# The Impact of Public Debt on India's Growth

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## DECLARATION BY STUDENT

I hereby declare that the data presented in this Dissertation report entitled, " The Impact of public debt on India's growth in Indian states" is based on the results of investigations carried out by me in the Master of Economics at the Goa Business School, Goa University under the Supervision of Ms. Heena Subrai Gaude and the same has not been submitted elsewhere for the award of a degree by me. Further, I understand that Goa University or its authorities will not be responsible for the correctness of observations / experimental or other findings given the dissertation.

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## COMPLETION CERTIFICATE

This is to certify that the dissertation report "Analysis on Impact of public debt on economic growth of Indian states" is a bonafide work carried out by Ms. Naveta Narayan Gauns under my supervision in partial fulfillment of the requirements for the award of the degree of Master of Economics in the Discipline of Economics at the Goa Business School, Goa University.

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# PREFACE

Public debt is a critical component of any country's economic landscape, and India is no exception. As the nation strives for sustained growth and development, understanding the implications of public debt becomes increasingly important, especially at the subnational level where regional disparities and dynamics come into play.

This study embarks on a journey to explore the complex relationship between public debt and India's growth, focusing on its impact at the state level. Given India's vast diversity across its 28 states, understanding the implications of public debt requires a nuanced approach that considers variations in economic performance and governance structures. The study seeks to address a fundamental question: How does public debt influence the economic growth of individual states in India? By gaining insights into this question, policymakers can make informed decisions on fiscal policy, debt management, and resource allocation to foster sustainable and inclusive development.

Readers are encouraged to critically engage with the findings presented here, as this research strives to contribute meaningfully to the discourse on public debt and economic growth in India. Ultimately, it aims to serve as a catalyst for informed policymaking and strategic action to shape the future trajectory of the nation's development.

**[Naveta Narayan Gauns]**

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# ABSTRACT

This study examined the empirical relationship between public debt and the economic growth of Indian states. Panel data for all 29 states and two union territories were analysed from the year 2000 to 2020. The variables for the study were state Gross Domestic Product, Public Internal Debt, Gross Capital Formation, Government Expenditure and Population. State-wise data was collected from RBI and EPWRF. To analysethe panel data, two models were used the fixed effect and random effect model. Findings revealed that public internal debt has a highly positive significant impact on the growth of the state economy, and other variables also showed a significant impact on the economic growth of Indian states.

Keywords: Public debt, economic growth, state level

# 1. INTRODUCTION

## 1.1.Background

Public debt refers to the total amount of money that a government borrows to meet its financial obligations when its expenditures exceed its income. This concept, which initially emerged to fund military activities during wars, has evolved significantly and now plays an important role in the financial strategies of countries around the world, both developed and developing.

For developed countries, public debt is a well-examined aspect of economic management. These countries use debt to fund social programs and infrastructure projects, and it also influences their monetary policies, which include changing interest rates and managing the money supply. Researchers and decision-makers in these nations keep a careful eye on the effects of mounting debt, assessing hazards like future recessions or spikes in inflation. However, the situation in developing countries is very different. As these nations work to strengthen their economies, enhance public services, and finance vital infrastructure projects like roads, schools, and hospitals, they are depending more and more on public debt. These nations borrow money, sometimes a lot, in order to finance these investments.

However, despite the growing reliance on public debt in these nations, there is a noticeable gap in economic research focused on the implications of such debt in developing countries . Unlike their developed countries, many developing countries lack comprehensive analyses that consider how rising debt might affect their economic stability, growth prospects, and financial health in the long term.

There are two contrasting view on the impact of public debt and economic growth that is traditional and Ricardian view .According to the traditional view singh, charan. *debt management in India*. Cambridge University Press, 2018., rising public debt hurts the economy. In the short run, the consumer would perceive himself as wealthier due to the rise in government debt, leading him to engage in more spending. Given the short-term sticky prices, there will be a greater demand for products and services, which will enhance output and employment. The rise in private savings is insufficient to offset the government's dissaving as the marginal inclination to consume is greater than the marginal propensity to save. The economy would see an increase in the real interest rate, which would stimulate capital inflow from abroad. In the long run, the higher interest rate would discourage investment and thus crowd out private investment. The lower domestic savings mean a smaller capital stock. The inflow from abroad would result in greater foreign debt. The greater demand of domestic currency would also result in the loss of competitiveness of the domestic firms in the international markets. The higher aggregate demand results in a higher price level which adjusts over time and the economy returns to the natural rate of output. The lower investment eventually leads to a lower steady state capital stock and a lower level of output. Therefore, the overall impact, considering the long run period, would be a smaller total output and eventually lower consumption and reduced economic welfare. This is also referred to as the burden of the public debt, as each generation burdens the next, by leaving behind a smaller aggregate stock of capital.

