How much Debt is Optimal for the Major Indian States? Economic Growth vs. Debt Sustainability

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Executive summary

FRBM Act 2003, amended vide the Finance Act 2018 **allowed states to hold public debt upto 20% of GDP.** *In this context, the present study proposes to explore an optimal range of debt to output ratio which is conducive to economic growth and appropriate for fiscal sustainability, considering the state level variations in economic and fiscal conditions.*

The conventional way of assessing fiscal sustainability assumes a linear reaction function of primary surplus to GDP ratio to public debt to GDP ratio. However, primary surplus to GDP ratio cannot increase unboundedly as it can never exceed GDP. Hence beyond a threshold debt-GDP ratio, incremental government borrowing may not be sustainable. A non-linear relation between primary surplus and public debt is thus expected.

Further, the conventional way of assessing fiscal sustainability does not account for the endogeneity among primary surplus, and economic growth via response of government spending to the economic condition, *where a non-linear relation can also exist between economic growth and public debt.* Conceptually, higher government expenditure funded by government borrowing may boost growth rate, initially via fiscal multiplier and crowding in effects and thereby yield a rise in primary surplus. However, beyond an optimal level of borrowing, an additional increase in public debt may reduce investment due to crowding out, debt overhang and uncertainty.

In this context, this study proposes to explore an optimal range of public debt to GDP ratio for which public debt is sustainable as well as contributing to

economic growth of 18 major Indian states for the period 2001-02 to 2019-20, taking into account the non-linearity of public debt with primary surplus and economic growth and endogeneity among fiscal situation and economic growth, in a **dynamic panel threshold regression model.**

Based on evidence for the period 2001-02 to 2019-20 for 18 major states in India, impact of public debt accumulation on debt sustainability and economic growth is found to crucially depend on the level of the public debt accumulated as a share of GSDP of the state. ***Starting from a low level of debt-GSDP ratio, public debt accumulation up to 25% of GSDP is found to be conducive for improving primary surplus. Primary surplus is found to be deteriorating with public debt accumulation beyond 25% of debt-GSDP ratio.*** *At a low level of public debt, higher government expenditure funded by government borrowing can enhance output and hence revenue sufficiently via positive fiscal multiplier and crowding in effects to improve primary surplus, thus ensuring sustainability of public debt dynamics. However, beyond an optimal level of public debt of 25% of GSDP, incremental public debt reduces investment and output due to the negative effects from crowding out, debt overhang and policy uncertainty. This causes primary surplus to decline with rising public debt beyond the threshold debt-output ratio, indicating difficulty of public debt dynamics to be sustained over time.* ***On the other hand, increase in public debt is found to be conducive to economic growth only after it reaches a minimum threshold level of 22% of GSDP.***

As a consequence of the non-linear relationship among public debt, economic growth and primary surplus, our major finding is that, there exists an optimal range of debt-GSDP ratio for the major states in India, which is conducive for economic growth, with a sustainable public debt dynamics. The optimal range of debt-GSDP ratio is thus found to be higher than the 20% debt-GSDP ratio for states allowed by the FRBM Act. *Given substantial variations in terms of per capita GSDP, growth trajectory, economic and institutional structures across Indian states,* a transition of states' debt-output ratio to the optimal range from the stipulated value has significantly varying consequences for economic growth and debt sustainability across the Indian states.

The main findings of our analysis are as follows:

1.   Based on the evidence for the period 2001-02 to 2019-20, overall, for the 18 major states in India, public debt is sustainable up to an optimal debt-GSDP ratio of 25%. Public debt financed spending can contribute to real economic growth beyond a threshold of 22% of debt-GSDP ratio and a threshold of 2% capex spending to GSDP ratio.

2. The growth enhancing effect of increasing debt-GSDP ratio from the stipulated 20% to 25% would be **higher in low economic growth states compared to the high economic growth states.**

3. Increase in debt-GSDP ratio from the stipulated 20% to 25% would raise **economic growth in high social spending states,** *while it would not have any impact on economic growth in the low social spending states.*

4. The growth enhancing effect of increasing debt-GSDP ratio from the stipulated 20% to 25% would be same for the states with both low and high share of spending on economic services.

5. Increase in debt-GSDP ratio from the stipulated 20% to 25% would increase *economic growth of the states with above average capex share to GSDP. However, the effect is not statistically significant.*

 The Major policy Implications of the findings are that**,** *allowing the major states of India to increase their public debt to GSDP ratio to 25% would be growth enhancing while the debt dynamics remaining sustainable.* ***This would benefit states with average and below average growth rate more in terms of increment in growth, compared to the states with above average growth rates. The increase in debt to GSDP ratio to 25% would also contribute to economic growth in the states with above average share of spending on social services.*** *This would also benefit states with both low and high share of spending on economic services equally in terms of boosting growth.*

1. Introduction

The issues of debt and fiscal sustainability of the states in India have been vacillating between the front and back-burner positions, including with proposals on constitution of a debt management office and a fiscal council. The differing stakeholders have expressed concerns both on the likely mandate and design of the institutional framework. However, the rising adoption of mechanisms for off-budget borrowing and expenditure through para-statals have assumed grave dimensions at all levels of government, with widening avenues bypassing most legislative and institutional scrutiny. These have implications for effectiveness and efficiency in debt and fiscal governance and adversely impact not only the potential but also the present development (outcome) indicators. This issue is even more complex at the sub-national level, with varying level of accumulated public debt and economic development across the Indian states.

FRBM Act 2003, amended vide the Finance Act 2018 **allowed states to hold public debt of 20% of GDP.** The 15th Finance Commission permitted ceiling of additional 3.5% borrowing in the FY 2022-23. The Commission recommended a borrowing limit of 3.0% for states from 2023-24 to 2025-26, with an extra borrowing of 0.5% related to power sector reforms. ***In this context, the present study proposes to explore an optimal range of debt to output ratio which would boost economic growth, maintaining the debt sustainability, considering the state level variations in economic and fiscal conditions.***

A recent report of Reserve Bank of India identified five high risk states for potentially unsustainable debt namely, Bihar, Kerala, Punjab, Rajasthan and West Bengal.[5] The study utilised conventional debt sustainability analysis tool of assessing the elasticity of primary surplus with respect to debt-GSDP ratio, whereby a negative elasticity coefficient for a state implied that an increase in debt-GSDP ratio in the current period would lead to a decline in primary surplus next period. It thereby rendered servicing of debt (that is, redress of interest obligation) difficult. For the remaining states, the estimated elasticities lie between zero and one, implying that "a rise in Debt-GSDP ratio in the current period leads to a rise in primary balance in the subsequent period which is consistent with a sustainable fiscal policy adjustment to debt."

This conventional way of assessing fiscal sustainability assumes a linear reaction function of primary surplus to GDP ratio to public debt to GDP ratio. However, primary surplus to GDP ratio cannot increase unboundedly as it can never exceed GDP. Hence beyond a threshold debt-GDP ratio, incremental government borrowing may not be sustainable. A non-linear relation between primary surplus and public debt is thus expected.

