Does Economic Development Affect Public Debt Accumulation ? Empirical Evidence from India

Pratibha Saini [1]
Krishna Muniyoor [2]

Abstract

The main aim of this paper was to explore various public debt determinants in India using structural equation modeling (SEM). This study is based on secondary data, starting from 1985 – 2018. The study was partially confirmatory and partially exploratory as it also inspected the interaction between economic development and public debt. The findings suggested that, among various macroeconomic variables, debt servicing, inflation, and military expenditure are the key determinants of debt in India. Moreover, as expected, economic development has a negative relation with public debt, suggesting that public debt accumulation tends to decrease with the progress in economic development. It is acknowledged that the improvement in socioeconomic conditions is likely to enhance the overall welfare of the people and thereby create more productive resources in the economy. Therefore, from a policy perspective, we should zero in on internal and debt-related factors.

Keywords : public debt, economic development, HDI, structural equation modeling, India

JEL Classification Codes : E6, H6, O1

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As in many other developing economies globally, public debt plays a crucial role in India's economic development. Public debt consists of two sources: internal and external. According to the International Monetary Fund (IMF), India's public debt as a percentage of its GDP has increased substantially from 66% in 2010 to 90% in 2020. Over the last three decades, the Indian economy has witnessed many macroeconomic unstable situations, which have caused an increase in public debt accumulation. For instance, the outbreak of the COVID-19 pandemic is mainly responsible for a steep upturn in public debt in the recent period. In the context of recurrent macroeconomic fluctuations, a pertinent question arises: What factors influence the debt-GDP ratio of an economy? Do external factors affect the amount of public borrowing an economy accumulates? Do internal factors such as economic development, corruption, etc., play a decisive role in determining the ratio of debt to GDP in an economy? The present study attempts to answer these questions by investigating the relationship between macroeconomic variables and public debt.

The Indian economy is an emerging market economy. Like any other economy globally, India's borrowing is essential to maintain and improve the economic growth rate consistently. When public expenditure on social welfare outpaces the revenue resources of the country, it is difficult for the government, be it Central or State, to

[1] *Research Scholar (Corresponding Author),* Department of Economics and Finance, BITS Pilani, Pilani Campus, Pilani - 333 031, Rajasthan. (Email : pratibha.bits429@gmail.com) ; ORCID iD : https://orcid.org/0000-0003-4879-7242
[2] *Assistant Professor,* Department of Economics and Finance, BITS Pilani, Pilani Campus, Pilani - 333 031, Rajasthan. (Email : krishna@pilani.bits-pilani.ac.in) ; ORCID iD : https://orcid.org/0000-0003-1504-712X

invest in new and large-scale projects. The country has consistently reported a widening gap between revenue and expenditure, leading to an increase in the fiscal deficit (Kubendran, 2018). For instance, India's fiscal deficit as a percentage of its GDP increased from 4.6% in 2019 – 20 to 9.2% in 2020 – 21. It reached the highest level following the economic disruptions due to the COVID-19 pandemic. The widening gap between revenue and expenditure of the government paves the way for mounting public borrowing. On the one hand, the mounting public debt in under-developed countries is further accelerated by the high level of poverty (Tiruneh, 2004). Moreover, there is a host of other factors influencing public debt in developing and developed nations.

Strictly speaking, the factors determining public debt may be classified into two : external and internal. We first look at the role of external factors affecting public debt accumulation. The rate of interest on the debt, the external shocks, and the terms of trade are assumed to be the key drivers of public debt. Unequivocally, the choice of borrowing from external sources depends on the ongoing terms of trade with other countries. If any, the prevailing external shocks also affect the economy and its decisions related to further debt accumulation. Moreover, the lending rate of interest at which the government borrows funds imperatively determines an economy's future borrowings.