According to the Ricardian perspective, future taxes are equal to the amount of government debt Barro, (1974, 1977). Given that customers are logical and anticipatory, the current deficit equals the discounted total of future taxes. Therefore, there are no aggregate wealth consequences when taxes and deficits are switched. The rise in public debt has little impact on consumer spending. A

decrease in government dissaving is equal to an increase in private savings. Given the unchanged total savings, investment and interest rates, as well as the national income, are also unaffected. The rational consumer, faced with current deficits, saves for the impending tax hike. According to Buchanan (1958), the accumulation of domestic debt causes tax obligations to be deferred from the present to the next generation. Although Barro argues that the phenomenon of operative intergenerational transfers means that the shift from current to future taxation implied by the debt issue does not involve a burden on later generations, this shift from current to future taxation could imply a shifting of tax burden from the current to future generations. Thus ,conclude internal debt reduces capital accumulation and growth in long run where as Ricardian equivalence hypothesis internal debt does not affect macro aggregates and economic growth.

This study will mainly focus on impact of public debt (internal debt) on economic growth. Internal debt refers to the amount of money that a government owes to domestic institutions and individuals within the country. In India internal debt has been increasing at a higher rate since 1952. The rising debt has been the result of large borrowing by government to achieve high rate of economic growth and development. In 2000 internal public debt was around 64.9 percentage to GDP. As of March 2021,(n.d.). Wikipedia. Retrieved May 16, 2024, from https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=22285 the internal debt stood at Rs 95,83,366 crore which is about 19.5 per cent higher than previous year. In terms of debt to GDP ratio, it stood at a massive 48.5 percent. It had jumped by 13.4 per cent to Rs 80,20,490 crore in 2019-20. Therefore this study aims to see weather the rising internal debt has any impact economic growth of Indian states.

### 1.2. Objectives

- To analyses the impact of public debt on economic growth of Indian states.

### 1.3. Hypothesis for the objective:

H0- There is no significant impact of public debt on state economy in India.

H1- There no significant impact of public debt on state economy in India.

### 1.3.1 Research Questions

- how does the level of public debt affect the growth of state economy.
- What are the correlation between the GSDP and other public debt, gross capital formation, government expenditure ,population?

### 1.4. Scope of the study

The study will concentrate on the Indian states, looking at public debt levels and state economic growth. This covers all 29 of India's states as well as its two union territories. The study will use data from the previous 20 years in order to offer a current and pertinent analysis. This time frame was selected to represent current economic trends and how they affect state economies. The GSDP, which measures economic growth, and the public debt as a percentage of GDP will be the

main areas of interest. To bolster the study's conclusions, additional economic variables like population, government spending, and gross capital formation are also examined. To assess the data, econometric models will be used in the study.

# 2. LITERATURE REVIEW

Public debt refers to the total amount of money that a government owes to internal or external lenders, Numerous studies have been conducted on the relationship between public debt and economic growth. These studies have shown mixed results, with some suggesting a positive relationship between public debt and economic growth, while others find a negative or non-linear relationship.

## 2.1.literature on Global context

A study by Bakri et al., (2022) aimed to demonstrate the empirical relationship between Indonesia's GDP (Gross Domestic Product) and government debt, financing, investment, inflation, and spending. The study used time series data from 2005 -2020 and ordinary least squares (OLS) multiple regression analysis to prove the relationship between these variables. Findings demonstrate that government debt does not significantly impact Indonesia's economic growth. Another study by Rais (2012), done on Pakistan, on public debt and economic growth, used the basic OLS method and data from 1972 to 2010. The results show that domestic and external debt negatively affect economic growth. Domestic debt affects positively to consumption expenditures that is for both public and private where whereas External debt affects negatively to consumption and investment, while exports positively impact both domestic and external debt in Pakistan.

Similarly Onogbosele& Ben, (2016) study used annual time series data on variable such as gross domestic product, treasury bonds, development stocks, federal government bonds, and interest rate,The study used the Vector Autoregression analytic approach and the Augmented Dickey-Fuller Unit Root test. According to the multivariate VAR model's results, debt is a major factor

in the Nigerian economy's growth process.Toriola et al., n.d.(2022)study investigates how public debt growth affects the expansion of the economy as a whole, as well as the agricultural and nonagricultural sectors ,as public debt may not have the same effect on economic growth in all areas and across the board, They used Fully Modified Ordinary Least Squares (FMOLS) to examine the sector-specific effects of public debt on sectors and overall economy. Findings suggested that Nigeria has statistically significantly impacted negatively by public debt, exports, and inflation, but positively by population growth. However, there is no statistically significant correlation between Nigeria's GDP and imports. Examining the sector-specific effect, public debt continues to have a significant and negative impact on the industrial and agricultural sectors, but has no discernible effect on the services sector. the study Wu, (2020) sheds light on the significance of taking into account region-specific factors and a variety of debt-level measures when examining the relationship between local government debt and economic growth in China

Anning et al., 2015, pp. (1990–2015)Used data from 1990 to 2015,and examined the relationship between government debt and Ghana's economic development using the basic Ordinary Least Squares methodology. The objective of the study was to investigate Ghana's deficient public infrastructure and inefficient management of its external and domestic debt. The study showed a negative correlation between Ghana's economy's growth and debt, both internal and external , and recommended that government debt borrowing be avoided while tax reform programs should be promoted to increase the country's revenue base. These were the studies which used time series data to see the impact of public debt on economic growth of the country’s.