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[5] https://www.rbi.org.in/Scripts/BS_ViewBulletin.aspx?Id=21070#

Further, the conventional way of assessing fiscal sustainability does not account for the endogeneity among primary surplus, and economic growth via response of government spending to the economic condition. Again, a non-linear relation can also exist between economic growth and public debt. Conceptually, higher government expenditure funded by government borrowing may boost growth rate, initially via fiscal multiplier and crowding in effects and thereby yield a rise in primary surplus. However, beyond an optimal level of borrowing, an additional increase in public debt may reduce investment due to crowding out, debt overhang and uncertainty. Rise in interest rate of government bonds to attract buyers raises market interest rate and crowd out private investors, reducing growth and government revenue, hence making debt servicing difficult. Optimal decision making by private investors is also hampered due to policy uncertainty caused by large accumulation of public debt.

In this context, this study proposes to explore an optimal range of public debt to GDP ratio for which public debt is sustainable as well as contributing to economic growth of 18 major Indian states. To this end, we address the following questions:

a) Is the public debt profile of the Indian states conducive for contributing to their growth?

b) Is there a non-linear (threshold) relation between public debt and growth in Indian states?

c) Does an optimal public debt/GSDP ratio exist for which public debt in Indian states is sustainable?

d) What is the optimal range for debt to output ratio such that public debt is sustainable and conducive for economic growth?

e) *Does the implication for economic growth of a rising public debt to GSDP ratio within the optimal range vary when state-level heterogeneities are considered* in terms of (i) low vs. high per capita income; (ii) states with low vs. high capex spending; (iii) states with below and above average growth rates; (iv) states with low vs high spending on economic or social services?

The main findings of our analysis are as follows:

1.   Based on the evidence for the period 2001-02 to 2019-20, overall, for the 18 major states in India, public debt is sustainable up to an optimal debt-GSDP ratio of 25%. Public debt financed spending can contribute to real economic growth beyond a threshold of 22% of debt-GSDP ratio and a threshold of 2% capex spending to GSDP ratio.

2. The growth enhancing effect of increasing debt-GSDP ratio from the stipulated 20% to 25% would be **higher in low economic growth states compared to the high economic growth states.**

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4. The growth enhancing effect of increasing debt-GSDP ratio from the stipulated 20% to 25% would be same for the states with both low and high share of spending on economic services.

5. Increase in debt-GSDP ratio from the stipulated 20% to 25% would increase *economic growth of the states with above average capex share to GSDP. However, the impact is not statistically significant.*

The rest of the paper is organised as follows. Section 2 discusses related literature. Section 3 depicts a few stylised facts regarding public debt, fiscal scenario and economic growth in 18 major states in India. Section 4 and 5 detail theoretical and empirical framework. Section 6 describes the variables and the data. Section 7 discusses the findings of the analysis. Finally, Section 8 summarises the results and discusses the policy implications of our findings.

2. Review of Selected Literature

The outcome of an incremental debt to GDP ratio on economic growth substantially vary with different theoretical paradigms. Empirical evidence on the role of public debt for growth as well are diverse for the developed, developing and country level studies suggesting positive, negative or apparently no role of debt-financed fiscal spending on economic growth. On the other hand, ever-rising public borrowing posits serious concern about the sustainability of debt-financed fiscal policy of a government. The following subsections discuss theoretical predictions and empirical literature on the role of public debt for fiscal sustainability and economic growth to understand the possibility of an optimal debt to GDP ratio for an economy.

2.1 Theoretical Predictions

<u>Sustainability of public debt dynamics</u>

The dynamics of public debt can be expressed as follows:

$$D_t = G_t - R_t + (1 + i_t)D_{t-1} \qquad (1)$$

Here D_t is the government debt in period t incurred to finance the difference between non-interest real government spending G_t and real revenue R_t and the repayment of previous debt where i_t is the real interest rate on government borrowing.

Expressing both sides of equation (1) as a ratio of current output Y_t as follows,

$$\frac{D_t}{Y_t} = \frac{G_t - R_t}{Y_t} + \frac{(1 + i_t)}{(1 + g_t)} \frac{D_{t-1}}{Y_{t-1}}$$

$$\frac{D_t}{Y_t} = \frac{G_t - R_t}{Y_t} + (1 + i_t - g_t) \frac{D_{t-1}}{Y_{t-1}} \qquad (2)$$

Here g_t is the real growth rate of output in period t. The relation between primary balance and public debt in equation (2) indicates that (i) if the government runs a primary deficit, the stock of debt will unambiguously grow if real output growth falls below the current real interest rate; (ii) it will grow otherwise if the deficit is sufficiently high. Again, if the government runs a primary surplus, the stock of debt will decline (iii) if the level of surplus is sufficiently high, when interest rate exceeds real growth rate; (iv) if the growth rate is higher than the interest rate, stock of public debt will unambiguously decline. Hence the condition for debt sustainability crucially depends on the empirical relation between primary surplus to output ratio and the current debt to output ratio.

Public debt is sustainable when primary surplus to output ratio is a positive function of outstanding public debt-GDP ratio (Bohn, 1995, 1998). The reason is that if governments run into debt today, they have to take corrective actions in the future by increasing the primary surplus in order for public debt to be sustainable. Hence if primary surplus increases at least linearly with debt/GDP at high debt-GDP ratios, ensuring that any upward movement in the debt to output ratio due to negative shocks is eventually reversed through primary surpluses. This sustainability test of Bohn (1995, 1998) is valid in economies with uncertainty and risk aversion and for arbitrary debt management policies, whether or not government bond rates are above or below the growth rate (Owusu, Bokemeier and Greiner, 2023). By the similar reasoning, if primary surplus responds to debt to output ratio negatively, public debt is not sustainable.

However, the limitation of Bohn (1995, 1998) and the downstream literature is that it is based on the implicit assumption that primary surplus can grow without upper bound (Owusu, Bokemeier and Greiner, 2023). A positive but small reaction coefficient on average does not ensure a bounded debt to output ratio. Public debt to output ratio remains bounded if the reaction coefficient exceeds the difference in interest rate on public debt and output growth rate on average (Owusu, Bokemeier and Greiner, 2023). A positive reaction coefficient lower than the difference between the interest rate and the output growth rate implies a

rising debt to output ratio, if the interest rate exceeds the output growth rate. Such a policy is not sustainable because it would require permanently rising primary surplus to output ratios. This is not feasible, since the primary surplus relative to output is bounded from above as the primary surplus can never exceed the aggregate output. Hence there can exist a critical threshold value of the debt to output ratio beyond which public debt becomes unsustainable. Empirically, a non-linear relation between primary surplus to output ratio and debt to output ratio captures such characteristics of the government debt dynamics.

Public debt and economic growth

Ricardian Equivalence Hypothesis (REH) suggests neutrality of public debt for economic growth (Ricardo, 1951; Barro, 1974; Buchanan, 1976). Under this hypothesis, an increase in public spending financed by government borrowing would not have any impact on economic activities, and hence growth. Following a rise in public debt in the current period, households with rational expectation anticipate a future tax rise so that the government can pay back the debt. Households thus reduce their current consumption and increase savings in an act of consumption smoothing. The negative effect on economic activities from reduced current consumption is offset by the positive effect from higher saving and investment, leaving no impact on economic growth. Overall, under REH, public debt does not pose any adverse effect on the economy as long as the solvency condition is met.