As discussed earlier, apart from the external factors, internal factors such as GDP, capital formation, expenditure, and debt servicing are the main drivers. Interestingly, these drivers are interconnected, influencing the role of each other in determining the indebtedness of the economy. More aptly, it is the GDP that is measured as the overall performance of an economy in a year. From an economic perspective, what matters is that the analysis of the economic growth rate and the revenues generated over the expenditure is essential to decide the repayment of the portion of existing debt and the amount of public borrowing required for supporting ongoing and new investment projects. In addition to these factors, a factor that has been less focused on the existing literature is the degree of political stability and corruption level. It is reasonable to assume that a more corrupt and irresponsible government worsens the credibility of an economy. The prevalence of corruption affects the quality of welfare programs and investment projects, leading to the inefficiency of public resources.

In brief, to achieve full employment in developing economies such as India, it is essential to accelerate economic growth. Interestingly, to accelerate economic growth, we need to focus on the development at the foundation. In economics parlance, it is acknowledged that the improvement in socioeconomic conditions is likely to enhance the overall welfare of the people and thereby create more productive resources in the economy. The relationship between public debt and economic development has not been widely discussed in the existing literature. This is the particular issue that motivated us to address how economic development affects public debt accumulation. Hence, this study proposes exploring the various determinants of public debt, including economic development, using a framework of exploratory research.

Literature Review

In this section, we provide a brief review of studies that examined various factors explaining public debt. Although limited, the extant literature on the determinants of public debt primarily zeros in on panel studies or a single component of public debt. Abiad and Ostry (2005) elucidated that primary balance stabilized the debt accumulation in emerging economies. In a study by Burger and Warnock (2006), it was reported that economic growth and fiscal balance are the two factors that negatively affected public debt accumulation. Similarly, a study by Mendoza and Ostry (2008), based on the experience drawn from emerging economies, suggested that the primary balance reacted positively at a low level of debt, while at a high level, the response declined. It is worth noting that Folorunso (2013) concluded that bidirectional causality existed between public debt and fiscal balance.

Generally, with an increase in debt, the economy tends to become incapable of repaying its existing debts, leading to a rise in interest rates for further accumulation. However, it is difficult to draw a relationship between debt servicing and interest rates in respect of debt. Concerning the empirical studies, Ghosh et al. (2013) confirmed that interest rate is an essential function of the debt servicing ratio and the level of debt. As expected, Corsetti et al. (2014) showed that the inability to repay the existing debt affected interest rates nonlinearly and later resulted in further debt accumulation. Anaya and Pienkowski (2015), in their study of 15 OECD countries for the period using SVAR, presented that the rates of interest and foreign exchange rates reacted positively to the level of debt in countries with restricted policies.

Based on the evidence drawn from a sample of 27 emerging economies and 49 advanced economies, Burger and Warnock (2006) confirmed that inflation and size of a country are positively related to the debt market. Claessens et al. (2007), in a panel study of 48 developed and emerging countries from 1993 – 2000, showed that foreign exchange rates and low inflation positively affected the local government debt. According to them, the flexible exchange rates favored the broader local bond markets, while drawing evidence from Pakistan, Mahmood and Rauf (2008) found that depreciation of the rupee affected the external debt adversely. According to Hilscher et al. (2022), inflation may be viewed as an important determinant of debt in the United States. More recent studies suggested the negative relationship between inflation and public debt (Cherif & Hasanov, 2012). However, Sadik - Zada et al. (2019) revealed that inflation had no significant effect on public debt.

A review of extant studies further showed that the quality of the institutions and country size are the two significant determinants of the level of debt within an economy (Burger & Warnock, 2006 ; Claessens et al., 2007; Gurinovich & Smirnikova, 2021). The size of the country, which is measured in terms of government spending, institutional quality, and corruption, are interrelated. More aptly, government spending gets affected due to the tax evasion practices within an economy, which paves the way for mounting public borrowing (Friedman et al., 2000). Moreover, in capital-intensive projects, the government officials are more intended to take bribes, leading to higher levels of debt accumulation for financing such projects (Kaufmann et al., 2011). Less impressive is that corruption tends to reduce institutional qualities and transparency in an economic system, making it difficult for the government to monitor the actual public spending, such as capital expenditure, social welfare, military expenditure, which absorb a significant part of the borrowings (Gupta et al., 2001).

