{1t})$. Assuming the last term in equation (9) is zero the equation can be transformed as standard regression

$$X_t = \alpha + \beta * MM_t + e_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (10)$$

Under null hypothesis then implies that budget constraint is satisfied with $\beta = 1$ and stationary error term. So, if X_t and MM_t are non-stationary then under null they are cointegrated "Cointegration is a necessary condition for the economy to satisfy the intertemporal budget constraint. Hakkio and Rush demonstrate the condition that in the case of government finance condition $\beta = 1$ is not satisfied. For the case where B_{t-1} is positive indicates that β needs to be less than 1 to satisfy external constraint. If β is less than 1 it is inconsistent with the external debt to GNP ratio which implies the possibility of the country to default on international debt".

For empirical analysis to check external debt sustainability it is necessary to test first the presence of unit root. The literature on panel data discusses two types of panel unit root tests keeping in account the presence/absence of cross-sectional dependence. We have applied both types of unit root tests to followed by checking cointegration between exports and imports to find out external sustainability in these countries.

Results and Discussions

The section sheds light on the results that have been taken out of the econometric analysis for external debt sustainability. Starting with descriptive analysis we have discussed in detail the results of models that have earlier been discussed in the preceding chapter. The detailed discussion is as follows,

Table 2

Descriptive Statistics of Macroeconomic Variables

	Variables			
	Current Account Balance	Exports	External Debt	Imports
Mean	-3.52	29.11	55.47	34.56
Median	-2.99	25.38	43.88	30.47
Maximum	27.32	84.11	1233.09	114.04
Minimum	-98.88	0.43	0.30	0.34
Std. Dev.	8.13	15.95	60.51	17.05
Skewness	-2.87	0.83	9.81	0.92
Kurtosis	28.96	3.16	155.022	3.79
Jarque-Bera	70936.69	281.54	2299676.	402.59
Probability	0.0000	0.0000	0.0000	0.0000
Observations	2407	2408	2349	2408

Source: Author Calculations

Table 2 shows descriptive statistics of selected macroeconomic variables. The mean value of external debt indicates that the average external debt in a sample of 60 developing countries is 55.47 with a right skewed symmetry in the data. The value of Jarque-Bera statistics rejects the null hypothesis of normality at a 5 percent level of significance. Of independent variables, exports and imports possess similar symmetry in their behavior as seen through the skewness of data. The mean value of exports and imports are found to be 29.11 and 34.56, respectively. The current account balance shows leptokurtic distribution as shown by the value of kurtosis.

The first step in analyzing sustainability is to examine whether the individual series exhibit non-stationarity in their behavior The presence of unit root is a necessary condition for checking sustainability. Of other issues in panel data cross-sectional dependency is the most important one as not taking it into account leads to inconsistent estimates which need to be investigated first before looking into the unit root process of data. Cross-section dependency arises due to many reasons for instance spatial dependency where economic shocks in one region may affect the other countries that lie in the proximity of that country. The results of Pesaran's (2004) cross section dependency test also

known as the CD test are reported in Table 3. Under the null hypothesis, there is cross-sectional independence across the panels. The value of the CD test for current account balance, exports, imports, and external debt clearly rejects the null hypothesis of cross-section independence in the panel as the p-value in all cases is less than 5%. We can conclude from the results that there exists cross-section dependency in the panel.

Table 3

CD Test Results.

Panel	Variables	CD test	Prob
Overall	Current Account Balance	14.95285	0.0000
	External Debt	48.84210	0.0000
	Exports	41.51560	0.0000
	Imports	45.95285	0.0000
CD=Cross Sectional Dependence			

Note. CD reports cross-section dependence test statistics.
Under the null hypothesis, there exists cross-section independence across panels where CD~N(0,1)
Source. Author's calculation

After the results of the cross-section dependency test, the results of 1st and 2nd generation panel unit root tests are reported in Table 4 and Table 5, respectively. The results are as follows,

Table 4

First Generation Panel Unit Root Test Results

Variable	Method	Statistic	Prob	Result
Current Account Balance	Levin, Lin & Chu t*	8.06327**	0.0000	I(0)
	Im, Pesaran and Shin W-stat	-10.3650**	0.0000	I(0)
External Debt	Levin, Lin & Chu t*	−17.1343**	0.0000	I(1)
	Im, Pesaran and Shin W-stat	−21.6114**	0.0000	I(1)
Exports	Levin, Lin & Chu t*	−17.6885**	0.0000	I(1)
	Im, Pesaran and Shin W-stat	−23.7587**	0.0000	I(1)
Imports	Levin, Lin & Chu t*	−4.25905**	0.0000	I(0)
	Im, Pesaran and Shin W-stat	−5.64676**	0.0000	I(0