The other paradigm suggests ***negative impact of public debt on growth***, known as Debt Overhang Hypothesis (DOH) in the literature (Myers, 1977; Buchanan, 1958; Diamond, 1965; Meade, 1958; Modigliani, 1961; Reinhart et al., 2012). Under this hypothesis, accumulation of public debt due to increasing fiscal deficit hinders economic agents to make optimal decisions regarding future investment. The DOH inflicts adverse impact on economic activities via three channels. Under the *rational expectations channel*, high public debt causes policy uncertainty hampering optimal decision making by private economic agents (Cochrane, 2011a; Panizza and Presbitero, 2013).

The second channel of DOH is well known as the *crowding out of private investment* (Huang, Panizza, and Varghese, 2018; Broner, Aitor, Alberto, and Jaume, 2014). Under this channel, government keeps the price of government bond low and interest rate high for private agents to hold public bonds. Private investors thus have to compete with government by offering a higher interest rate on private bonds if the access to credit is restricted, which causes private investment costs to rise. Consequently, private investors reduce investments leading to a negative effect on economic activities.

Under the third channel of DOH, known as *fiscal illusion theorem* (Pereira and Rodrigues 2001), when agents can not foresee the full future tax burden following a rise in current period public debt, they perceive debt financed fiscal expansion as a source of permanent rise in income. They respond to it by increasing current consumption and lowering savings and investment, leading to a decline in growth.

The main channel of ***positive effect of public debt on economic growth*** arises via *Keynesian multiplier effect.* Increase in public debt induces high levels of productive public spending on physical and social infrastructure, impacting economic activities and growth positively through positive externality effects (Lybeck, 1988; Kobayashi, 2015). This channel also acts as an automatic stabiliser. If public debt is utilised to finance decrease in capital tax rates or a substantial rise in public sector capital investments, the net return to capital increases. It stimulates domestic economic activity and hence crowds-in private investment (Elmendorf & Mankiw, 1999).

Government borrowing from domestic debt market strengthens domestic financial market, stimulates private saving and investments and hence growth (Gulde, Pattillo, and Christensen, 2006; Abbas & Christensen, 2007). Again when aggregate demand is depressed but interest rate is high to combat inflationary pressure, public debt financed fiscal expansion boosts aggregate demand in the long run, contributing to economic growth (Greiner, 2006).

The literature addressing possible ***non-linear relationship between public debt and economic growth*** suggests that rising public debt can be detrimental for the economic activities beyond a threshold. When public debt is below a certain threshold, the crowding-in effect of government borrowing dominates the crowding-out effect, raising growth rate in the economy (Krugman, 1988). Again rising public debt from an initial low level, boosts economic activity. However beyond a certain limit, further rise in it increases uncertainty regarding future tax hike, hampering investment and growth (Sachs, 1989).

2.2   Review of Selected Empirical Literature

Primary Surplus and Public Debt

Primary surplus assumes a pivotal role in the analysis of public debt sustainability of any nation. Therefore, debt sustainability analysis (DSA)[6] is evaluated on the adjustment in primary balance necessary to either reduce the debt ratio to GDP or maintain its stability (Celasun, Debrun, & Ostry, 2006; Ferrarini & Ramayandi, 2015). A higher level of debt entails higher expenditure on interest payments, which could have been spent on productive purposes.

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[6] Widely adopted by supranational institutions such as the IMF, World Bank, ADB, etc.

Hence, the analysis of debt sustainability, which is generally described in terms of inter-temporal budget constraint, necessitates the initial debt to be smaller than or equal to present value of expected future primary surpluses less the expected value of future interest payments (Eichengreen & Panizza, 2014).

Empirical evidences in the context of US showed that governments concerned with solvency would raise primary surpluses when their debt to GDP ratio is higher indicating sustainability by satisfying the inter-temporal budget constraint (Bohn, 1998). In the context of emerging market economies, Celasun, Debrun, & Ostry (2006) revealed that high debt to GDP episodes were positively associated with primary balances. Analysing 54 advanced and emerging economies, Eichengreen and Panizza (2014) found that primary surpluses are incurred when the economic growth is strong, when the current account is in surplus and the debt to GDP ratio is high. For debt to be sustainable, larger primary surpluses are needed such as in the case of Ireland, where the debt to GDP ratio declined with accelerating economic growth.

In the Indian context, Rangarajan and Srivastava (2003) state that public debt to GDP ratio is affected by the accumulation of primary deficits and the cumulated effect of the interest rate to economic growth differential. They found that over the period 1955-56 to 1999-2000, the primary deficit led to an increase in the debt-GDP ratio. The study further revealed that the sole reason for the increase in India's debt to GDP ratio over the study period was the increase in primary deficits, while the growth rate in excess of the interest rates helped evading vulnerability of the fiscal finances.

Considering the combined debt to GDP ratios of the central and state governments in India, Srivastava et al. (2021) estimated the contribution of determinants of debt accumulation namely primary deficit to GDP ratio, lagged debt-GDP ratio, nominal GDP growth rate and interest rate. The results of the pre-covid analysis revealed the debt to GDP ratio to exceed the sustainability threshold fixed by the Fiscal Responsibility and Budget Management (FRBM) Review Committee (2017) target of 60 per cent of GDP. The impact of the lagged debt to GDP ratio on the primary deficit to GDP ratio revealed higher levels of previous debt which needs to be reduced in order to reduce the future primary deficit and thereby the debt to GDP ratio. The study further suggested a reduction in the primary deficit in order to put the debt at sustainable levels.

Public Debt and Economic Growth

Majority of the reviewed empirical literature reveals a negative relationship between public debt and economic growth through different channels such as crowding out of private investment leading to higher interest rates, higher level of inflation and increased distortionary taxes (Cecchetti, Mohanty, & Zampolli, 2011; Cochrane, 2011; Patinkin, 1965; Panizza & Presbitero, 2013; Karadam, 2018). The

influential work by Reinhart and Rogoff (2010) found that in a sample of advanced and emerging economies, for the countries having debt to GDP ratio below ninety per cent, the relationship between government debt and real GDP growth was negative.

Kumar and Woo (2010) established strong evidence for the existence of negative relationship between public debt and economic growth for advanced and emerging economies over the period 1970 – 2007, where 10 per cent point increase in the debt to GDP ratio resulted in a decline of real per capita GDP growth by about 0.2 per cent per year. The study found non-linearity at debt levels as high as 90 per cent of GDP which adversely impacted the economic growth. Examining the average impact of government debt on per capita GDP growth in twelve EU countries over 1970 to 2010, spanning about 40 years, Checherita and Rother (2010) found that there was a non-linear impact of public debt on economic growth, where the prevalence of a debt-to-GDP ratio in the range of 90-100 per cent resulted in an adverse impact on economic growth. The negative impact of debt on growth was found to be explicit at around 70 -80 per cent levels of debt to GDP ratio.

Another study considering the same time period by Presbitero (2010) in a panel of low and middle-income countries found that public debt had a negative impact on output growth up to a threshold level of 90 per cent, beyond which its effect was irrelevant. In a broader spectrum of analysis using macroeconomic data on 252 countries over the period 1960-2009, Swamy (2015) found a non-linear relationship between government debt and growth. Examining whether public debt and economic growth relationship depends on time horizon, Gomez-Puig and Sosvilla-Rivero (2015) reiterated the negative effect of public debt on economic growth in the long-run in the case of 11 Euro area countries. Nevertheless, the study asserts that in the short-run the positive effect of public debt on economic growth could be observed through enhanced productive capacity of the economy. Further, the study suggests that debt limits and fiscal policy effectiveness may be country-specific.