Some of the other studies which provide great insight on this research areas were the studies done on countries using panel data analysis. Onofrei et al.,(2022) did a study on The short-and

long run impacts of public debt in development in EU nations was examined in this paper, used time period from 1995-2019 that is 25 years. Econometrics methods such as ARDL (autoregressive circulated slack model then pooled mean gathering (PMG), the mean gathering (MG), and the unique fixed impacts (DFE) models were used for analysis. The results showed both statistically significant and negative impact on short and long run . Hameed, M. R., & Quddus, M. A. (2020) carried out study on Impact of high and growing public debt on economic growth in SAARC countries, the results showed that public debt and economic growth are positively correlated, albeit indirectly, through investment. The findings demonstrate a statistically significant and positive correlation between public debt and investment, as well as a substantial impact of public debt on economic growth.

Doojav&Baatarkhuu, (2024) and Turan &Iyidogan, (2023) study tried to explain the threshold effects in their studies (Doojav&Baatarkhuu used annual time series and panel Generalized Method of Moments (GMM) regressions and panel vector autoregression (VAR) models, this study investigates the nonlinear impacts of public debt on economic development in Asian developing economies. research showed that the relationship between public debt (as a percentage of GDP) and GDP per capita growth is statistically significant nonlinear, in other words inverted U-shaped . there were two-way effects are both statistically significant and more prominent when public debt exceeds the threshold between public debt and economic growth. These two-way impacts showed stronger and statistically significant in the public debt. Where as Turan &Iyidogan,(2023)Study examined the effects of public debt on the investment ,growth rate and domestic credits given to private sector. They did analysis for 53 developing countries and used dynamic panel threshold regression method ,findings suggest that public debt does not have a significant impact on the economic growth rate. but there exist strong negative effect on

the total investment but there was no strong threshold effect on private investment. But on the other side there was evidence for a threshold effect of public debt on public investment.

the studyIbrahim& Khan, (2019) looks at the long-term relationship between domestic debt and the fiscal policy of economic growth in Nigeria from 1981 to 2013. The study used the limits test and the autoregressive distributed lag (ARDL) approach as suggested by Narayan (2005), which is based on the endogenous growth perspective. The findings show that while domestic debt generally has a negative impact on the economy, it has a beneficial impact on total government revenue and economic growth in Nigeria over the study period. The research also creates a method to evaluate the adjustment mechanism coefficient's speed in an error correction model (ECM)

Study by Ahlborn & Schweickert, (2018) examined the impact , while accounting for national economic system variations, the relationship between public debt and economic growth. The goal of the study was to examine how various economic systems, including the Nordic, Continental, and Liberal ones impact the growth . The analysis discovered a considerable degree of variation in the correlation between public debt and economic growth among country groups. Different nations have experienced differing implications of public debt on long-term growth. Richer countries showed a lesser or even positive effect of public debt on growth, while poorer and underdeveloped countries showed a linear negative influence. Compared to Liberal and Nordic countries, the Continental country group exhibited a different debt-growth connection.

Ramos-Herrera &Sosvilla-Rivero,(2017) tried to answer two important questions is economic growth affected by the level of public debt? does it depend upon the income level, data used collected from 115 countries based on their debt level. It was discovered that countries with the

lowest levels of public debt also have the fastest rates of economic growth, while those with the largest levels of public debt also have the slowest growth rates. However, this finding is qualified when we examine the countries according to income level: low-income countries behave differently from lower-, upper-, and high-income countries. The results show a varied association between such important macroeconomic factors rather than a clear pattern in the public debt–economic growth relationship across different nations when utilizing the IMF's country classification.

## 2.2. India-specific studies

Some of the studies for India are, a study by Bal & Rath, (2014) Focused on important macroeconomic factors, and investigated how public debt affects economic growth in India using annual data from 1980-2011,Their findings revealed that there is long-run equilibrium relationship between the variables, according to the ARDL model's results. But there was no long-term effect of TFP growth on economic growth.. Singh, (1999)The aim of Charan Singh's paper, "Domestic Debt and Economic Growth in India," examined the connection between domestic debt and economic growth in India, with a particular emphasis on the traditional perspective and the Ricardian equivalency hypothesis. The study's empirical findings did not give any meaningful causal connection between India's economic growth throughout the studied period (1959–1995) and domestic debt.