Note. Under the Null hypothesis, the series contains a unit root.
, **, * represents level of significance at 10%, 5%, and 1%*
Source: Author's own calculations

The results of first-generation panel unit root tests are shown in Table 4. We have employed two commonly used tests for checking the presence of unit root namely Levin, Lin & Chu, and Imm, 2002 Pesaran, and Shin test. The current account balance shows stationarity in the behavior of the series as shown by a significant value of both test statistics at 5 percent. It implies that the current account balance shows a mean reverting behavior as the null hypothesis is rejected. For external debt P values of both test statistics are significant at first difference at a 5 percent level of significance which clearly implies unit root in the series, and we conclude that external debt is showing a trend in its behavior with no property of mean reversion. External debt is found to be integrated into order 1. Similarly for two major trade variables exports and imports, for exports both test statistics clearly show non-stationarity in series as P values are significant at first difference. Exports are found to be stationary at the first difference at a 5 percent significance level. Test statistics in the case of imports reject the null hypothesis in level form suggesting that imports are integrated of order zero or level stationary.

As earlier depicted by the CD test there exists cross-section dependency in the panel, so we also employed a second-generation panel unit root test that includes cross-sectional dependency. The results of the test are depicted in Table 5,

Table 5

Second Generation Panel Unit Root Test Results

Variable	Method	Constant	Prob	Constant and Trend	Prob	Result
Current Account Balance	Bai and Ng-PANIC	2.62	(0.9990)	3.27	(0.9990)	I(1)
	Pesaran CIPS	-2.10	(<0.05)	-2.26	(>=0.10)	
External Debt	Bai and Ng-PANIC	1.54	(0.9990)	1.55	(0.9990)	I(1)
	Pesaran CIPS	-2.55	(<0.01)	-2.7	(<0.05)	I(0)
Exports	Bai and Ng-PANIC	24.97	(0.9990)	41.10	(0.9990)	I(1)
	Pesaran CIPS	-2.30	(<0.01)	-2.2	(>=0.10)	I(0)
Imports	Bai and Ng-PANIC	-13.68	(0.9990)	13.91	(0.9990)	I(1)
	Pesaran CIPS	-2.64	(<0.01)	-2.71	(<0.05)	I(0)

Note. Under the Null hypothesis, the series contains a unit root.
Source: Author Calculations

For checking the presence of unit roots two test statistics are reported namely Bai and Ng and Pesaran CIPS. The estimated results of two models with constant and constant trends are reported. For current account balance, the results of the Bai and Ng test show unit root in both models whereas the Pesaran CIPS test shows unit root for the model in which trend is included. External debt shows unit root in both models of Bai and Ng whereas the Pesaran CIPS test shows that series is stationary at level. For both exports and imports, the results of Bai and Ng clearly depict non-stationarity in the series implying the presence of unit root whereas the Pesaran CIPS test indicates that both series are level stationary series.

For assessing the sustainability of external debt, it is necessary to see whether the observed characteristics of exports and imports satisfy intertemporal budget constraints also known as solvency conditions. If cointegration is found between exports and imports it implies that external debts are sustainable. Unlike traditional cointegration tests for panel data, the Pedroni test tests the presence of long-term relationships across multiple cross-sections over time. The test proposes seven test statistics based on different forms of cointegration across panels namely within dimensions and between dimensions. For checking cointegration using within dimension four test statistics are proposed namely panel v statistic, panel rho statistic, panel PP statistic, and panel ADF statistic. All these test statistics check cointegration based on individual cross sections whereas the between dimension uses three test statistics namely group rho, group pp, and group ADF statistics based on cointegration across all cross-section units. The results are reported in Table 6 as follows,

Table 6

Pedroni Cointegration Test Results

No Deterministic Intercept or Trend

Within Dimension			Between Dimension		
Statistic Type	Statistic	Prob	Statistic Type	Statistic	Prob
Panel v-Statistic	6.62**	0.0000	Group rho-Statistic	−7.45**	0.0000
Panel rho-Statistic	−14.10**	0.0000	Group PP-Statistic	−11.61**	0.0000
Panel PP-Statistic	−10.61**	0.0000	Group ADF-Statistic	−10.92**	0.0000
Panel ADF-Statistic	−11.03**	0.0000			

Note. Under the Null Hypothesis, there is no cointegration between Exports and Imports
, **, * represents level of significance at 10%, 5%, and 1%*
Source: Author Calculations