Tracing the relationship between India's domestic debt and economic growth, Singh (1999) found the non-existence of any causal relationship between domestic public debt and economic growth, thereby providing an evidence of Ricardian equivalence or the neutral effect of domestic debt on India's economic growth rate. Examining the impact of public debt on its economic growth during the period 1980 to 2010 in the Indian context, Bal and Rath (2014) found that both domestic and external debts had significant negative impact on economic growth. The negative relationship between public debt and economic growth has been further re-established in the recent studies by Mohanty and Panda (2020) and Barik and Sahu (2020). Kaur and Mukherjee (2012) found public debt to have a significant non-linear relation with economic growth in India. However, the

studies on the non-linear relation of public debt with economic growth in the Indian context have been found largely elusive in the recent literature.

3. A Tale of Public Debt of the Major Indian States: Stylised Facts

The Constitution of India empowers State Governments to borrow only from domestic sources under Article 293(1). However, states are not fully independent regarding their borrowing decision. Under Article 293(3) of the Constitution of India, "A State may not without the consent of the Government of India raise any loan if there is still outstanding any part of a loan which has been made to the State by the Government of India." [7]

The average outstanding ratio of public debt to Gross State Domestic Product (GSDP) for 18 major states in India stands at 23% over the period 2001-02 to 2021-22. These 18 major states include Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

Large variation in debt-GSDP ratio across the states over the sample period, although half of the observations are concentrated below 23%: Over the last two decades, public debt to GSDP ratio for these 18 states varies by 8.5% around the average ratio. On average, over the two decades, the highest outstanding public debt to GSDP ratio was at 36.4% recorded by West Bengal, while Chhattisgarh had the lowest ratio at 13.5% (first column of Table A.1 in Appendix A). In 2021-22, Punjab recorded the highest debt-GSDP ratio of 39.8%, while it is the lowest for Odisha at 11.2% (second column of Table A.1 in Appendix A). *However the density plot of debt to GSDP ratio in Figure 3.1 is skewed to the right indicating a concentration of half of the observation below the average of 23%.* Table A.1 also reveals *that on average, public debt constitutes 74.2% of the total government liabilities. Out of the total public debt, almost half of it is under market borrowing (49%), followed by NSSF (25.4%) and Loans and advances from the centre (14.8%).*

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[7] "Status Paper on Government Debt for 2018-18", (April, 2020), DEA, Ministry of Finance.

Figure 3.1: Distribution of Public debt GSDP ratio of the Indian states
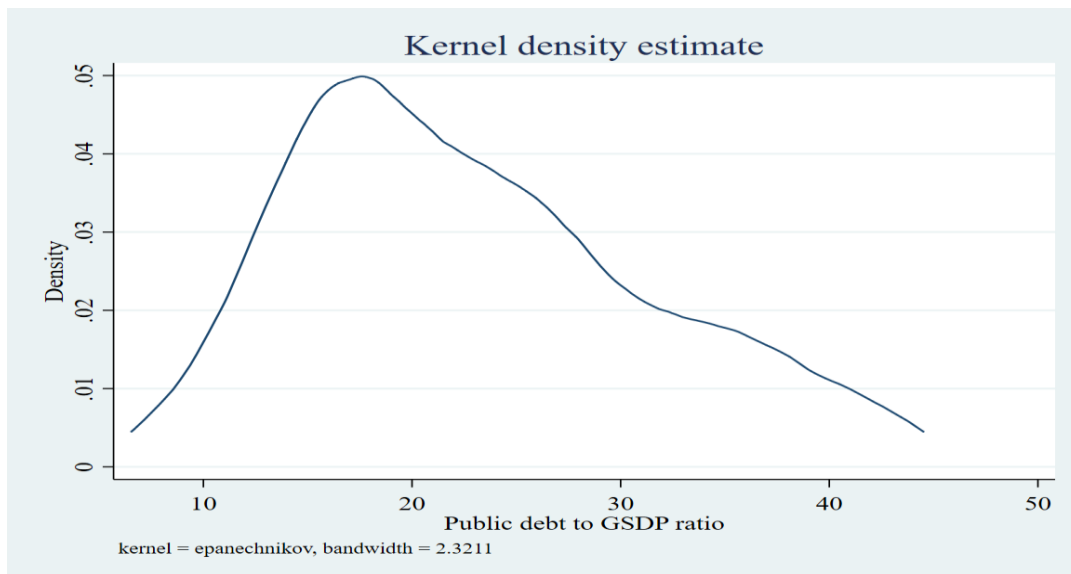
Source: RBI & Authors' estimates

Among the 18 states, Bihar, Kerala, Andhra Pradesh, Chhatisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Madhya Pradesh, Rajasthan, Tamil Nadu and West Bengal are in perpetual deficit for the period of six years of 2017-18 to 2022-23. Among the rest of the six states, Himachal Pradesh and Uttar Pradesh were the primary deficit states since 2017-18, but became primary surplus states in 2019-20. Odisha and Uttarakhand experienced reversal from deficit to surplus in 2021-22. On the other hand, Maharashtra and Panjab, which were running primary surplus since 2017-18, turned to deficit states in 2019-20 and 2020-21 respectively. Tables A.2 and A.3 in Appendix A summarise the pattern of primary balance of the 18 states in the sample during 2017-18 to 2022-23.

We observe that there are considerable variation in the pattern of relationship between public debt and primary surplus as depicted in Figure 3.2. For example, in *Gujarat, primary surplus to GSDP ratio is negatively related with debt to GSDP ratio, while the relationship is found to be positive in Andhra Pradesh. In West Bengal, primary surplus to GSDP ratio has a U shaped relation with public debt to GSDP ratio. In Karnataka on the other hand, the relation is inverted-U shaped.* Apart from Gujarat, a negative relationship is found in Madhya Pradesh, Uttar Pradesh, Punjab, Tamil Nadu, and Maharashtra. While Rajasthan, Jharkhand, Bihar depict a U-shaped relation, an inverted-U shaped relation is found in Odisha, Kerala, Chhattisgarh, Haryana, Himachal Pradesh and Uttarakhand.