As far as the relationship between economic development and public debt is concerned, the existing literature does not precisely provide any insights. It is interesting to note that economic growth has always been considered as one of the proxies for measuring economic development in economics research (Cárdenas-García et al., 2015; Kim et al., 2006). Likewise, the association between economic growth and public debt (either harmful or positive) has been proven by many studies (Al-Fawwaz, 2016; Afonso & Jalles, 2013; Bittencourt, 2015; Globan & Matošec, 2016). Moreover, the empirical studies undertaken in India primarily zeroed in on the relationship between public debt and economic growth, excluding the role played by economic development (Bal & Rath, 2014; Dash & Rath, 2016; Kaur et al., 2018; Swamy, 2015). It is widely argued that economic growth is the common factor between public debt and economic development. Given that, the possibility of linkage between economic development and public debt increases.

From the above description of the literature review, we conclude that the contribution of this paper is threefold. First, we understand that the factors explaining the composition of public debt vary from country to country significantly, and the existing literature is mainly focused on the external factors. We hardly find any relevant studies touching upon both the factors – external and internal – that influence public debt, particularly in the Indian context. Second, as mentioned earlier, the existing literature does not consider the effect of economic development as a factor of public debt. Hence, it is essential to pinpoint the significant factors influencing India's public debt.

Further, it is acknowledged that the role of economic development is vital in determining the level of debt. Third, our approach of measuring the relationship between public debt and economic development is quite distinct from the methods used in the previous studies. The methodology is based on path diagrams and structural equations between the exogenous and endogenous variables to determine the relevance of each variable as the determinant of the public debt.

Variables and Data Sources

In this study, eight variables are used to capture the magnitude of economic development. The human development report suggests that HDI, an aggregate index of three variables, is the primary and the most appropriate variable to measure economic development. It should be noted that this study also covers a few more variables to understand the direct effect of these different economic variables on public debt. These variables collectively account for HDI. Table 1 presents the major variables applied in the model and the data sources. Some of the variables are converted into log form to maintain the normality in the research, such as the human development index, GDP per capita, infant mortality rate, and life expectancy rate. The focus of the study is limited to India, ranging from $1985 - 2018$. The period of the study is based on the data availability.

Table 1. *Variables and Data Sources*

Variables	Labels	Definitions	Data Sources
For Economic Development (*ED*)			
Human Development Index	*HDI*	The composite index evaluates the three basic dimensions of human development - healthy and long life, a modest standard of living, and knowledge accessibility on a scale of 0 to 1.	UNDP
Life expectancy at birth (years)	*LE*	The expected number of years a newborn baby will live.	WDI
Mortality rate, infant (per 1,000 live births)	*IM*	The infant mortality rate shows the probability of an infant dying between birth and the age of one year expressed as per 1,000 births.	WDI
Physicians (per 1,000 people)	*PHY*	All professionals and medical doctors and medical school graduates working in any area of expertise (per 1,000 inhabitants).	WDI
GDP per capita (constant LCU)	*GDPC*	Total gross domestic product of an economy is divided by the total population.	WDI
Government expenditure on education, total (% of GDP)	*GEE*	Public expenditure on government academic institutions, including subsidies given to all levels of private educational institutions with expenses bearings such as salaries of staff and other benefits, contracted services, teaching materials and books, equipment, repairs, furniture, and telecommunications (as a percentage of GDP).	WDI
Current health expenditure	*CHE*	Current expenditure from the government budget, social health insurance funds, grants, and external borrowings (as a percentage of GDP).	WDI
Other Variables			
Debt-GDP ratio	*DGR*	Debt-GDP ratio is the borrowings accumulated by the government as a percentage of GDP.	IMF
Military expenditure	*ME*	Military expenditure is the expenditure on defense taken as a percentage of GDP.	WDI
Lending interest rate (%)	*IR*	The lending interest rate is the interest rate to be paid on the borrowings	WDI

