



## External Debt - Blessing or Curse: Empirical Evidence from Pakistan

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### ABSTRACT

This study investigates the impact of external debt on the economic growth of Pakistan using annual time series data over the period 1976 to 2018. For this purpose, the syntheses of debt overhang and debt crowding-out hypotheses are examined within the framework of augmented Solow growth model. An autoregressive distributed lag (ARDL) model, Error Correction model and appropriate data diagnostic tests are applied. The empirical results indicate that external borrowing and debt servicing hamper the economic growth in Pakistan. Results reveal that 1% increase in stock of external debt is causing 0.20% fall in economic growth. Similarly, 1% increase in debt servicing is causing 0.13% fall in economic growth. The findings of this study suggest that the policy makers should create a conducive environment for bringing increase in the level of domestic savings and exports, and should focus on increasing the inflow of capital through foreign direct investment and attracting the foreign exchange reserves. Incorporation of debt monitoring system along with its management is also required for minimizing the adverse effects of debt overhang and debt crowding out effects of the external debt.

**Keywords:** External Debt; Economic Growth; ARDL; Pakistan

**JEL Classifications:** F34, O11, C22, P24

### 1. INTRODUCTION

Heavy indebtedness has been remained one of the major policy issue in Pakistan since the beginning of 21<sup>st</sup> century (Akram, 2013). Depending upon the nature of government policies and economic environment of the country, external borrowing reacts to shape the growth process accordingly. Countries who give effective response towards external borrowing in the form of deploying wide variety of policy approaches normally succeed to combat with the adverse effects of external debt. On the other hand, it would affect the economic growth negatively if the government policies are not effective towards utilization of the borrowed money in investment-oriented projects and been spent on purposes which do not bring any profit. Similarly, countries who fail to meet their debt obligations suffer from severe macroeconomic imbalances in the form of high fiscal discrepancy, deterioration in foreign exchange

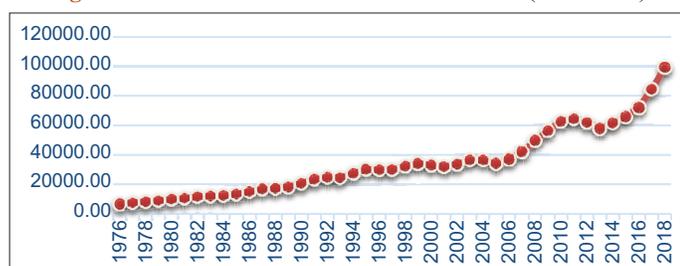
reserves, fall in confidence of investors, instability in exchange rate and persistent fall in its credit rating by the international rating agencies (Economic Survey of Pakistan, 2007-2008). It means that when the fund raisers failed to inject the borrowed money in the revenue generating and other productive projects, then excessive borrowing not only leads to reduce the debt servicing and loan amortization abilities of the indebted country but also creates obstacles in the path of getting sustainable economic growth and development in the long run (Abdelaziz et al., 2019). Therefore, the borrowed money should be utilized effectively and productively in such types of developmental and investment-oriented projects which help in enhancing the debt carrying capacity of the debtor country.

Rapid increase in the stock of overseas debt put hurdles in the path of economic growth, which constitutes obstacles to

macroeconomic stability (in the form of inflation, unemployment and poverty), discourages the inflow of capital, depreciates the local currency, and produces hindrances for government to bring reforms in different sectors of the economy (Ahmad, 2015). The empirical findings suggest that external borrowing leads to depress the growth process by increasing the uncertainty of investors about future decisions of the government, especially the taxes, to meet its debt servicing obligations, which causes deterioration in the macroeconomic environment by hindering the level of investment and growth. Factors like persistent level of current account deficit, sluggish economic growth, imprudent utilization of the stock of debt, increase in debt service payment (cost of debt), stagnant exports, short fall in foreign exchange reserves, high fiscal deficit, devaluation of currency, huge defense expenditures, incompleteness of different developmental projects by the government, and frequent changes in its policies are considered to be the crucial factors of external debt accumulation in Pakistan (Awan and Asghar, 2011; Sheikh et al., 2013; Awan et al., 2015; Azam and Feng, 2017). Figure 1 presents the history sheet of external debt in Pakistan, whereas Figure 2 depicts its relationship with the gross domestic product.

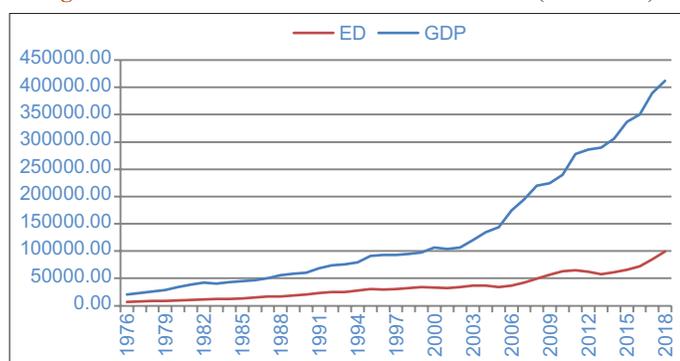
Studies focused on quantifying the effects of external debt on key macroeconomic variables, like investment and economic growth, have presented different theories in support of their claims. The classical and neoclassical economists are of the view that external debt discourages the investment and hampers the growth performance in the long run. The Ricardian economists consider it as a tax on future generation and believe on its neutrality in the context of debt-growth nexus (Barro, 1990). On the other hand, the Keynesian economists have considered its short run impact and have focused on policy prescriptive for combating with its

**Figure 1:** External debt accumulation in Pakistan (1976-2018)



Source: World Development Indicators (2020)

**Figure 2:** External Debt and GDP in Millions USD (1976-2018)



Source: World Development Indicator, 2020

adverse effects. Similarly, there are several other contributions from numerous researchers who have analyzed the cost of debt in terms of its diversion from potential spending areas towards debt servicing and loan amortization (Moss and Chiang, 2003).