Figure 3.2: Non-linear relationship exists between primary surplus to GSDP ratio and debt to GSDP ratio in Indian states

Primary Surplus as percent of GSDP in relation to Debt as percent of GSDP
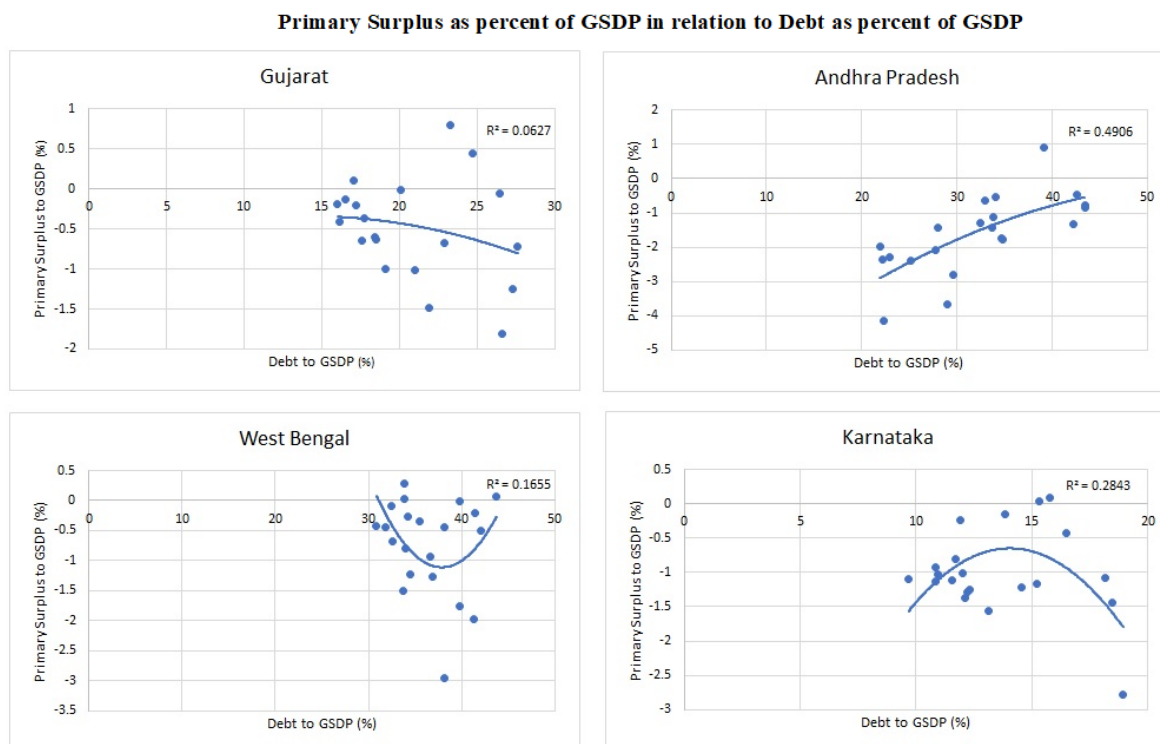
Source: RBI & Authors' estimates

During the last two decades, on average, Gujarat grew at the highest rate of 9.25%, followed by Haryana at 7.82% (Table 3.1). In the post pandemic year 2021-22, these two states, along with other eleven states recorded double digit growth, on account of the strong base effect from output contraction in the pandemic year of 2020-21. In 2022-23, the real growth rate of the states, except for Bihar declined due to the fading base effect.

Table 3.1: Real growth rate of 18 major states during 2001-02 to 2022-23 (%)

States	Average	2021-22	2022-23
Andhra Pradesh	6.85	11.23	7.02
Bihar	6.91	8.46	10.64
Chhattisgarh	6.83	8.46	8.00
Gujarat*	**9.25**	10.56	-
Haryana	**7.82**	11.32	7.10
Himachal Pradesh	6.77	7.55	6.44
Jharkhand	6.28	10.87	6.76
Karnataka	7.40	10.96	7.86
Kerala*	6.27	11.93	-
Maharashtra*	6.87	9.13	-

States	Average	2021-22	2022-23
Madhya Pradesh	6.73	10.43	7.06
Odisha	7.36	11.26	7.14
Punjab	5.75	6.51	6.40
Rajasthan	6.77	11.36	8.19
Tamil Nadu	7.60	7.92	8.19
Uttar Pradesh	5.94	10.20	8.30
Uttarakhand	**8.95**	8.19	7.08
West Bengal	5.42	10.76	8.41
Average of 18 states	6.99	9.84	7.64

Source: RBI & Authors' estimates. *Averages for 2001-02 to 2021-22

Figure 3.3: Non-linear relationship exists between real growth rate and debt to GSDP ratio in Indian states

GSDP growth rate in relation to Debt as percent of GSDP
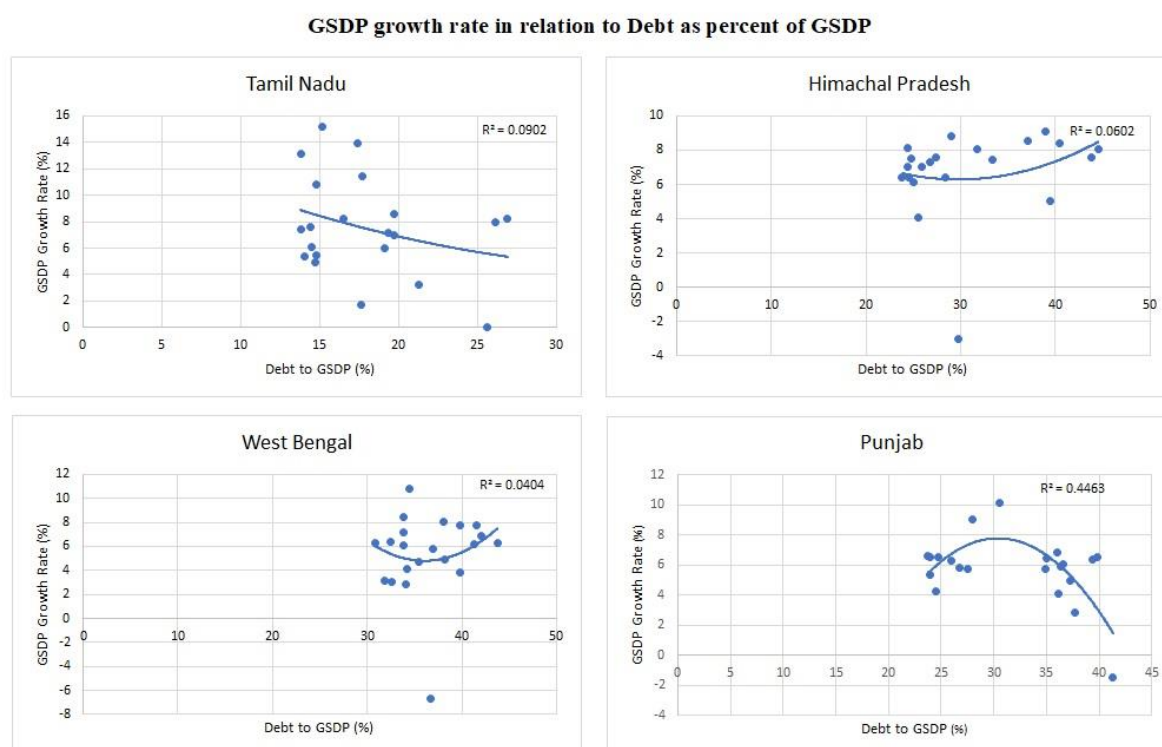
Source: RBI and Authors' estimates

We also find varying patterns of relationship between real growth rate and the debt to GSDP ratio across the states as shown in Figure 3.3. For instance, real growth rate declines with debt to GSDP ratio in Tamil Nadu, while it increases beyond a threshold value of debt-GSDP ratio in Himachal Pradesh, West Bengal, Gujarat and Maharashtra. Growth rate initially increases with debt to GSDP ratio, but declines beyond an optimal ratio in Punjab, Bihar, Odisha, Kerala, Rajasthan, Uttar Pradesh, Chhattisgarh, Haryana, Jharkhand, Karnataka, and Madhya Pradesh.

4. Theoretical Framework

Equation (2) of section 2.1 constitutes the underlying relationship between primary surplus and public debt in our analysis.