|		by the government.	
Corruption	*CPI*	The corruption perceptions index shows the country's score on how corrupt their public sectors are seen to be. The score lies between 0 and 10 ; 0 represents highly corrupt, while 10 means highly clean.	TI
Inflation, consumer prices (annual %)	*IN*	Inflation is the annual percentage change in the cost to the average consumer of obtaining a basket of goods and services.	WDI
Gross fixed capital formation (constant LCU)	*GFCF*	As per the Reserve Bank of India, gross fixed capital formation is the investment taken as the aggregate of gross additions to the fixed assets during one year.	WDI
Total debt service	*DS*	Total debt service is the debt service on the borrowings taken as a percentage service of exports of goods, services, and primary income.	WDI

Note. UNDP – United Nations Development Programme, WDI – World Development Indicators, IMF – International Monetary Fund, TI – Transparency International.

Econometric Procedure

Conceptual Framework

As mentioned earlier, the conceptual framework used in this study is based on the existing literature, particularly a study by Forslund et al. (2011). The framework defines the relationship between public debt composition and various macroeconomic factors. Figure 1 shows the rough diagram of the relationship, which is to be investigated for the analysis.

Figure 1. *Relationship Between Debt and Various Macroeconomic Variables*
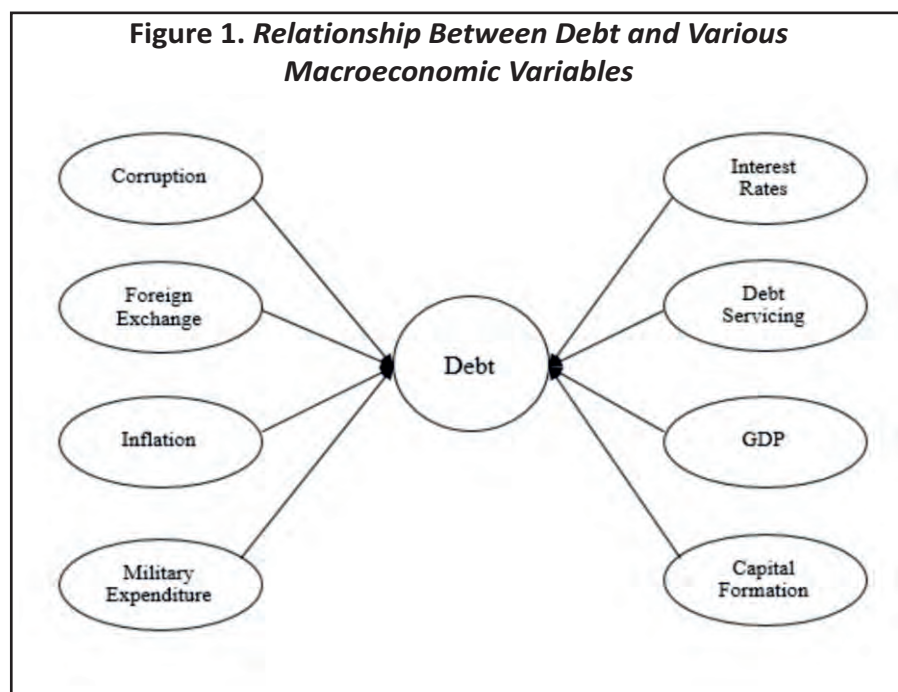
Moreover, this study extends the existing conceptual framework by capturing another dimension of the economy, that is, economic development. The aim is to examine whether economic development acts as a determinant of public debt accumulation or not. It is of interest to note that economic development is a broader term and cannot be accounted for by a single factor; hence, several other variables have been taken into account to estimate the effect of economic development on public debt.