Table 7

Deterministic Intercept and Trend

Within Dimension			Between Dimension		
Statistic Type	Statistic	Prob	Statistic Type	Statistic	Prob
Panel v-Statistic	−0.92	0.8218	Group rho-Statistic	−2.36**	0.0091
Panel rho-Statistic	−3.46**	0.0003	Group PP-Statistic	−6.94**	0.0000
Panel PP-Statistic	−4.95**	0.0000	Group ADF-Statistic	−5.69**	0.0000
Panel ADF-Statistic	−3.91**	0.0000			

Note. Under the Null Hypothesis, there is no cointegration between Exports and Imports
, **, * represents level of significance at 10%, 5%, and 1%*
Source: Author Calculations

Table 8

No Deterministic Trend

Within Dimension			Between Dimension		
Statistic Type	Statistic	Prob	Statistic Type	Statistic	Prob
Panel v-Statistic	4.09**	0.0000	Group rho-Statistic	−5.41**	0.0091
Panel rho-Statistic	−6.94**	0.0000	Group PP-Statistic	−7.62**	0.0000
Panel PP-Statistic	−6.31**	0.0000	Group ADF-Statistic	−6.65**	0.0000
Panel ADF-Statistic	−5.73**	0.0000			

Note. Under the Null Hypothesis, there is no cointegration between Exports and Imports
, **, * represents level of significance at 10%, 5%, and 1%*
Source: Author Calculations

For checking the cointegration between exports and imports three models have been estimated both within dimension and between dimensions. A model in which no deterministic trend or intercept is added to all statistics within dimension and between dimensions clearly rejects the null hypothesis of no cointegration as all test statistics are highly significant at a 5 percent level of significance. For the model where deterministic trend and intercept are added within dimension panel v statistic shows no cointegration as explained by insignificant values, whereas the other three statistics reject the null hypothesis of no cointegration whereas all test statistics between dimensions imply cointegration between exports and imports. Lastly, the model for which no deterministic trend is added models all test statistics within dimension and between dimensions clearly rejects the null hypothesis of no cointegration.

Summing up the results of all panel cointegration tests reject the null hypothesis of no cointegration between exports and imports which implies that external debt is sustainable in developing countries thereby satisfying solvency conditions.

Conclusion and Policy Recommendations:

Conclusion

This paper attempts to shed light on the sustainability of external debt in developing countries for the period of 1980 to 2020. To achieve the aforementioned objectives, we have used unbalanced panel data from 60 countries. To test sustainability, the study employed a standard intertemporal approach to the current account used in the literature. For empirical analysis, a standard panel cointegration methodology is adopted.

The findings of our study imply that in our model of developing countries external debt is found to be sustainable since there is strong evidence of cointegration of exports and imports using both first- and second-generation panel cointegration models. This cointegration between exports and imports necessarily implies that the countries are satisfying their external constraint or the solvency condition which restricts them from lending or borrowing in international financial markets indefinitely. Our findings are found to be consistent with both first- and second-generation

panel cointegration tests. This cointegration between exports and imports also implies that countries are generating enough trade surpluses which enable them to finance their future external debt or in other words, the discounted value of future external debt of developing countries matches with their trade surpluses that these countries generate today.

Policy Recommendations

Based on the findings following recommendations for policymakers are suggested for external debt management in developing countries,

1. There is a need to maintain fiscal discipline and budgetary control. Countries must align their borrowings with developmental priorities, and it must be ensured that debt should finance those activities that aid economic growth in a country which would help to pay debt servicing costs.
2. Countries should set and adhere to sustainable levels of Debt GDP ratios and avoid accumulating excessive debt since it jeopardizes long-term economic activity and strains resources toward nonproductive needs.
3. Countries should stabilize their currencies and avoid depreciation as it was found that currency depreciation is a major factor which is accumulating external debt in developing countries. Necessary actions that can be taken include, effectively implementing, and maintaining prudent fiscal and monetary policy, controlling inflation, promoting exports, diversifying the economy, maintaining a healthy level of foreign exchange reserves, encouraging foreign direct investment in the economy, etc.
4. Countries should improve their current account balance as it is one of the major determinants of external debt. For improvement, countries should promote export-oriented industries and enhance export competitiveness, encourage import substitution by growing domestic industries, rationalize import tariffs, and optimization of domestic resources. Apart from macroprudential measures can be taken which include effective exchange rate policies that support exports, prudent macroeconomic policies and their coordination, infrastructure development, etc.

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