Again, in a macroeconomic framework, government spending can influence output growth such that,

$$g_t = f_g\left(\frac{G_t}{Y_t}\right), \qquad f_g' \lesseqgtr 0 \qquad (3)$$

From the discussions on theoretical prediction of the impact of debt financed government spending on growth in Section 2, it is intuitive that the sign of f_g' can be zero if REH holds; it can be positive if Keynesian multiplier effect if strong enough, while it can be negative if debt overhang and crowding out effects are stronger; or can change signs beyond a threshold if a non-linear relation exists.

Again public spending can be endogenous to economic condition, responding to the growth rate of the economy,

$$\frac{G_t}{Y_t} = f_G(g_t), \quad f_G' \lesseqgtr 0 \qquad (4)$$

Public spending responds positively to growth if it is pro-cyclical, while responds negatively if fiscal policy is counter-cyclical.

5. Empirical Strategy

Panel Dynamic Threshold Regression Model developed by Seo and Shin (2016) is applied to explore the nature of non-linear relationship of public debt to GSDP ratio with primary surplus and economic growth. The underlying regression model estimated to explore debt sustainability in an optimal debt framework is as follows:

$$y_{it} = X_{it}'\beta + (1, X_{it})'\delta \mid \{q_{it} > \gamma\} + \alpha_i + \varepsilon_{it} \qquad (5)$$

Here, y_{it} is the primary surplus to debt-GSDP ratio; X_{it} is the vector of explanatory variables including debt-GSDP ratio and growth in real GSDP; q_{it} is the threshold variable which is the debt-GSDP ratio in our analysis; α_i captures the state fixed effect, and ε_{it} denotes the i.i.d. shock. Endogeneity between primary surplus/GSDP ratio and real growth is addressed using the lagged values of growth and debt-GSDP ratio as instruments. The null hypothesis is that the model is linear, i.e., $H_0 : \delta=0$. If δ is statistically significant so that H_0 is rejected, the relation is non-linear.

The underlying regression model estimated to explore the non-linear relation between public debt and economic growth is similar to equation (5),

$$z_{it} = X'_{it}\theta + (1, X_{it})'\phi \mid \{q_{it} > \rho\} + \mu_i + \epsilon_{it} \qquad (6)$$

Here, z_{it} is year-on-year growth in real GSDP; X_{it} is the vector of explanatory variables including debt-GSDP ratio and the total developmental and non-developmental capital expenditure (capital outlays) as a share of GSDP; q_{it} is the threshold variable which is the debt-GSDP ratio in our analysis; μ_i captures the state fixed effect, and ϵ_{it} denotes the i.i.d. shock. Endogeneity among economic growth and capital spending is addressed using the lagged values of debt-GSDP ratio and capital outlay to GSDP ratio. The relation between public debt and economic growth is non-linear if the null hypothesis H_0: ϕ=0 is rejected. The model is estimated using the Dynamic First Difference Generalised Method of Moments (FD-GMM) following Seo and Shin (2016) and Seo et al. (2019).

6. The Data

The study period spans the financial years (FYs) 2001-02 to the pre-covid year of 2019-20 (unless otherwise mentioned). We constrain the period of analysis till the pre-covid year, as the pandemic and the pre-pandemic years are characterised by large volatilities in growth rates across all states. In the covid year of 2020-21, all states experienced contraction in GSDP, resulting in negative growth rate, followed by sharp rise in growth rate, in the post covid year of 2021-22, essentially driven by base effect from the previous year.[8]

The study uses annual data from secondary sources taken from the Reserve Bank of India Handbook of Statistics on Indian States, Reserve Bank of India State Finances: A Study of Budgets - 2023, and the Ministry of Statistics and Programme Implementation -2023 (Government of India). The financial year runs from April 1 through March 31. Eighteen major states of India namely, Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand (formerly Uttaranchal), and West Bengal are considered in this study. Considering the states formed in the year 2000 viz., Chhattisgarh, Jharkhand and Uttarakhand, the FY 2001-02 is taken as the initial period of analysis.

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[8] In fact, Table B.3 in Appendix B shows that Kerala, Haryana, Jharkhand, Odisha and West Bengal which were in the group of below average growth rate before the pandemic, shifted to the set of above average growth states post-pandemic. However, this upward transition of the perpetual low growth states over the two decades is attributable to the sharp rise in growth rate in the post-pandemic period on account of strong base effect from the pandemic year.

6.1 Variable Description:

The Gross State Domestic Product (GSDP) is used as the measure of economic activity at the state level. The annual estimates of GSDP for each state at both constant (2011-12 base) and current prices are considered in this study. For the variable GSDP at constant prices, all the previous base year values are spliced to the latest base year. Real GSDP per capita for each state is calculated from the Real Net State Domestic Product (NSDP) at factor cost and real NSDP per capita values using the formula:

GSDP per capita = (NSDP per capita * GSDP) / NSDP, all in real terms.

The GSDP data for all states are considered for the period 2001-02 to 2022-23, except for the states Gujarat, Kerala and Maharashtra which is taken till 2021-22 due to non-availability of data for the year 2022-23.

The major fiscal variables include primary surplus, debt, and expenditures of the state governments. The debt of state governments is classified into public debt and other liabilities as per the official documentation by Government of India[9]. Accordingly, public debt of each state is calculated as the sum of total internal debt and the loans and advances of the Centre. Total internal debt of states comprises of market loans or State Development Loans (SDLs), power bonds, Compensation and Other Bonds, borrowings from National Small Savings Fund (NSSF), Ways and Means Advances (WMA), and Loan from Banks and Other Financial Institutions. Power bonds are shown as Ujwal Discom Assurance Yojana (UDAY) bonds after its introduction in November 2015.

Gross fiscal deficit is indicative of the current year's borrowings due to the excess of expenditure over the revenue mobilised. The gross primary deficit, indicative of the current year's borrowings excluding the interest payments, is converted to primary surplus.

The components of expenditure in the Indian context are broadly classified into revenue expenditure and capital expenditure, which are further classified into developmental and non-developmental expenditures. The revenue expenditure comprises of all those expenditures that do not result in creation of physical or financial assets, namely under the heads, Social Services, Economic Services, General Services, and Grants-in-Aid and Contributions. Similarly, the capital expenditure comprises of Social Services, Economic Services, General Services, Discharge of Public Debt and Loans and Advances, Inter-State Settlement, Transfers to Contingency Fund[10]. Table 6.1 summarises the data sources and Table 6.2 describes the variables used in our analysis in details.

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[9] Status Paper on Government Debt for 2021-22, Ministry of Finance, Government of India.
[10] Finance Accounts 2021-22, Comptroller and Auditor General of India.