Methodology

As mentioned earlier, this study uses the structural equation modeling (SEM) method for data analysis. In general, SEM is a method used for both factor analysis and regression analysis. The evolution of SEM took place from simple linear models to non-parametric models, and now, it can be used in complex time-series models (Fan et al., 2016; Hair et al., 2021). SEM is based on a path diagram constructed from theoretical constructs. The primary purpose of using the SEM technique is the model specification, and the current research is partially confirmatory and partially exploratory. Generally, SEM analysis is conducted to test a hypothesis, test a model, modify a model, or test and compare two or more models. Furthermore, SEM can be used when the theoretical base is not well developed. This study is exploratory, with little or no evidence in existing literature (Hair et al., 2021). Moreover, it may be applied to time series studies with a small sample size (Fan et al., 2016).

The underlying assumptions of SEM while computing the multiple regression model are : a) the independent or the exogenous variables are correlated to each other, and b) the residual term is considered an unobserved latent variable, the value of which is fixed to unit one. Generally, the path diagram consists of two types of variables: latent and observed variables. While the latent variables are not observable directly, the observed variables are the variables considered for the study. It is worth noting that the data for the latent variables were not readily available. Hence, the latent variables are constructed by the various observed variables.

For the present study, we have used two path diagrams. Figure 2 shows the first path diagram representing