Manik & Khan, (2018) also looked into the connection between domestic debt and economic expansion and investigated the causal connection between economic expansion and external

debt, used the annual data from 1980- 2016 and applies techniques like unit root test, granger causality test, the results of Granger causality test found there is no relationship among the variables in short run, but there is unidirectional causality from economic growth and domestic debt to external debt in long run. Where as Mohanty& Panda, (2020)Examined how public debt affects interest rates, investments, inflation, and economic growth in India over the period from 1980 to 2017, using a structural vector autoregression approach. And the study revealed that public debt has a mixed effect (both positive and negative) on investment and inflation, but it has a negative impact on economic growth in the short term and a positive impact on the long-term interest rate, according to the impulse response function results. Additionally, discovered that the effects of domestic debt on the economy are more detrimental than those of foreign debt. India's public debt and growth account for a significant portion of the variance in a few chosen macro variables, according to the estimated variance decomposition analysis. A. Mohanty et al., (2016) an other important study which used the Dumitrescu-Hurlin causality test to investigate the relationship between public debt and economic growth for 15 Non special category states in India between 1991-2015. The panel causality test demonstrated the directional causal relationship between these two variables, were used to identify the endogeneity problem. By including additional controllable variables in the model, they examined the impact of public debt on economic growth for Non special category states throughout the same time period and used FMOLS to address both the endogeneity and serial autocorrelation issues in the model. Findings showed total credit, total revenue, and public debt all contribute to economic growth significantly.

The study by Akram & Rath, (2019) used annual data from 1990-1991 to 2014-2015 to evaluate the convergence analysis of public debt among Indian states.The findings show that debt

difference exists across all Indian states. Based on the amount of debt each state has, four clubs are created, and three of these clubs provide credence to the theory of club convergence. Furthermore, market loans, bank loans, and loans and advances from the central government make up the three compositions of the overall public debt. When it comes to market and bank loans, there is convergence; when it comes to loans and advances for entire states, there is variance. applying the club convergence method that Phillips and Sul (2007) proposed.

An other study tried to explain the log run effects Husain, (2019) study looked into how public debt affected economic development between 1990 and 2017. As a stand-in for economic development, they used statistics on per capita income and public debt (both internal and foreign). This study employed the ARDL cointegration test to examine long-run the way in which the variables are related. The study suggested long-term correlation between public debt and economic growth was confirmed by the cointegration test. Long- and short-term effects of public debt on economic growth are noteworthy. The Granger causality test was also employed in the study to examine unidirectional causality. Economic development was solely attributed to debt.

And the most recent study was the study Pratibha & Krishna, (2022) to investigate how the COVID-19 pandemic has affected the public debt and economic growth of India. Additionally, for the next five years, the authors try to project economic growth and external debt (ED) on a quarterly basis. The authors employed an auto-regressive integrated moving average (ARIMA) model to forecast India's GDP and ED for the ensuing five years. To ensure that the data were

stationary, an augmented Dickey–Fuller (ADF) test was performed on the model, the results indicated that the COVID-19 pandemic has noteworthy consequences for both public debt and economic growth .And Due to the halt of economic activity and ongoing struggles with negative GDP values, the economy shrank in the first quarter of 2020. The projections show that ED will keep expanding to keep up with the rising demands for health care spending, and that the GDP will likewise grow more slowly after 2021.

# 3. METHODOLOGY

## 3.1 Study Area

Data have been collected from secondary sources for 21 years from 2000-2020, from 29 indian states (Andhra Pradesh, Arunachal Pradesh, Assam ,Bihar, Chhattisgarh ,Goa, Gujarat , Haryana Himachal Pradesh, Jammu and Kashmir ,Jharkhand, Karnataka, Kerala MadhyaPradesh, Maharashtra, Manipur, Meghalaya, Mizoram ,Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal) and 2 Union Territories (NCT Delhi and Puducherry) .

## 3.2 variables

The dependent variable in our models is represented by the GSDP (Gross State Domestic Product), used as a proxy for economic growth. The key explanatory variable is internal public debt(debt), measured in our study by total internal debt to gross state domestic product. In addition, our models include a set of control variables to highlight the impact of other determinants of economic growth. Such gross fixed capital formation (gfc), government total expenditure (government_expenditure), and total population (pop). unit of measurement was in lakhs.