Table 6.1: Sources of variables used in the analysis

Variable	Description	Source/ Database
GSDP (Constant Prices – 2011-12)	Gross State Domestic Product (GSDP) at constant prices which is the real GSDP	RBI Handbook of Statistics on Indian States 2019, 2013
GSDP (Current Prices – 2011-12)	Gross State Domestic Product (GSDP) at current prices which is the nominal GSDP	RBI Handbook of Statistics on Indian States 2019, 2023
NSDP per capita	Net State Domestic Product (NSDP) per capita at factor cost	RBI Handbook of Statistics on Indian States 2019, 2023
NSDP at factor cost	Net State Domestic Product (NSDP) at factor cost	RBI Handbook of Statistics on Indian States 2019, 2023
Public debt	Sum of Total Internal Debt and Loans and Advances from the Central Government	RBI Handbook of Statistics on Indian States 2023, 2019
Gross Primary Deficit	Gross fiscal deficit minus interest payments	RBI Handbook of Statistics on Indian States 2019, 2023
Total Capital Disbursements	Sum of Total Capital Outlay and Debt Repayments including Other Capital Disbursements (DROCD)	RBI State Finances: A Study of Budgets 2023
Debt Repayments and Other Capital Disbursements (DROCD)	Includes Discharge of Internal Debt, Repayment of Loans to the Centre, Loans and Advances by State Governments, Inter-State Settlement, Contingency Fund, State Provident Funds, etc., Reserve Funds, Deposits and Advances, Appropriation to Contingency Fund, and Remittances	RBI State Finances: A Study of Budgets 2023
Total Capital Outlay	Total Capital Disbursements excluding debt repayments. This variable is taken as capital expenditure in the study.	RBI State Finances: A Study of Budgets 2023
Revenue Expenditure	All those expenditures of the government, which do not result in creation of physical or financial assets	RBI State Finances: A Study of Budgets 2023
Total Expenditure	Total expenditure is taken as the sum of Revenue expenditure and Total Capital Disbursements.	RBI State Finances: A Study of Budgets 2023
Social Expenditure	Total expenditure on social services, both of revenue and capital nature, incurred by States	RBI State Finances: A Study of Budgets 2023
Economic Expenditure	Total expenditure on economic services, both of revenue and capital nature, incurred by States	RBI State Finances: A Study of Budgets 2023

Source: Authors' compilation

Table 6.2: Variable Description

Variable Notation	Description	Calculation
GSDP per capita	GSDP per capita	((GSDP*NSDP per capita)/NSDP)
Total Expenditure to GSDP	Total expenditure as per cent of GSDP	(Total Expenditure / GSDP) * 100
Capital Expenditure to GSDP	Capital expenditure as per cent of GSDP	(Capital Expenditure / GSDP) * 100
Capital Expenditure to Total Expenditure	Share of capital expenditure in the total expenditure	(Capital Expenditure / Total Expenditure) * 100
Revenue Expenditure to GSDP	Revenue expenditure as per cent of GSDP	(Revenue Expenditure / GSDP) * 100
Debt to GSDP ratio	Public debt as percent of GSDP	(Public Debt / GSDP) * 100
Real economic growth	Yearly growth rate real GSDP	((Real GSDP in current year – Real GSDP in previous year) / Real GSDP in previous year)) * 100
Primary Surplus to GSDP	Negative of primary deficit to GSDP ratio	((- Primary Deficit) / GSDP) * 100
Fiscal Deficit to GSDP	Gross Fiscal Deficit to GSDP ratio	(Gross Fiscal Deficit / GSDP) * 100
Dummy Variables:		
GSDP per capita Dummy	Dummy variable for per capita GSDP above the combined average per capita GSDP of all the 18 states for the year	GSDP per capita Dummy at year t = 1 if the per capita GSDP is above the average per capita GSDP for the 18 states at year t, otherwise = 0.
Capital Expenditure Dummy	Dummy variable for states, if the capital expenditure incurred in a year is above the combined average capital expenditure of all the 18 states for the year	Capital Expenditure Dummy at year t = 1 if capital expenditure for the year is above the average capital expenditure of all the 18 states at year t, otherwise = 0.
GSDP Growth Rate Dummy	Dummy variable for states, if the GSDP growth rate in a year is above the combined average GSDP growth rate of all the 18 states for the year	GSDP Growth Dummy at year t = 1 if GSDP growth rate for the year is above the average GSDP growth rate of all the 18 states at year t, otherwise = 0.
Economic services dummy	Dummy variable for states, if the share of expenditure on economic services in total expenditure in a year is above the combined average share of spending on economic services of all the 18 states for the year	Economic services Dummy at year = 1 if expenditure share on economic services for the year is above the average share of all the 18 states at year t, otherwise = 0.
Social services dummy	Dummy variable for states, if the share of expenditure on social services in total expenditure in a year is above the combined average share of spending on social services of all the 18 states for the year	Social services Dummy at year t = 1 if expenditure share on social services for the year is above the average share of all the 18 states at year t, otherwise = 0.

Source: Authors' compilation

7. Findings

7.1: Response of primary surplus and economic growth to rising public debt in the Indian states during 2001-02 to 2019-20.

Overall, for 18 states, ***the positive reaction of primary surplus to debt-GSDP ratio is sufficiently high enough for the debt-output ratio to remain bounded and hence sustainable upto an optimal ratio of 25%*** (Table 7.1).[11] At this stage, higher growth reduced primary surplus, as government spending increased significantly following booming economic activities, indicating a pro-cyclical fiscal stance in the states in the pre-covid period. Increase in debt-GSDP ratio beyond the threshold of 25% negatively affected primary surplus to GSDP ratio, indicating difficulty in debt servicing when debt-GSDP ratio is higher than the optimal ratio.

Again, public debt was found to positively affecting economic growth beyond a threshold debt-GSDP ratio of 22% (Table 7.2).[12] Beyond this threshold, Keynesian multiplier effects of debt financed public spending was sufficiently high for the growth to increase with debt. However capital spending did not seem to contribute to growth in the pre-pandemic period. *We re-estimate the growth equation by allowing a possible threshold capital spending to affect growth.* ***We find that it positively contributed to growth beyond a capex to GSDP ratio of 2%. This result supplemented our finding that public debt contributes to growth beyond a threshold. That is, public borrowing helps growth in Indian states when it is utilised to build a sufficient level of capital stock.***

The findings implied that a rise in debt to GSDP ratio from the current stipulated 20% to a range of 22-25% would be sustainable and contributing to economic growth of the major Indian states in the pre-pandemic period.

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[11] The results in Table 7.1 are from the estimated static form of the equation (5). Since the coefficient of the lagged value of dependent variable is not significant when the dynamic specification is estimated, the static model is chosen for the final estimation.

[12] The results in Table 7.2 are from the estimated static form of the equation (6). Since the coefficient of the lagged value of dependent variable is not significant when the dynamic specification is estimated, the static model is chosen for the final estimation.

Table 7.1: Response of primary surplus/GSDP ratio to an increase in debt/GSDP ratio in pre-pandemic period

Explanatory variables	Primary surplus to GSDP ratio (%) All 18 major states	
	Coefficient	**p-value**
Debt/GSDP (debt/GSDP < γ)	**0.309****	0.015
Real growth (debt/GSDP < γ)	-0.123***	0.000
Constant	11.421	0.012
Debt/GSDP (debt/GSDP > γ)	**-0.550*****	0.002
Real growth (debt/GSDP > γ)	0.189**	0.013
Optimal/Threshold debt/GSDP (γ)	**25.045*****	0.000
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

Table 7.2: Response of real GSDP growth to an increase in debt/GSDP ratio in pre-pandemic period

Explanatory variables	Real GSDP growth (%) All 18 major states	
	Coefficient	**p-value**
Debt/GSDP (debt/GSDP < μ)	**-7.525*****	0.000
Capex/GSDP (debt/GSDP < μ)	-4.184	0.485
Constant	-110.523***	0.000
Debt/GSDP (debt/GSDP > μ)	**7.156*****	0.000
Capex/GSDP (debt/GSDP > μ)	**6.652**	0.519
Optimal/Threshold debt/GSDP (μ)	**22.052*****	0.000
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

7.2 States with low vs. high per capita income

We further explore the effect of public debt on primary surplus for low versus high per capita GSDP states using a dynamic dummy variable. The dummy variable takes value 1 if per capita GSDP of a state in year t is higher than the average per capita GSDP of the 18 states in that year, otherwise zero. *The marginal effect of debt to GSDP ratio in high per capita states is captured by an interaction term of debt to GSDP ratio with the dummy variable representing high income states.*

Table B.1 in Appendix B lists the states above and below the average per capita GSDP of the 18 states in the initial year of 2001-02 and in 2019-20. The classification is found to remain same over the two decades, except for Uttarakhand, which was below average per capita GSDP in 2001-02, shifted to the group of above average income states in 2019-20.