Figure 2. *Path Diagram for Model 1*

Figure 3. *Path Diagram for Model 2*
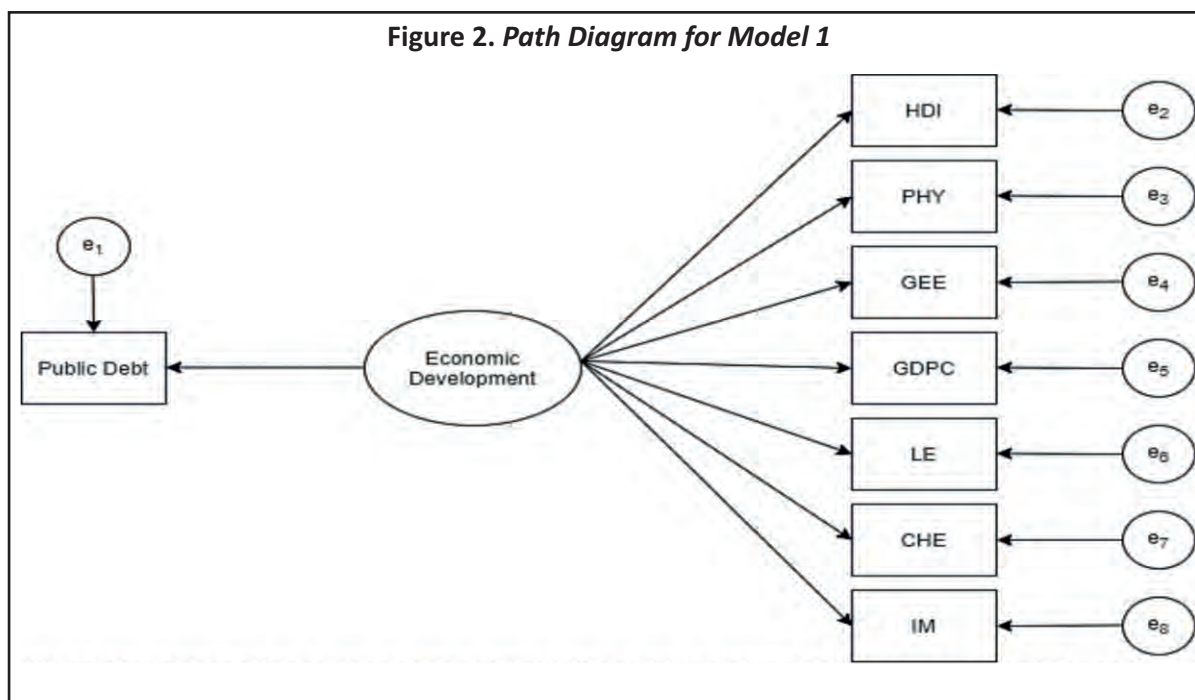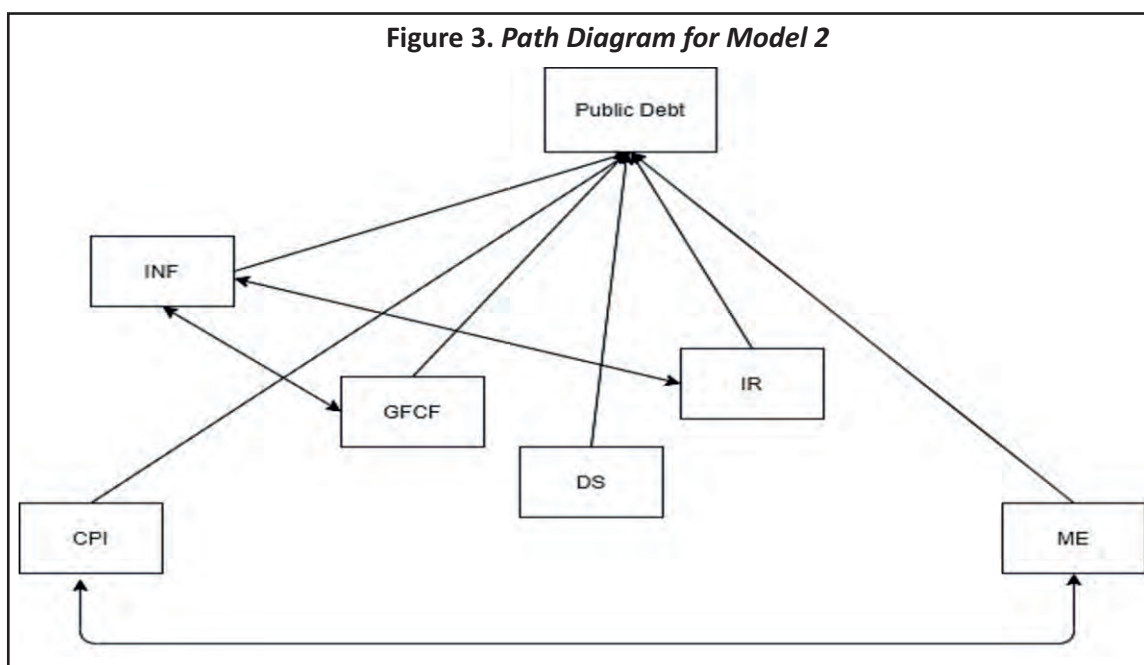
economic development (latent variable) and its observable variables. Latent variables are always drawn within a circle/oval, and observed variables are drawn as squares. Moreover, in the given diagram, economic development acts as an independent variable to compute coefficients of the dependent variable, that is, public debt. Smaller ovals are the error terms of each observed variable.

Figure 3 presents the second path diagram, which illustrates the relationship between public debt and other macroeconomic factors, in which some of the variables are correlated to each other. The hypothesis (H_1) of Figure 2 is that economic development influences public debt. Economic development is defined by its observed variables. The hypothesis (H_2) of Figure 3 is that the selected macroeconomic variables influence public debt. The analysis was performed by using AMOS software.

Empirical Analysis and Results

After constructing the path diagram as per the theoretical model, the next thing is to compute the standard estimates of the parameters. Following this, it is important to compute non-standard estimates, standard deviations, and *t*-statistics to determine the significance of each variable. Based on these estimates, it is possible to decipher the type of relationship of these variables with economic development and public debt. Lastly, different measures to check the model's goodness of fit are analyzed.

Estimates of Model 1, as shown in Table 2, suggest that GDP per capita, no. of physicians, life expectancy, and infant mortality rate are the observed variables that define economic development. Here, economic development has been considered both an independent and latent variable. On the other hand, the findings indicate that economic development has a negative relation with public debt, which depicts that with the rise in economic development, there will be a decrease in public debt accumulation with a coefficient of 23.23. The standardized results show that one unit change in almost half of the observed variables (HDI, GDP, LE, IM) has an approximate one unit change in economic development. Hence, the hypothesis (H_1) is accepted for almost all the variables in Model 1 except for GEE and CHE.