Researchers have divided the repayment liability of the external debt into two components; principal amount which is supposed to be amortized on maturity of the loan agreement (either in total or in periodical installments) and the interest on loan (debt servicing) which is supposed to be paid as per mutual consent of the parties. Keeping in view these two components of the external debt, researchers have classified the debt-growth dilemma into two main categories; the debt overhang dilemma and the debt crowding-out dilemma. The channel through which the growth process is dampened by the principal amount of overseas debt is known by the debt overhang dilemma. It is a channel through which the external debt accumulation starts affecting the investment and growth negatively. In literature, ratio of debt to GDP has been used as indicator for the measurement of this effect (Cordella et al., 2005; Sen et al., 2007; Hwang et al., 2010; Fosu, 2011; Sichula, 2012; Lee and Ng, 2015; Daka et al., 2017; Ndubuisi, 2017; Matuka and Asafo, 2018; Shkolnyk and Koilo, 2018; Nor-Eddine and Chkiriba, 2019). In contrast, Siddiqui and Malik (2001), Maana et al. (2008), Sheikh et al. (2010), Lau and Kon (2014), Talreja et al. (2016), Jaurez and Almada (2016), and Chaudhry et al. (2017) found that external debt acts as a stimulating factor of economic growth. On the other hand, when the adverse effects of debt are transmitted by the debt service payment, then it is known by the debt crowding-out dilemma. It refers to that situation where the domestic creditors (especially the central bank) are unable to meet the needs of investors due to higher lending rate and liquidity constraints (Broner et al., 2013). Researchers have used the ratio of debt servicing to exports as indicator for the measurement of this dilemma. Studies made by Cordella et al. (2005), Hwang et al. (2010), Ndubuisi (2017), Matuka and Asafo (2018), and Shkolnyk and Koilo (2018) used this variable in their models and confirmed the existence of debt crowding out hypothesis. Similarly, those who tried to connect the external debt with growth, without incorporating the debt overhang or debt crowding-out effects, do believe that debt is a curse for the economic growth of Pakistan (Malik et al., 2010; Ali and Mustafa, 2012; Jibrán et al., 2016; Sajjad et al., 2018). However, there are few researchers who believe on the positive externalities and blessings of the foreign debt and consider it beneficial for boosting the standard of living and economic growth of Pakistan (Siddiqui and Malik, 2001; Khan et al., 2016).

In line with the assessment made by Cordella et al. (2005), Sen et al. (2007), Hwang et al. (2010), Daka et al. (2017), Matuka and Asafo (2018), and Shkolnyk and Koilo (2018) this study also intends to examine the debt-growth dilemmas in Pakistan. We are agree with their assessment, but our point of departure is that, first, this study intends to examine the synthesis of debt overhang and debt crowding out effects combinely. Second, these dilemmas have been examined within the framework of augmented Solow growth model. Third, growth rate of GDP per capita has been used for the 1<sup>st</sup> time as a dependent variable in a model that investigates the debt-growth dilemmas for Pakistan. Fourth, ARDL bound

testing approach is deployed as estimation technique for the issue in hand. Fifth, error correction model and a variety of diagnostic tests are also conducted in this study. We hope that present study will help in the provision of a productive base for the policy makers to formulate sound and future oriented effective strategy for minimizing the adverse effects of foreign debt.

This article is organized as follows. Section 2 presents the review of literatures and highlights the research gap. Section 3 is centered on the methodology deployed. Section 4 presents the analysis of data and discusses the research findings. Section 5 concludes the study and highlights policy guidelines.

## 2. LITERATURE REVIEW

Researchers have not only used different nature of data but have also used different sort of econometric techniques for the analysis of the cited issue in different countries around the globe. Review of their empirical work is presented in the following two sections.

### 2.1. Literature in General on the External Debt and Growth Relationship

Cordella et al. (2005) investigated the synthesis of debt overhang effect for eighty highly indebted poor countries by adding the foreign debt variable in the augmented Solow growth model. They divided the panel sample of eighty countries into highly indebted and non-highly indebted poor countries. By applying the panel OLS and system GMM, they found that debt overhang dilemma is effective in non-highly indebted poor countries only if it crosses the inflexion point and becomes sufficiently high. The findings of this study also depicted that countries with sound institutional framework and effective policies may also experience the debt overhang effect if it crosses the threshold level of debt, which is 15-30% of GDP in this study. Sen et al. (2007) also analyzed this effect for six Asian and five Latin American countries by applying a variety of panel data estimation techniques including OLS, fixed-effects model, random-effects model and system GMM to a panel data of 32 years. The findings of this study identified that debt overhang effect exists for both types of countries but it seems to be moderate for Asian countries as compare to Latin American countries. Hwang et al. (2010) extended this work for same region by increasing the number of panel sample, from 11 to 20, and examining the synthesis of debt crowding out effect as well. The panel estimators used in this study indicated that debt overhang prevails in these countries. The debt crowding out effect was confirmed by the fixed-effects and GMM models. The OLS techniques, used in this study, ended with a crowding-in scenario.

Fosu (2011) examined and confirmed the existence of debt overhang hypothesis in thirty five Sub Saharan African countries. Zafar et al. (2015) used the augmented neo-classical growth model and triggered to sort out debt-growth synthesis for a pooled sample of thirty three countries. Panel data estimators depicted that external debt is the key determinant which dampens the economic growth in these countries. Farhani (2016) also examined the debt-growth dilemma in India by utilizing the augmented Solow growth model. Results of the ARDL bound test depicted that debt overhang and debt crowding out synthesis prevail in India. However,

Jilenga et al. (2016) and Chaudhry et al. (2017) found that foreign debt acts as a stimulating factor of the economic growth. Similarly, Daka et al. (2017) also came with different conclusions in terms of time period; first, debt overhang effect was found effective only in the long run. It was noticed to be a stimulating factor of the growth in short run. Second, the crowding-out effect was found effective only in the short run. External borrowing was found to be a source of blessings for the economy as it leads to debt crowding-in effect in the long run. Ndubuisi (2017) denied the roots of debt overhang hypothesis by noting that foreign debt is stimulating the growth process in Nigeria. The crowding-out synthesis of debt was found valid in this study.

Pegkas (2018), Kharusi and Ada (2018), Shittu et al. (2018), Senadza et al. (2018) and Çiftçiöğlü and Sokhanvar (2018) found that external debt deteriorates the growth process in the long run. Matuka and Asafo (2018) found that debt overhang is effective only in the short run, whereas the debt crowding out is effective in both periods. Shkolnyk and Koilo (2018) found that debt overhang is effective in most of the countries they used in their analysis. Nor-Eddine and Chkiriba (2019) noted that the short run effect of the debt overhang is more severe than its long run effect.