### 3.3 Data Sources

Data has been collected from RBI annual publications such as Handbook of Statistics on Indian Economy , Handbook of Statistics on Indian States and State Finances :A Study of Budgets. And even from EPWRF(Economic and Political weekly Research)

**Table No 3.1 Data sources**

| sr.no | Variables | Data sources | Links |
|---|---|---|---|
| 1 | Gross state domestic product | RBI | https://www.rbi.org.in/ |
| 2 | Internal Debt | RBI | https://epwrfits.in/ |
| 3 | Gross capital formation | RBI | https://www.rbi.org.in/ |
| 4 | Government Expenditure | EPWF,RBI | https://www.rbi.org.in/ https://epwrfits.in/ |
| 5 | Population | RBI | https://www.rbi.org.in/ |

### 3.4 Data Analysis

The data analysis were done utilizing a combination of statistical tools and econometric models. Statistical tools like scatter plots were employed to visualize and understand the relationships between variables, and correlation matrix were constructed to quantify the strength and direction

of associations between the variables Meanwhile, econometric models, including fixed and random effects models, were applied to assess the economic significance of these relationships.

To assess the impact of public debt on state economy following equation has been regressed:

$$GSDPt\ it = \beta 0 + \beta 1 debtit + \beta 2 gcf + \beta 3 govt\ exp + \beta 4\ pop\ it + \varepsilon it$$

*Where:*

*GSDP= gross state domestic product,*

*debt=* public internal debt ,

*gcf= gross capital formation ,*

*govt exp= government expenditure,pop= population.*

The "i" subscript depicts the states, and the "t" denotes time (year).β0 is the intercept, β's are the coefficients of the respective explanatory variables, and ε is the random error. To examine the

correlation between the dependent and independent variable correlation matrix and scatter plot were done using gretl and fixed and random effect was done using R-studio.

**3.5.1 Fixed effect model:** The fixed effect model estimates the relationship between variables while accounting for the unique characteristics of each individual or group, treating them as fixed and not subject to change throughout the analysis. This allows researchers to isolate the impact of other variables of interest without being confounded by the specific characteristics of the individuals or group study.

**3.5.2 Random effect model**: The random effects model assumes that the individual-specific effect is a random variable that is uncorrelated with the explanatory variables in the model. This individual effect captures all the unobserved factors that may influence the dependent variable and differ across individuals but are constant over time for each individual.

**Selection of model:** To select between the fixed and random model was done by hausman test

**3.5.3 Hausman test** is used to determine whether a random effects model or a fixed effects model is more appropriate for a given dataset, especially in the context of panel data. This test addresses is whether the unobserved individual-specific effects are correlated with the

explanatory variables in the model. If they are correlated, the random effects estimator may provide biased results, making it necessary to use the fixed effects estimator.

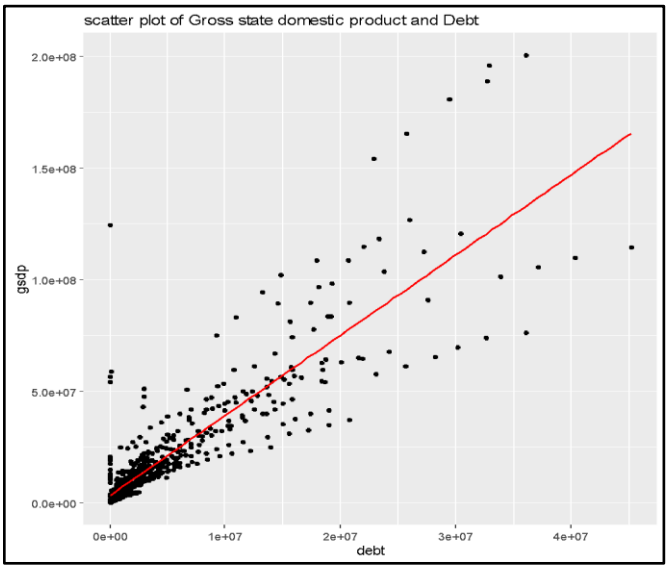
Ho: null hypothesis is that the preferred model is random effects model

H1:alternative hypothesis is that fixed effect model is more appropriate.