Table 2. *Estimates of the Model 1*

Parameters	Unstandardized Estimates	S.E.	C.R.	Standardized Estimates
ED	−23.23	11.031	−2.106**	−0.434
GEE	1.547	1.224	1.263	0.497
GDPC	3.354	0.108	31.068***	1
CHE	0.158	1.514	0.104	0.226
HDI	1	0.344	2.631***	0.975
PHY	1.105	0.42	2.631***	0.41
LE	0.427	0.013	33.008***	0.992
IM	−2.813	0.115	24.548***	−0.998

Note. ***, **,* signifies level of significance at 1%, 5%, and 10%, respectively.

Table 3. *Estimates of the Model 2*

Parameters	Unstandardized Estimates	S.E.	C.R.	Standardized Estimates
IR	−0.771	0.616	−1.253	−0.278
DS	−3.073	1.816	−1.693*	−0.665
ME	1.156	0.223	−5.183***	0.877
CPI	1			0.535
INF	−0.355	0.205	−1.738*	−0.291
GFCF	−0.534	0.489	−1.091	−0.229

Note. ***, **,* signifies level of significance at 1%, 5%, and 10%, respectively.

Table 3 presents the estimates of Model 2. The results suggest that debt servicing, inflation, and military expenditure are the critical factors of debt accumulation in India. While debt servicing and inflation have a negative impact on the accumulation of debt, elevation in military expenditure provides a boost to the public debt requirements. The standardized results show that military expenditure has the highest coefficient, that is, 0.877, and has a positive relationship with public debt at a 1% significance level. The negative coefficient of inflation implies that any change in inflation beyond a threshold level is likely to create uncertainties in the economy, thereby adversely affecting the public debt. Also, the negative debt servicing coefficient explains that any increase in the country's ability to repay (debt servicing ratio) will drag down the public debt accumulation or vice-versa. The remaining two variables, namely, gross fixed capital formation and interest rate, do not significantly impact our dependent variable. The regression coefficient of corruption has been set to 1 here due to the pre-requirement of performing structural equation modeling. It is of interest to note that corruption has an impact of 0.535 units on public debt for a one-unit change in corruption. Hence, the hypothesis (H_2) is accepted for all the macroeconomic variables in Model 2 except IR and GFCF.

Goodness of Fit

There are various measures to assess the model fit. Almost all the goodness of fit methods are based on the chi-square function or the degrees of freedom. In time-series data, the focus is on the measures which produce a good fit model index, irrespective of the size of the sample or distribution.

Table 4. *Model Fit Summary - Model 1*

Fitness Criteria	Current Value	Standard Value
χ^2	1.797	<3
GFI	0.823	≥ 0.9
RMSEA	0.155	<1
CFI	0.768	≥ 0.9

Table 5. *Model Fit Summary - Model 2*

Fitness Criteria	Current Value	Standard Value
χ^2	2.224	<3
GFI	0.73	≥ 0.9
RMSEA	0.193	<1
CFI	0.362	≥ 0.9

Tables 4 and 5 present the goodness of fit model statistics with different criteria. Most of the criteria require that the value of goodness of fit should satisfy the standard values. However, in some cases, the data and the variables selected for the study affect the goodness of fit indices. The values of the indices do not necessarily be equal to or nearby to the standard values as the model is always incomplete and can always be improved with more modifications. It should be noted that a few variables in the model are important for the study and cannot be eliminated to improve the model fitness. Thus, to maintain the essence of the study, we have considered a few of the criteria.

From Table 4, it is evident that Model 1 satisfies the first three categories of the goodness of fit measure :

(i) Based on the chi-square values of the model, which is less than the standard value depicting that the model is fit.