### 2.2. Literature on the External Debt and Growth Relationship in Pakistan

Researchers around the globe have also explored this issue for Pakistan. Siddiqui and Malik (2001) noted that foreign debt accumulation leads to strengthen the growth process in Pakistan. In contrast, Malik et al. (2010) and Atique and Malik (2012) found that debt overhang and debt crowding out synthesis prevail in Pakistan. They also highlighted that mismanagement of debt is the root cause of sluggish economic growth because it does not allow debt to play its due role in the process of development. Ali and Mustafa (2012) concluded that foreign debt accumulation is the key factor which traps the country in debt overhang situation and leads to sluggish economic growth. Shahzad et al. (2014) also concluded that external debt dampens the growth process in Pakistan. In contrast, Khan et al. (2016) found that the association of public debt with the economic growth is positive but statistically insignificant. On the other hand, the findings of Jibrán et al. (2016) and Sajjad et al. (2018) indicated that debt crowding-out hypothesis is effective for Pakistan's economy. Table 1 presents a brief summary of this whole discussion.

In sum, it appears that there is a dynamic association between economic growth and debt indicators; however the evidence of a clear connection is still unclear. The reasons behind this synthesis may be the selection of rout identifying the linkage between the two or selection of variables and data, or nature of area covered (geographical or economical) and methods of estimation. Therefore, no one can tell prior the exact relationship between the two without acquiring a necessary econometric analysis. Clearly, it creates a need that this area may be investigated yet further.

## 3. DATA AND EMPIRICAL METHODOLOGY

External debt, if used effectively by the country who needs external financing, can play an active role in capital accumulation through

Table 1: Summary of the literature review

A. Other countries					
Author (s)	Sample periods	Methodology	Dependent variable	Independent variables	Findings
Cordella et al. (2005)	Eighty highly indebted and non-highly indebted poor countries 1970-2002	Panel OLS system GMM	Growth rate of real GDP	External debt, debt service payment, foreign aid, population growth, term of trade, education, investment, inflation and trade openness	Debt overhang synthesis prevails only for non-highly indebted poor countries. Countries with sound institutional framework will experience the debt overhang problem as the external debt exceeds the inflexion point
Sen et al. (2007)	Six Asian and five Latin American countries (1982-2002) and (1970-2000)	OLS, FEM, REM, System GMM	GDP per capita	Ratio of debt to GDP, ratio of debt services to GDP, ratio of debt to exports, gross fixed capital formation, and labor force	Debt overhang hypothesis was found valid, but found moderate for Asian countries as compare to Latin American countries
Hwang et al. (2010)	Twenty Asian and Latin American countries 1982-2004	OLS, FEM and GMM	GDP per capita	External debt, debt servicing, gross fixed capital formation and labor force	Debt overhang effect was confirmed for these countries by each estimator. The crowding out effect was found effective only in FEM and GMM. The OLS gave a crowding-in effect for the ratio of debt servicing to exports
Foso (2011)	Thirty five Sub-Saharan African countries 1980-1990	OLS	GDP	External debt and growth rate of labor, capital and exports	Debt overhang effect was found effective in these countries
Zafar et al. (2015)	33 countries from East Asia, Middle East, North Africa, and South Asia 1980-2012	REM, FEM	Growth rate of GDP	External debt, saving, trade openness, government expenditure and FDI	External debt impedes growth negatively and significantly
Farhani (2016)	India 1970-2012	ARDL bound test, Vector ECM, GCT	Real GDP	External debt, debt servicing and military spending	Debt indicators were found to be the key factors of sluggish economic growth in India
Jilenga et al. (2016)	Tanzania 1971-2011	ARDL	Real GDP	Foreign debt, debt servicing, FDI, exchange rate, and net official development assistance	Debt indicators play a positive role in the economic growth of Tanzania
Chaudhry et al. (2017)	25 developing countries 1990-2014	FMOLS, JFPCT	Real GDP	External borrowing, labor force, gross fixed capital formation, domestic saving and government consumption	External debt and FDI stimulate the economic growth in these regions
Shkolnyk and Koilo (2018)	Ukraine and other emerging economies 2006-2016	ADL	Growth rate of GDP	Foreign debt, debt service payment, population growth, investment, GNI per capita, exchange rate, unemployment rate, trade openness and foreign reserves	Debt overhang problem was found effective for America, Azerbaijan, Belarus, Kazakhstan, Moldova and Ukraine
Pegkas (2018)	Greece 1970-2016	ARDL, VAR	Real GDP	External debt, trade openness, investment, private consumption, government consumption and population growth	External debt hampers the economic growth negatively and significantly
Shittu et al. (2018)	Five Sub-Saharan African countries 1990-2015	FMOLS, dynamic OLS	GDP	External debt, corruption, interest on debt and gross capital formation	External debt hampers the growth process in these countries
Kharusi and Ada (2018)	Oman 1990-2015	ARDL, ECM	Growth rate of GDP	External debt, trade openness, population, physical capital, human capital and inflation	External debt hampers the growth process in Oman
Senadza et al. (2018)	39 Sub-Saharan African countries 1990-2013	System GMM, FEM, REM	Growth rate of GDP	Foreign debt, labor force, investment and exports	External debt hampers the growth process in these countries

(Contd...)

Table 1: (Continued)