# 4. ANALYSIS

## 4.1 Statistical analysis

**Figure 4.1.1: scatter plot of gross state domestic product and debt**




corr(gsdp, debt) = 0.88016469

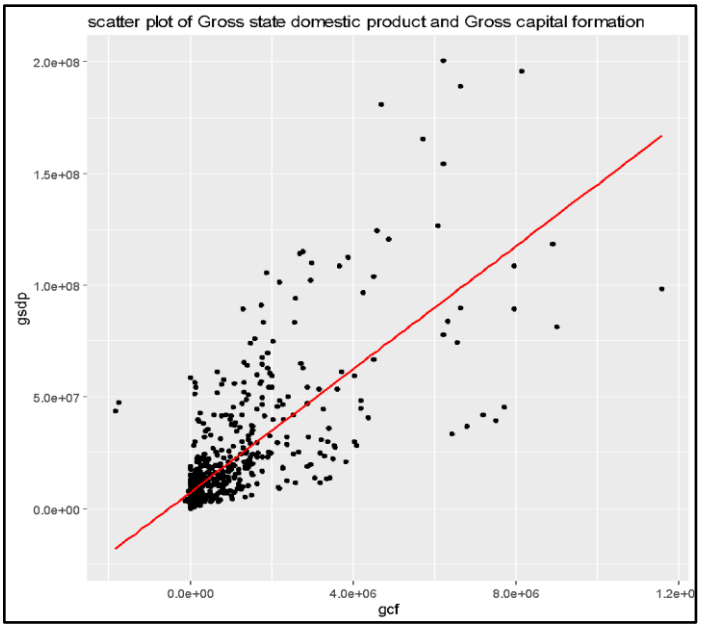
p-value =0.0000

In the above scatter plot on the y axis we have gross state domestic product debt and on the x-axis we have debt. the fitted line is indicating that there is positive correlation between the gross state domestic product and internal debt. And the results of correlation matrix which is mentioned at the right top p-value is 0.000 which indicate that there is a positive significant correlation between Gross state domestic product and internal debt.

When a government takes borrows money, it usually uses the money to make investments in the infrastructure, healthcare, and education sectors of the economy. These investments have the potential to boost economic growth by boosting output, generating employment, and enhancing

the nation's infrastructure. Increased borrowing-funded governmental spending can offset a decline in private sector spending during economic downturns. By keeping aggregate demand stable, this can support ongoing economic activity and even hasten the recovery of the economy .Long-term initiatives that private investors might shy away from because of their high initial costs and protracted return times can be funded with borrowed money. Large-scale renewable energy projects and significant transportation infrastructure projects, for example, have the potential to spur economic growth for many years or perhaps decades to come. Borrowed money can be used by governments to fund R&D, which is essential for innovation and technological advancement. New goods, more effective procedures, and a competitive edge in international markets can result in increasing economic growth.

**Figure 4.1.2: scatter plot of gross state domestic product and gross capita formation**




corr(gsdp, gcf) = 0.74075687

p-value 0.0000

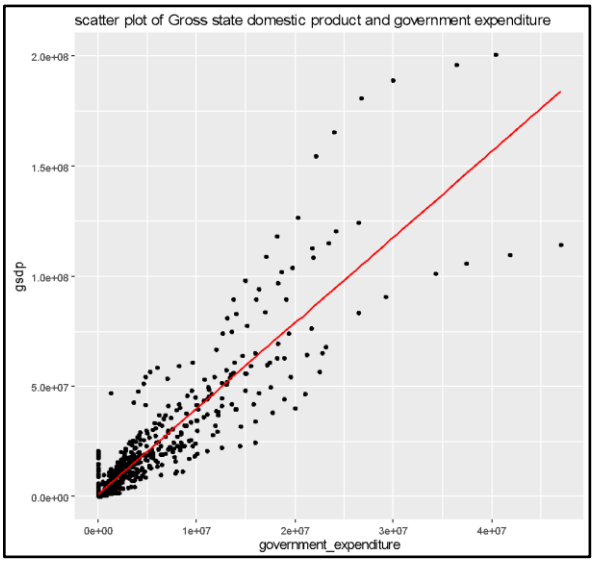
In the above scatter plot on y axis we have gross state domestic product and on the x-axis we have gross capital formation .the fitted line is showing an upward slope from left to right for the

variables Gross state domestic product and gross capital formation. Which indicate positive correlation between the two variables. And the coefficient 0.74075687 and p- value 0.0000 of correlation matrix also shows a positive correlationship between the two variables.

Gross State Domestic Product (GSDP) has positively impact gross capital formation by boosting investor confidence and providing a stable economic backdrop that encourages investment. GSDP indicates strong economic health, which can increase government and private spending on capital projects like infrastructure and technology. This investment not only fuels economic growth but also helps in better planning and allocation of resources, leading to sustained economic development. Essentially, a strong GSDP serves as a foundation for enhancing productive capacity and future growth through substantial capital investments.

A higher GSDP can improve the creditworthiness of a state, enabling it to borrow at more favorable rates or under better conditions. This increased access to finance can be used to fund large-scale capital projects, enhancing overall capital formation. Growth in GSDP also often involves expansion across various sectors such as manufacturing, services, and agriculture. This diversified growth encourages investments in specific sectors, which is a direct form of capital formation that helps in modernizing and enhancing sectoral productivity.