(ii) The goodness of fit (GFI) standard values indicate an excellent fit if the indices of a model are equal to or higher than 0.90. Here, in the present case, the value is 0.823, significantly closer to 0.90, indicating a good fit. The same is the case with the comparative fitness index (CFI), the standard value is 0.90, but the current value is slightly below, that is, 0.768, yet it can be considered a good fit.

(iii) The root mean square error of approximation (RMSEA) value for the current study is below the standard value of <1, implying an excellent model fit.

Table 5 shows the results of the goodness of fit measures of Model 2. The results indicate that out of the four, the model has a good fit in the first three criteria. The value of CFI is much lower than the standard value, implying a lousy fit. Overall, we can say that both the models are in line with the data specifications.

Conclusion and Policy Implications

The main aim of this study was to find various determinants of public debt accumulation from 1985 – 2018 in India. The data suggest that economic development, inflation, military expenditure, debt servicing, and corruption

are the main factors influencing the debt-GDP. Improved economic development such as the healthcare system, education, and standard of living enhance labor productivity, employment opportunities, and overall capital efficiency. It increases income and investment, which later help in economic growth and make the country less dependent on other financial institutions. This could be the possible reason for the adverse effect of economic development on public debt.

Presumably, the positive relationship between CPI ranking and public debt is because, with improved corruption ranking, the credibility of an economy increases, thus providing easy access to borrowings. High credibility makes borrowings easy. On the other hand, a rise in debt servicing ratio also depicts that the economy is doing well and can repay its debts timely, which helps in reducing debt. Also, excessive expenditure on the military or defense as a GDP ratio should be taken care of because a significant part of new debts goes for defense. Moreover, inflation acts as a negative factor in determining the public debt accumulation of the country. High inflation may increase uncertainty in the market and might also increase the cost of issuing domestic debt. The study's findings are consistent with the existing literature (Ghosh et al., 2013; Kaur et al., 2018; Lakshmanan, 2019).

From a policy perspective, transparency should be maintained to improve the current CPI score and reduce corruption and debt requirements. It is a matter of utmost urgency to take care of the excessive expenditure on military or defense because a significant part of new debts goes for defense (Gupta & Bedarkar, 2016). Economic development should be of paramount importance in such a way that the country would be more self-reliant, generate more employment, and improve labor productivity.

Limitations of the Study and the Way Forward

This study uses the structural equation modeling approach to investigate the role of economic development in influencing public debt. The application of SEM in a model requires a large sample size to provide more reliable and accurate results. However, our study uses only 33 years of data points due to data unavailability for all the variables for a more extended period. Therefore, it is recommended that extending the frequency of the variable series will help get more robust results. We also recommend the inclusion of some more variables, such as poverty, inequality, unemployment, etc., which affect economic development and thereby affect public debt indirectly.

Authors' Contribution

Pratibha Saini conceived the idea and developed qualitative and quantitative design to undertake the empirical study. Dr. Krishna Muniyoor extracted research papers with high repute, filtered these based on keywords, and generated concepts and codes relevant to the study design. He verified the analytical methods and supervised the study. The numerical computations were done by Pratibha Saini using AMOS, and she wrote the manuscript in consultation with Dr. Krishna Muniyoor.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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About the Authors

Pratibha Saini is a Research Scholar in the Department of Economics and Finance at Birla Institute of Technology and Science, Pilani, Rajasthan. She holds UGC NET-JRF award. She is pursuing PhD in public debt and its determinants in India. Her research interests include public finance and macroeconomics.

Dr. Krishna Muniyoor is an Assistant Professor in the Department of Economics and Finance at Birla Institute of Technology and Science, Pilani, Rajasthan. He was a Visiting Doctoral Fellow at the London School of Economics. His main research areas include human capital, job search, knowledge, and social networks. He is also a member of the Forum for Global Knowledge Sharing. He is currently working in the area of female participation in domestic and household-based activities.