A. Other countries					
Author (s)	Sample periods	Methodology	Dependent variable	Independent variables	Findings
Çiftçiöğlu and Sokhanvar (2018)	Twelve Central and Eastern Europe 1995-2014	FEM GCT	Growth rate of real GDP	External debt, ratio of $M_2$ to GDP, investment, inflation, trade openness and education Same as above	Growth is negatively correlated to external debt. Granger causality was found in eight countries, going from external debt to GDP
Nor-Eddine and Chkiriba (2019)	Morocco 1988-2016	ARDL bound testing approach	Growth rate of real GDP per capita	External debt, debt servicing, gross fixed capital formation, human capital, terms of trade, inflation and corruption perception index	Foreign debt hampers the growth process in Morocco both in long run as well as in short run
B. Pakistan					
Siddiqui and Malik (2001)	Sri Lanka, Pakistan and India 1975-1998	OLS FEM	Growth rate of GDP	Foreign debt, debt servicing, investment, budget deficit, trade openness and population growth	Foreign debt stimulates the growth process significantly
Malik et al. (2010)	Pakistan 1972-2005	OLS	GDP at factor cost	External debt and debt servicing	External debt and debt servicing are adversely affecting the economic growth
Atique and Malik (2012)	Pakistan 1980-2010	JCT, ECM	Growth rate of GDP	Domestic debt, investment, inflation, labor force and corruption perception index	The synthesis of debt overhang and debt crowding out effects exist in Pakistan
Shahzad et al. (2014)	Pakistan 1980-2013	OLS	GDP growth	Domestic debt is replaced with external debt External debt, debt servicing, FDI, national saving and export of goods and services	External debt was found to have a significant and negative impact on the economic growth of Pakistan
Khan et al. (2016)	Pakistan 1972-2013	ARDL bound testing model, ECM	Real GDP	Public debt, investment, population and human capital	Foreign debt is affecting the growth process positively but insignificantly
Jebran et al. (2016)	Pakistan 1972-2012	ARDL bounding testing approach	GDP	Public debt, debt service payment, inflation and trade openness	Foreign debt hampers the growth process significantly
Sajjad et al. (2018)	Pakistan 1980-2016	OLS, JCT	GNP Growth rate of GDP	Same as above External debt servicing, total debt servicing, human capital, gross fixed capital formation, FDI and exports	Foreign debt servicing and total debt also hampers the growth process

GMM: Generalized methods of movement, FEM: Fixed-effects model, REM: Random-effects model, JCT: Johansen co-integration test, GCT: Granger causality test, ARDL: Autoregressive distributed lag, ECM: Error correction model, VAR: Vector auto regressive model, FMOLS: Fully modifies ordinary least square, JFPECT: Johansen fisher Panel cointegration test

portfolio investment in productive ventures and, eventually, to economic growth. However, it may also lead to debt overhang and debt crowding out dilemmas if the debtor country fails to service its debt obligations, especially in that situation when the cost of debt is expected to exceed the repayment capacity of the debtor country in the future. Similarly, it may also lead to produce “credit rationing” dilemma which occurs when the debtor country is unable to get new loans due to their inability and unwillingness to service their debt obligations. Consequently, the government will start to spend major portion of their earnings from productivity and exports on loan amortization. Similarly, government will also bring increase in taxation on the investment projects to service its debt liabilities, which will create disincentives for the investors and they will start thinking about the postponement of their investment decisions. Resultantly, the growth process and investment will be dampened and the country will start suffering from debt overhang and debt crowding out dilemmas.

**3.1. Theoretical Framework**

As we know that debt has to play no role in the classical growth model because they have assigned a very limited role to the government. However, the Keynesian and Neo-classical growth models are in deep concern about the role of government, especially when the economy suffers from the deficit saving scenario. Both these school of thoughts are of the view that if an economy suffers from this scenario, then government can use the option of taking debt from its sources (no matter whether internal or external). According to the neo-classical growth model, the developing countries have limited stock of capital and investment opportunities at initial stages of the economic growth. Therefore, capital mobility to such countries, if used optimally, causes macroeconomic stability and growth to these economies (Akram, 2013).

**3.2. Solow Growth Model**

The famous Cobb-Dougllass production function which is also known by Solow-Swan Neo-classical growth model, produced by Solow (1956) and Swan (1956), can be expressed in the following way:

$$Y=f(A,K,L)=AK^\alpha L^{(1-\alpha)} \tag{1}$$

with  $0 \leq \alpha$  and  $1-\alpha \leq 1$

Where Y = real output; K = stock of capital input; L = labor input; A = representative of technology;  $\alpha$  = output elasticity of capital, a number between zero and one;  $1-\alpha$  = output elasticity of labor.

The given production function can also be expressed in the following manner, if we manipulate it mathematically:

$$Y=k^\alpha \tag{2}$$

This equation holds:

- a. Constant return to scale, and
- b. Diminishing return to each input.

We also know that

$$Y=C+I \tag{3}$$

Where; Y, C and I stand for output per worker, consumption per worker and investment per worker, respectively. Mathematical manipulation of this equation gives us the following capital accumulation equation.

$$I = sY \text{ OR } I = sk^\alpha \tag{4}$$

Where; i = accumulation of new capital; s = saving rate; Y = amount of output; and  $k^\alpha$  = amount of existing capital stock. This equation denotes that increase in capital stock will lead to economic growth.

Mathematically;

$$\Delta k = i - \delta k \text{ OR } \Delta k = sY - \delta k \tag{5}$$

Where;  $\Delta k$  = change in capital stock =  $sY$  = gross investment (investment per worker),  $\delta k$  = depreciation cost

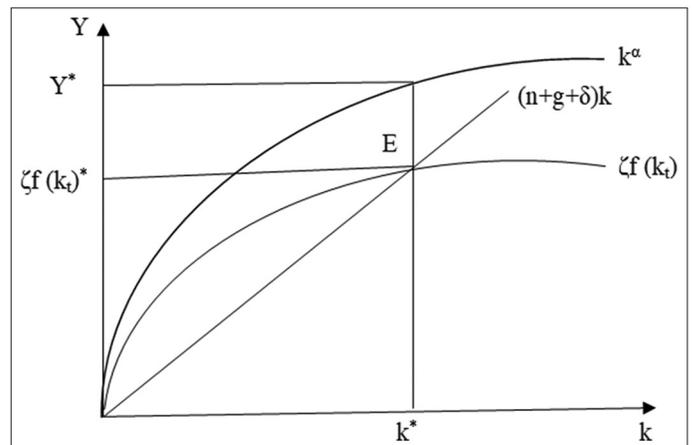
This equation indicates that investment and depreciation cost are the two factors which affect the capital stock ( $k^\alpha$ ). To find the impact of growth in technology and growth in population on stock of capital, Solow extended his analysis and derived the following capital accumulation equation in term of per worker, which is also know by the fundamental law of motion.

$$k_t^* = \zeta f(k_t) - (n+g+\delta)k_t \tag{6}$$

Where; n = growth in population, g = technological growth, and  $\delta$  = depreciation cost. It implies that the difference between actual investment [ $\zeta f(k_t)$ ] and break-even investment [ $(n+g+\delta)k_t$ ] will yield the rate of change in capital stock per unit of effective labor ( $k_t^*$ ). So if we want to live on the break-even point then we have to equalize both the actual and break-even investments. Figure 3 concludes this whole discussion.