**Figure 4.1.3: scatter plot of gross state domestic product and government expenditure**



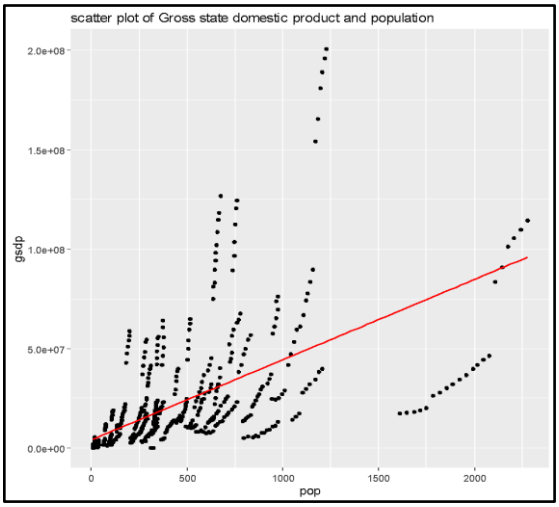

corr(gsdp,government_expenditure)
= 0.90112884 pvalue =0.0000

In the above figure 4.1.3 on y axis we have gross state domestic product and on the x-axis we have government expenditure .we can see that the gsdp and government expenditure has a upward fitted line which indicates that there is a positive linear relationship between the two variables .The correlation coefficient and p value between lagged gross state domestic product and government expenditure shows a statistically significant positive correlation between gross state domestic product and government expenditure.

A positive relationship between Gross State Domestic Product (GSDP) and government expenditure implies that economic performance in previous periods can lead to increased government spending. Essentially, when a state's economy has been strong historically, it typically results in higher tax revenues and financial resources, enabling the government to allocate more funds towards public services, infrastructure, and social welfare programs. This

increase in expenditure can further stimulate economic growth by boosting demand and creating jobs, thereby creating a reinforcing cycle of growth and investment.

**Figure 4.1.4: scatter plot of lagged gross state domestic product and population**




corr(gsdp, pop) =0.60411500

p-value 0.0000

In figure 4.1.4 below we can see a scatter plot ,on y axis we have gross state domestic product and on the x-axis we have population . we can see that Gross state domestic product and population has an upward sloping fitted line. And the coefficient 0.60411500 and p value: 0.0000 of correlation matrix shows statistically significant positive correlation between gross state domestic product and population. Which means as the GSDP increases, the population tends to increase as well.

A positive impact of Gross State Domestic Product (GSDP) on population suggests that strong economic performance may lead to population growth. Higher GSDP often indicates more job opportunities, better services, and enhanced living standards, attracting more people to move to the area for better economic prospects. This influx can lead to increased demand in various

sectors such as housing, education, and healthcare, further stimulating economic activities and growth within the states

### 4.2 Regression analysis

For analysis this study ,we employ panel data regression to assess how public internal debt(debt), gross capital formation (GCF), government expenditure, and population influence the lagged Gross State Domestic Product (GSDP) across different states over time, aiming to identify significant economic relationships between the variables. To estimate the results accepted methods such as fixed effect and random effects are used. In table 4.1 the results of fixed effect model are given and in table 4.2 results of random effect model is mentioned .

**Table No. 4.1 Panel Estimation Results(fixed effect)**

| **Variables** | **Coefficient** | **Std.Error** | **p-value** |
|---|---|---|---|
| **Dependent variable is GSDP** | | | |
| **Debt** | **7.7012e-01 ***** | **1.6135e-01** | **2.269e-06** |
| **gcf** | **2.5646e+00***** | **4.2771e-01** | **3.445e-09** |
| **Government expenditure** | **3.4078e+00 ***** | **3.4078+00** | **<2.2e-16** |
| **pop** | **-8.6906e+04***** | **1.1129e+04** | **2.488e-14** |

**Total Sum of Squares: 2.6365e+17**

**Residual Sum of Squares: 3.9698e+16**

**R-Squared: 0.84943**

**Adj. R-Squared: 0.84112**

**F-statistic: 868.781 on 4 and 616 DF, p-value: < 2.22e-16**

**Note: *p<0.1; **p<0.05; ***p<0.01**

Table 4.1 shows the results of fixed effect model. fixed effect model in panel data is used to capture the individual-specific variability by assuming that each entity(states) has its own individual characteristics that influence the dependent variable that is the gross state domestic product. This is particularly used when dealing with non-observable individual heterogeneity in the model.

For each one unit of increase in internal debt leads to 0.77012 units increase in gross state domestic products of Indian states ,which is significant at 0.01 level indicating 99% of confidence level. coefficient of 2.5646 indicates that for every unit increase in gross capital formation there is 2.5646 units increase in gross state domestic product at 99% confidence level which signify highly significance. With one unit increase in government expenditure suggests 3.4078 increase in gross state domestic product showing a strong positive impact with a very high level of statistical significance at 0.01 significant level. However for each unit increase in population is there is a decrease of -86906 in GSDP, Which is statistically significant at 0.01 level showing negative impact

**Table No.4. 2 Panel Estimation Results(random effect)**

| Variables | coefficient | Std.Error | p-value |
|---|---|---|---|
| **Dependent variable is GSDP** | | | |
| **Debt** | **8.2430e-01*** ** | **1.644e-01** | **5.391e-07** |
| **gcf** | **2.9774e+00*** ** | **4.277e-01** | **2.393e-12** |
| **Government expenditure** | **2.6056e+00 *** ** | **2.6056e+00** | **<2.2e-16** |
| **pop** | **-5.6968e+03.** | **3.0716e+03** | **0.06365.** |
| **Total Sum of Squares: 2.8347e+17**<br>**Residual Sum of Squares: 4.5777e+16**<br>**R-Squared: 0.83851**<br>**Adj. R-Squared: 0.83751**<br>**Chisq: 3354.33 on 4 DF, p-value: < 2.22e-16** | | | |