This diagram represents the Solow growth model with the help of three curves. First, the production function curve ( $k^\alpha$ ), second, actual investment curve [ $\zeta f(k_t)$ ] and, third, break-even investment curve [ $(n+g+\delta)k_t$ ], which is a combination of growth in population “nk”, growth in technology “gk” and depreciation cost “ $\delta k$ .”

**Figure 3: Solow production function**



### 3.3. External Debt and Solow Growth Model

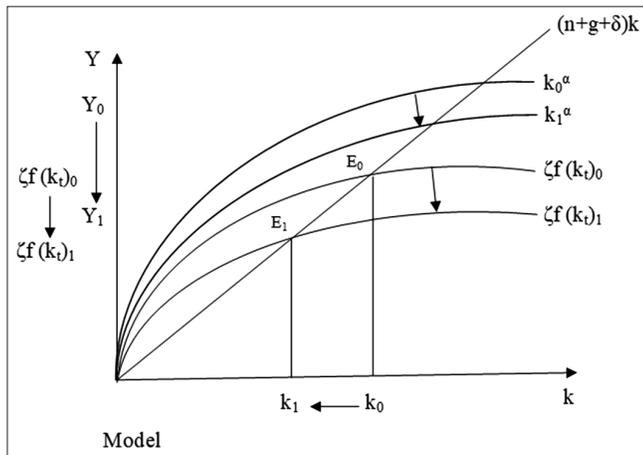
Debt overhang dilemma is based on the proposition that the loan amortization policy of the government leads the country to increase the rate of tax on the private sector which, in turn, not only reduces the level of private investment but also leads the economy toward sluggish economic growth. Resultantly, it will cause the actual investment curve [ $\zeta f(k_t)$ ] and production function curve ( $k^\alpha$ ) in the Solow growth model to shift downward. Similarly, when major portion of the income generated from export and monetary resources like foreign exchange reserves and foreign aid are spent to meet the debt obligations, the debtor countries are then left with fewer resources for public investment and financing the government expenditures, a case of debt crowding-out effect. This decrease in public investment will deteriorate the growth process and will bring a downward shift in the investment and production curves (i.e., from equilibrium point  $E_0$  to  $E_1$ ). It means that the presence of debt-overhang and debt crowding-out dilemmas will cause a downward shift in the investment and production function in the augmented. Solow growth model. Figure 4 presents a brief summary of this whole discussion.

This diagram indicates that no matter whether we are interested to investigate the dilemma of debt overhang or debt crowding-out, individually or collectively, the resulting change in investment and economic growth will be the same.

### 3.4. Model Specification and Data

As discussed above, Solow growth model describes the productivity of a country by attributing it to growth in capital and labor only. However, the literature review portion of this study indicates that there are numerous studies who have mentioned so many other variables

Figure 4: External debt and solow growth



that affect the productivity and growth. Sen et al. (2007), Adegbite et al. (2008), Hwang et al. (2010), Fosu (2011), Sichula (2012), Azam et al. (2013), Akram (2013), Shabbir (2013), Sánchez-Juárez and García-Almada (2016), Daka et al. (2017), Matuka and Asafo (2018) and Shkolnyk and Koilo (2018) used the augmented neo-classical growth model for estimating the impact of foreign debt and debt service payment on the productivity of different regions across the globe. In line with these studies, this study also aims to use the neo-classical growth model as a base line equation and make it augmented through inclusion of the targeted variables and the error term. External debt as percent of GDP is used in this model as indicator of the debt overhang dilemma, whereas debt service payment as percentage of exports is added for the purpose of analyzing the debt crowding-out hypothesis. It is expected that these variables will produce a negative relationship with the growth rate of GDP per capita. Detail description of the remaining variables is summarized in Table 2.

Regarding the estimation tools, this study is focused on the ARDL bound testing approach of cointegration used by Pesaran et al. (2001) and Fatukasi et al. (2015). This technique is more proficient than other estimators of cointegration in many aspects; firstly, it avoids endogeneity problem which is linked with the Engle and Granger (1987). Secondly, it has the privilege of estimating the long-run and short-run parameters of the model simultaneously (Pesaran and Pesaran, 1997). Thirdly, it has the ability to give better results of cointegration for small sample size. Finlay, pretesting of unit root and checking for the order of cointegration are also not required for this tool. Though, applying the unit root tests were not required but still ADF and PP tests are used to confirm the stationarity of variables. In addition, diagnostic tests including Durbin-Watson for auto correlation, LM test for serial correlation, Breusch-Pagan-Godfrey (BPG) for heteroscedasticity, Jarque-Bera for the normality of residuals. In light of the above discussion, the augmented neo-classical growth model will become:

$$\begin{aligned} \Delta G_t = & \delta_0 + \sum_{i=1}^n \delta_1 \Delta G_{t-1} + \sum_{i=0}^n \delta_2 \Delta ED_{t-1} \\ & + \sum_{i=0}^n \delta_3 \Delta DSP_{t-1} + \sum_{i=0}^n \delta_4 \Delta ER_{t-1} + \sum_{i=0}^n \delta_5 \Delta FDI_{t-1} \\ & + \sum_{i=0}^n \delta_6 \Delta GFCF_{t-1} + \sum_{i=0}^n \delta_7 \Delta HK_{t-1} + \\ & \sum_{i=0}^n \delta_8 \Delta INF_{t-1} + \sum_{i=0}^n \delta_9 \Delta LF_{t-1} + \\ & \sum_{i=0}^n \delta_{10} \Delta FER_{t-1} + \gamma_1 G_{t-1} + \gamma_2 ED_{t-1} + \gamma_3 DSP_{t-1} \\ & + \gamma_4 ER_{t-1} + \gamma_5 FDI_{t-1} + \gamma_6 GFCF_{t-1} + \gamma_7 HK_{t-1} + \gamma_8 INF_{t-1} \\ & + \gamma_9 LF_{t-1} + \gamma_{10} FER_{t-1} + \epsilon_j \dots \dots \dots R \end{aligned} \tag{7}$$

Table 2: Variables description/definition and sources (dependent variable is GDP per capita)