**Note: *p<0.1; **p<0.05; ***p<0.01**

Table 4.2 shows the results of panel estimation for random effect model. the random effect model assumes that while there could be individual-specific variability across entities(states) these effects are uncorrelated with the repressors in the model. this model is especially useful

when these individual effects are thought to be random and not inherently linked with independent variables. this model is balanced panel data with 31 entities that is states over 21 years. For each one unit of increase in internal debt leads to 8.2430 units increase in gross state domestic products of Indian states ,which is significant at 0.01 level indicating 99% of confidence level suggesting strong positive relationship. coefficient of 2.9774 indicates that for every unit increase in gross capital formation there is 2.9774 units increase in gross state domestic product at 99% confidence level which suggesting highly significance. With one unit increase in government expenditure suggests 2.6056 increase in gross state domestic product showing a strong positive impact with a very high level of statistical significance at 0.01 significant level .whereas for each unit increase in population is there is a decrease of -5696.8 in GSDP.

To select the best model between fixed effect and random effect Hausman test is used. Since the p-value for the test is less 0.05 we reject the null hypothesis and are in favour of alternative hypothesis which says fixed effect model is appropropriate over random effect.

**Table 4.3 Results of Hausman Test**

| | |
|---|---|
| p-value | < 2.2e-16 |
| chisq | 155.46 |
| df | 4 |

The fixed effect is considered as the good model over random effect model .table 4.1 model explains 84.943 percent variability in gross state domestic product which is quite high suggesting a good fit. Adjusted R-squared for the number of predictors value is 84.112% which

is strong indicating that the model explains a significant portion of the variability in gsdp. F-statistic is highly significant p value is < 2.2e-16 which is less then0.05 ,indicating that model is statistically. The p value for debt is less than 0.05 indicating a positive relationship between debt and gsdp. Which suggests that increase in debt will lead to increase gross state domestic product within the same entity over time holding other factor constant. Even the p value for gross capital formation and government expenditure is less than 0.05 indicating positive relationship between the variables and gsdp. which highlights the importance of investment in physical assets like buildings , machinery and equipment to promote economic growth, and even the government expenditure is important factor of economic growth. Model also shows that population has negative coefficient and the is significant at 0.01 level which shows that with increase in population there is decrease in gsdp within the states, growing population may lead to insufficient economic growth.

# 5.CONCLUSION

This study used panel data analysis to investigate how public debt affected the gross state domestic product (GSDP) of different Indian states. This approach made it possible to analyze the data in a complex way across state-level and over time. The results showed that public internal debt has a highly positive significant with gross states domestic product, within the timeframe analyzed for the study, supporting the to existing results of study, which suggested that public debt has a positive statistical significance on the impact on state economies.

Other economic variables, used in study, also provided a significant insight to the study such as it was shown that gross capital formation and government spending had a highly positive favorable influence on GSDP. These results highlight the necessity of strategic budgetary control and capital asset investment as essential to supporting state economy. On the other hand, the GSDP was negatively impacted by the population variable. This suggests that states with higher population growth may experience decreasing effects on their economic output per capita, possibly as a result of increased demand for infrastructure and public services that is not matched by an increase in economic output or investment.

These findings have numerous outcome. To begin, in order to maintain economic growth, policymakers ought to think about giving priority to investment in capital projects and maintaining government spending during fiscal planning. Second, when it comes to debt

management, by enabling the funding for infrastructure projects, educational facilities and other public good debt can be a powerful instrument for promoting economic growth .

Some of the limitations of the study include the potential for data to vary between states and the static nature of economic analysis in a dynamic fiscal environment, longitudinal studies should be considered for future research to track these relationships over time. In addition study can also investigate how well capital is used and the details of government spending, which can give better insight on how these factors helps or hinder economic growth.

In conclusion, public debt continues to be an essential component of economic discourse and fiscal policy, its direct impact on state-level economic growth in India has higher significant along with that of other factors like government spending, capital formation, and population dynamics. To enhance economic outcomes, this study suggests targeted government spending and tax measures. It also adds to our understanding of how different Indian states might encourage economic growth.

## 5.1.Findings of the study

The study attempts to examine the impact of public debt on gross state domestic product on Indian state. The findings of the study have revealed that there is highly positive statistically significant impact of public internal debt on economic growth of Indian states economy along with other variables such government expenditure and gross capita formation, however the expenditure and gross capita formation has highly positive significant but population has a negative significant on the growth of state economy .

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