Variables	Symbols	Definition/unit	Source	Expected sign
External debt	ED	External debt as percent of GDP	WDI (2020)	-
Debt service payment	DSP	DSP as percent of exports	WDI (2020)	-
Exchange rate	ER	Exchange rate	Economic research division (2020)	+
Foreign direct investment	FDI	FDI as percent of GDP	WDI (2020)	+
Capital	GFCF	GFCF as percent of GDP	WDI (2020)	+
Human capital	HK	Primary school enrollment	WDI (2020)	+
Inflation	INF	Growth rate of CPI	WDI (2020)	-
Labor force	LF	Total population aged between 15 and 64	WDI (2020)	+
Foreign exchange reserve	FER	Foreign reserve as percent of GDP	WDI (2020)	+

Where:

- G=Growth rate of GDP per capita
- ED=External debt as a percent of GDP, representative of the debt overhang effect
- DSP=Debt service payment as percent of exports, representative of the debt crowding out effect
- ER=Exchange rate
- FDI=Foreign direct investment as percent of GDP
- GFCF=Gross fixed capital formation as percent of GDP
- HK=Human capital/literacy rate measured by primary school enrollment
- INF=Inflation rate measured by consumer price index
- LF=Labor force participation rate
- FER=Foreign exchange reserves as percent of GDP
- (t)=Time period
- $G_{t-1}$ =Lagged value of GDP per capita, for capturing the conditional convergence of income
- $\delta_1$  to  $\delta_{14}$ =Short run dynamics of the model
- $\gamma_1$  to  $\gamma_{14}$ =Long run cointegration vector
- $\epsilon_j$ =Error term with zero mean and constant variance

The following null hypothesis of no cointegration will be tested against the alternative hypothesis. Symbolically:

$$H_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 = \delta_{10} = 0$$

$$H_A = \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq \delta_8 \neq \delta_9 \neq \delta_{10} \neq 0$$

The F-statistics of bound cointegration is used for establishing the long-run association among the target variables. If the computed F-statistics value was found exceeding the upper bound critical values, it means that variables are cointegrated in the long run, and the null hypothesis ( $H_0$ ) will be rejected. In this situation (if  $H_A$  is accepted), this study will use the following long-run ARDL model of cointegration.

$$\begin{aligned} \Delta G_t = & \delta_0 + \sum_{i=1}^n \delta_1 \Delta G_{t-1} + \sum_{i=0}^n \delta_2 \Delta ED_{t-1} \\ & + \sum_{i=0}^n \delta_3 \Delta DSP_{t-1} + \sum_{i=0}^n \delta_4 \Delta ER_{t-1} + \sum_{i=0}^n \delta_5 \Delta FDI_{t-1} \\ & + \sum_{i=0}^n \delta_6 \Delta GFCF_{t-1} + \sum_{i=0}^n \delta_7 \Delta HK_{t-1} + \sum_{i=0}^n \delta_8 \Delta INF_{t-1} \\ & + \sum_{i=0}^n \delta_9 \Delta LF_{t-1} + \sum_{i=0}^n \delta_{10} \Delta FER_{t-1} + \mu_j \end{aligned} \quad (8)$$

Error correction model is constructed in the following manner, just to analyze the short-run dynamics of the model.

$$\begin{aligned} \Delta G_t = & \rho_0 + \sum_{i=1}^n \rho_1 \Delta G_{t-1} + \sum_{i=0}^n \rho_2 \Delta ED_{t-1} + \sum_{i=0}^n \rho_3 \Delta DSP_{t-1} \\ & + \sum_{i=0}^n \rho_4 \Delta ER_{t-1} + \sum_{i=0}^n \rho_5 \Delta FDI_{t-1} + \sum_{i=0}^n \rho_6 \Delta GFCF_{t-1} \\ & + \sum_{i=0}^n \rho_7 \Delta HK_{t-1} + \sum_{i=0}^n \rho_8 \Delta INF_{t-1} + \sum_{i=0}^n \rho_9 \Delta LF_{t-1} \\ & + \sum_{i=0}^n \rho_{10} \Delta FER_{t-1} + \zeta ECM_{t-1} + \mu_t \end{aligned} \quad (9)$$

## 4. RESULTS AND DISCUSSION

### 4.1. Unit Root Test

Tables 3 and 4 depict the results of ADF and PP tests of stationarity, both at level and at 1<sup>st</sup> difference. These tests were conducted

with intercept and time trend in the model. The optimal number of lags included in the test was based on automatic selection by Schwartz-Bayesian Criteria (SBC), Akaike Information Criteria (AIC) and the adjusted R<sup>2</sup> Criteria. The values in the parenthesis indicate the stationary of variables at level or at first difference. The estimated values of these variables indicate that all of them are stationary either at level or at first difference (i.e.  $H_0$  is rejected).

### 4.2. ARDL Bound Cointegration Test

Before applying this test, F-Bound test was conducted as an evidence for the existence of long run cointegration. The calculated F-Bound test was conducted against the null hypothesis of no cointegration in the long run. Table 5 indicates that the calculated F-statistics value is higher than the upper bound tabulated value at all the traditional levels of significance, i.e., 1%, 2.5%, 5% and 10% critical values, which provides enough evidence to reject the null hypothesis of no cointegration.

**Table 3: Unite root test augmented dickey fuller test**

Variables	Null hypothesis		Unit root	
	(With intercept)		(With Intercept and trend)	
	t-statistics	Decision	t-statistics	Decision
GDP	-4.533015*	I(0)	-4.566686*	I(0)
ED	-6.879796*	I(1)	-6.778763*	I(1)
DSP	-9.278799*	I(1)	-9.391137*	I(1)
ER	-3.646103*	I(1)	-4.445942*	I(1)
FDI	-4.328052*	I(1)	-4.301879*	I(1)
GFCF	-3.241614**	I(0)	-3.698115**	I(0)
HK	-9.404133*	I(1)	-10.13317*	I(1)
INF	-8.614882*	I(1)	-8.839411*	I(1)
LF	-3.196123**	I(1)	-4.913861*	I(1)
FER	-7.566827*	I(1)	-7.463242*	I(1)

\*, \*\* indicate that null hypothesis is rejected at 1% and 5% levels of significance, respectively

**Table 4: Unite root test: Phillips-perron (PP) test**

Variables	Null hypothesis		Unit root	
	(With intercept)		(With intercept and trend)	
	t-statistics	Decision	t-statistics	Decision
GDP	-4.572288*	I(0)	-4.523445*	I(0)
ED	-6.879796*	I(1)	-6.778763*	I(1)
DSP	-9.278799*	I(1)	-9.833671*	I(1)
ER	-3.696005*	I(1)	-3.910845**	I(1)
FDI	-4.289207*	I(1)	-4.258528*	I(1)
GFCF	-3.241550**	I(0)	-3.667540**	I(0)
HK	-9.431791*	I(1)	-10.63182*	I(1)
INF	-8.184661**	I(1)	-8.825370*	I(1)
LF	-7.694287*	I(1)	-9.061517*	I(1)
FER	-7.675986*	I(1)	-7.564241*	I(1)

\*, \*\* indicate that null hypothesis is rejected at 1% and 5% levels of significance, respectively

**Table 5: Cointegration test (F-bound test)**

$H_0$ : No cointegration (null hypothesis)			
Calculated F-statistic	F-bound test		
	4.952994		
	Lower bound	Upper bound	
10%	1.88	2.99	
5%	2.14	3.3	
2.5%	2.37	3.6	
1%	2.65	3.97	

Table 5 also depicts that all variables of the model should be considered as the long-run determinants of economic growth in Pakistan. So based upon the results of the F-test we, therefore, proceed for finding the long run estimates of the model.

### 4.3. Long Run Estimates

The ARDL bound test confirms the existence of long-run relationship among the variables. Table 6 depicts that; first, external debt and labor force are significant at 1%, second, debt service payment, foreign direct investment and gross fixed capital formation are significant at 5%, and finally, exchange rate, human capital and foreign exchange reserves are significant at 10%. Surprisingly, the inflation rate stood insignificant at all the three traditional levels of significance.

The coefficient of the foreign debt variable indicates that debt overhang dilemma exists in Pakistan. It denotes that 1% increase in foreign debt will lead to decrease the economic growth of Pakistan by 0.20%, approximately. Thus, the economic rationale for boosting the growth process is to decrease the stock of foreign debt as it discourages the growth process significantly. The results of this variable supports the theoretical expectation of the classical and neoclassical school of thoughts who believe that external borrowing discourages investment and hampers the economic growth. These results are also consistent with most of the empirical findings discussed in the literature review portion of this study. Particularly, it agrees with studies made by Were (2001), Presbitero (2006), Sen et al. (2007), Adegbite et al. (2008), Hwang et al. (2010), Malik et al. (2010), Daud and Podivinsky (2012), Azam et al. (2013), Atique and Malik (2012), Shabbir (2013), Lee and Ng (2015), Daka et al. (2017), Pegkas (2018), Shittu et al. (2018), Shkolnyk and Koilo (2018), Kharusi and Ada (2018), Sajjad et al. (2018), Senadza et al. (2018), Nor-Eddine and Chkiriba (2019), and Moh and Jaradat (2019) who found that debt overhang dilemma prevails. However, these findings are contradictory to the findings of Siddiqui and Malik (2001), Maana et al. (2008), Khan et al. (2016), Jilenga et al. (2016), Sánchez-Juárez and García-Almada (2016), Talreja et al. (2016), Chaudhry et al. (2017), and Ndubuisi (2017), who found that debt overhang dilemma does not prevails. For them, overseas borrowing acts as a stimulating factor for the economic growth. Moreover, the findings of Cordella et al. (2005), Chaudhry et al. (2009), Sichula (2012) are also contradictory to our results, as their findings suggest that external debt does not matter at all.

**Table 6: Long-run estimates**

ARDL (1, 0, 1, 1, 0, 1, 0, 0, 0, 0) selection is based on schwarz info criterion GDP per capita is the dependent variable

Variable	Coefficient	t-Statistics	P-values
ED	-0.202243*	-3.720035	0.0009
DSP	-0.131042**	-2.157543	0.0397
ER	0.098733***	1.967531	0.0591
FDI	1.091023**	2.392132	0.0237
GFCF	0.383153**	2.421739	0.0222
HK	0.174277***	1.986492	0.0568
INF	-0.078723	-1.444514	0.1597
LF	1.433090*	2.885157	0.0074
FER	0.673201***	1.985366	0.0570
C	78.27610	2.652061	0.0130

\* \*\*, and \*\*\* indicate that variables are significant at 1%, or at 5% or at 10% level, respectively

Similarly, the coefficient of debt servicing variable confirms the existence of debt crowding-out dilemma as it affects the economic growth negatively and significantly. It denotes that 1% increase in debt service payment is associated with 0.13% decrease in economic growth in the long run. The policy implication for this estimate is to reduce the debt service liability as it hampers the growth of Pakistan's economy. Policy makers should develop proper mechanism for reducing the level the debt service payment through bringing a considerable decrease in stock of the external debt. The finding of this variable is in line with the conceptual framework of this study, the theoretical expectation of classical and neoclassical economists, and also with the most of studies discussed in the literature review portion of this study. The estimate of debt servicing variable supports the finding of Were (2001), Presbitero (2006), Adegbite et al. (2008), Sheikh et al. (2010), Malik et al. (2010), Hwang et al. (2010), Fosu (2011), Atique and Malik (2012), Shabbir (2013), Farhani (2016), Ndubuisi (2017), Sajjad et al. (2018), and Matuka and Asafo (2018) who found that debt service payment leads to discourage the productivity of the debtor through crowding-out effect. However the estimate of this variable contradicts the finding of Sánchez-Juárez and García-Almada (2016) and Daka et al. (2017) who believe that instead of debt-crowding out effect, debt service payment leads to debt crowding-in effect by encouraging the level of economic growth. Similarly, it also contradicts the findings of Daud and Podivinsky (2012) and Sichula (2012) who believe on the neutrality of external debt, as they found that debt servicing has no effect on the economic growth.

Table 7 also highlights the effects of the remaining determinants on the economic growth of Pakistan. The estimates of these variables denote that, except inflation, all variables are playing a significant and positive role in the determination of economic growth in the long run. The role of foreign direct investment and labor force seems more effective than the remaining variables. The coefficient of FDI demonstrates that 1% increase in this variable will cause the GDP per capita to grow by 1.09% in the long run. Similarly, 1% increase in labor force efficiency will cause 1.43% increase in per capita GDP in the long run. Surprisingly, the inflation variable got its expected sign but remained insignificant.

### 4.4. Short Run Estimates

Error correction model finds the speed at which the disequilibrium is adjusted in the long run. The negative sign of this parameter indicates that any sort of an economic shock that takes place in the

**Table 7: Error correction model: Short run estimates**

Variable	Coefficient	t-statistics	P-values
ED (-1)	-0.082195	-0.852376	0.4012
DSP (-1)	-0.319337	-4.508297	0.0001
ER (-1)	-0.103070	-2.216715	0.0349
FDI (-1)	-0.366312	-0.708328	0.4846
GFCF (-1)	0.139560	0.472520	0.6402
HK (-1)	0.155765	1.072470	0.2927
INF (-1)	-0.047360	-0.464246	0.6461
LF (-1)	-0.560352	-0.696662	0.4918
FER (-1)	0.338049	0.594466	0.5570
C	36.26484	0.767317	0.4493
ECM (-1)	-0.617892	-6.536180	0.0000

short run will be adjusted in the long run. The speed of adjustment is 61.7%, which demonstrates that the disequilibrium, caused by economic shocks in the previous year, will be converged back to the long run equilibrium in a period of 20 months. Table 7 presents a brief summary of this whole discussion.

#### 4.5. Diagnostic Tests

This study has conducted the diagnostics tests for the ARDL model. The Durbin-Watson and BPG statistics, portrayed in Table 8, show that there is no problem of auto correlation or serial correlation in the residuals. The Langrangian Multiplier (LM) test and Jarque-Bera tests also confirm that there is no issue of heteroscedasticity and that residuals are normally distributed across the observations.

#### 4.6. Stability Tests

In addition to the diagnostic tests, it is of great importance that the stability tests should also be applied in time series data, especially in a situation when the positioning of structural changes is uncertain in the mind of researchers. CUSUM and CUSUMSQ check the stability of the long-run and short-run coefficients of the model and avoid any biasness in the results which is caused by unstable parameters. Figures 5 and 6 indicate that all coefficients are stable as the CUSUM and CUSUMSQ do not violate the upper and lower bounds and remains within the 5% critical bounds.

### 5. CONCLUDING REMARKS

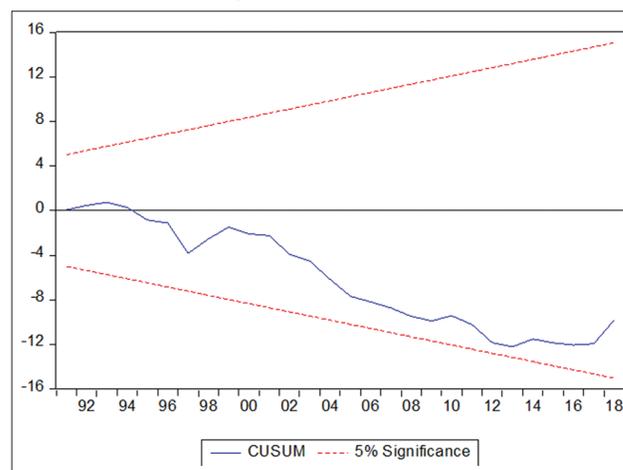
This paper has investigated the adverse effects of foreign debt on the economic growth of Pakistan. Augmented Solow growth model has been used for examining the debt overhang and debt crowding-out dilemmas of the external borrowing. Ratio of external debt to GDP is used as indicator of debt overhang effect, whereas ratio of debt service payment to exports is used as indicator of debt crowding-out effect. In addition, FDI, exchange rate, gross fixed capital formation, human capital, inflation, labor force and foreign exchange reserves were also added to this model. GDP per capita is used as indicator of economic growth. ARDL bound testing approach to cointegration was deployed to a time series data set, spanning from 1976 to 2018, for establishing the long run relationship among the target variables. Error correction model and a variety of diagnostic tests were also conducted in this study. The findings of this study have validated the co-existence of overhang and crowding out dilemmas for the external debt in Pakistan. It means that foreign debt and debt servicing impede the economic growth in the long run. One percent increase in stock of external debt was found to bring 0.20% fall in economic growth. Similarly, 1% increase in debt servicing was found to hamper the economic growth by 0.13% in the long run. The findings of this study have also highlighted the effectiveness of the remaining key determinants of economic growth. Except inflation, all variables were found to affect the economic growth positively and significantly. The role of foreign direct investment and labor force were found more effective than the remaining variables.

The empirical findings of this study recommend that policy makers should develop proper mechanism for boosting the level of economic growth through substantial reduction in the stock of

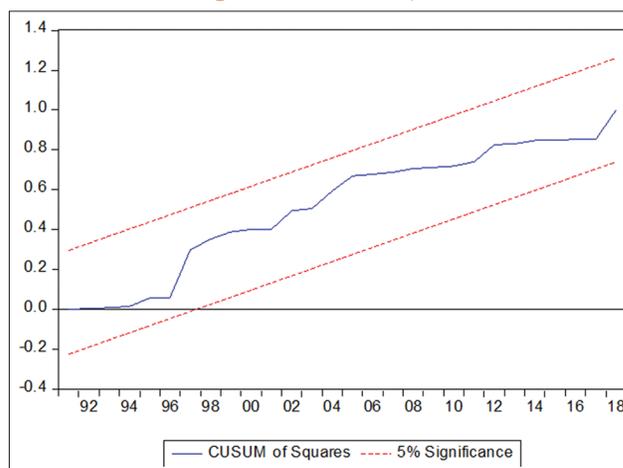
**Table 8: Diagnostic tests**

Test	Estimates	F-Statistics
Durbin-Watson	2.034266	-----
BPG (P-value)	-----	1.184148 (0.3220)
LM (P-value)	-----	1.510615 (0.1748)
Jarque-Bera (P-value)	0.613170 (0.735956)	-----
R <sup>2</sup>	0.87	-----
$\bar{R}^2$	0.81	-----

**Figure 5: CUSUM test**



**Figure 6: CUSUM SQ test**



foreign debt and debt servicing as they dampen the growth process negatively and significantly. Gross Fixed Capital Formation is also considered to be the “long-run forcing” factor of the economic growth in Pakistan. Efficiency of the labor force should also be strengthened through investment on human capital as it is the root cause of bringing growth in all sectors of the economy. Similarly, economist should also focus on improving the growth level of GDP per capita as it leads to dampen the need for external debt accumulation. Finding also suggests that government should create a conducive environment for investment through bringing increase in the level of domestic savings and exports, and should focus on increasing the inflow of FDI and attract the foreign exchange reserves to Pakistan. Incorporation of debt monitoring system along with its management is also required for minimizing the negative effects of foreign debt and debt servicing.

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