Table 7.3: Response of primary surplus/GSDP ratio to an increase in debt/GSDP ratio: Low vs. high per capita GSDP states

	Primary surplus to GSDP ratio (%)	
Explanatory variables	**Low vs. high per capita income states**	
	Coefficient	**p-value**
Debt/GSDP in low income states (debt/GSDP < γ)	**-0.845***	**0.053**
Debt/GSDP in high income states (debt/GSDP < γ)	**0.528***	**0.000**
Real growth (debt/GSDP < γ)	0.111	0.147
Constant	-2.840	0.865
Debt/GSDP in low income states (debt/GSDP > γ)	0.548	0.394
Debt/GSDP in high income states (debt/GSDP > γ)	**-0.412***	**0.000**
Real growth (debt/GSDP > γ)	-0.181***	0.001
Optimal/Threshold debt/GSDP (γ)	**25.05***	**0.073**
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

We find that primary balance deteriorates with accumulation of public debt in the average and below average per capita income states below a threshold debt-output ratio of 25.1% (1% increase in public debt to GSDP ratio lowers primary surplus by 0.85% in low per capita income states, **see Table 7.3**). **Primary surplus also falls in the above average per capita income states, however, to a lesser extent compared to the low income states** (by -0.85+0.53=-0.32%). *Beyond the threshold debt-output ratio, rise in public debt still reduces primary balance in high income states, while it does not affect primary balance in low income states beyond the threshold debt-GSDP ratio.*

For both the low and high income states, positive effect on revenue of the debt-financed spending is not strong enough to generate a surplus. **However, when debt to GSDP ratio is sufficiently high, low income states adopt a more prudent expenditure management policy, considering the limited powers of the states to increase tax revenues. That holds the key for improvement in the primary balances with rising public debt beyond the threshold debt-GSDP ratio in low income states, although the extent is not statistically significant.**

Empirical evidence does not support non-linearity in the relation between economic growth and public debt for both low and high per capita income states (Table C.1 in Appendix C). Hence we explore the relationship between public debt and growth for these two types of states in the dynamic panel framework of Arellano and Bond (1991). As in the non-linear specification, we address the possible endogeneity among economic growth, debt-output ratio and capital spending to output ratio using their lagged values as instruments.

Table 7.4: Response of real GSDP growth to an increase in debt/GSDP ratio: Low vs. high per capita GSDP states

Explanatory variables	Real GSDP growth (%) Low vs. high per capita income states	
	Coefficient	p-value
Real growth (-1)	-0.182**	0.010
Debt/GSDP in low per capita income states	**-0.890*****	**0.001**
Debt/GSDP in high per capita income states	**0.243****	**0.013**
Capex/GSDP	0.399	0.200
Constant	4.006**	0.022
Number of units	18	
Number of time period	18	

Source: Authors' estimates
"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

We find that public debt financed spending reduces growth in both low and high income states, while the degree of the impact is lower in high income states (Table 7.4). *Rise in public debt reduces investment and growth in these states due to debt overhang and policy uncertainty (Table 7.4).* However, public debt can render positive growth effect for the low income states **beyond a threshold capital expenditure to GSDP ratio of 2%. *The findings indicate if state level heterogeneity in terms of per capita income are considered, public debt is neither sustainable, nor conducive to economic growth across low and high per capita income states in India.***

7.3. States with below vs. above average capital expenditure to GSDP ratio

Next, we explore the effect of public debt on primary surplus and economic growth for the states with below and above average ratio of capital expenditure to GSDP, using a dynamic dummy variable. The dummy variable takes value 1 if the share of capital expenditure of a state in year t is higher than the average share of capital expenditure of the 18 states in that year, otherwise zero. *The marginal effect of debt to GSDP ratio in high capex share*

states is captured by an interaction term of debt to GSDP ratio with the dummy variable representing high capex share states.

Table B.2 in Appendix B lists the states above and below the average capex share in selected years. Among the states with below the average capex share in the initial year of 2001-02, Madhya Pradesh, Chhattisgarh and Punjab transited to the set of above average capex share states after two decades in 2019-20. On the other hand, Andhra Pradesh, Bihar and Rajasthan, which were in the group of above average capex share states in 2001-02 shifted to the group of below average capex share states in 2019-20.

Table 7.5: Response of primary surplus/GSDP ratio to an increase in debt/GSDP ratio: Low vs. high capex to GSDP ratio states

	Primary surplus to GSDP ratio (%)	
Explanatory variables	States with low vs. high capex to GSDP ratio	
	Coefficient	p-value
Debt/GSDP in low capex share states (debt/GSDP < γ)	0.204	0.378
Debt/GSDP in high capex share states (debt/GSDP < γ)	0.062	0.374
Real growth (debt/GSDP < γ)	-.0091	0.357
Constant	41.382***	0.001
Debt/GSDP in low capex share states (debt/GSDP > γ)	**-1.126****	**0.024**
Debt/GSDP in high capex share states (debt/GSDP > γ)	-0.081	0.419
Real growth (debt/GSDP > γ)	0.075	0.499
Optimal/Threshold debt/GSDP (γ)	**29.98*****	**0.000**
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

We find that *primary balance deteriorates with an increase in public debt in both low and high capex share states, beyond an optimal debt-GSDP ratio of 30% (Table 7.5), while there is no significant difference in the extent of the impact across low and high capex states.*

A rise in debt-output ratio lowers economic growth in high capex share states beyond a debt output ratio of 27.3%, while below this ratio, debt positively affect growth, although the impact is not statistically significant (Table 7.6). Again, debt financed spending does not contribute to economic growth in the low capex share states.

Table 7.6: Response of real GSDP growth to an increase in debt/GSDP ratio: Low vs. high capex share states

	Real GSDP growth (%)	
Explanatory variables	States with low vs high capex to GSDP ratio	
	Coefficient	**p-value**
Debt/GSDP in low capex share states (debt/GSDP < μ)	-0.273	0.650
Debt/GSDP in high capex share states (debt/GSDP < μ)	0.385	0.278
Capex/GSDP (debt/GSDP < μ)	0.660	0.831
Constant	31.630	0.216
Debt/GSDP in low capex share states (debt/GSDP > μ)	-0.516	0.577
Debt/GSDP in high capex share states (debt/GSDP > μ)	**-1.012****	**0.034**
Capex/GSDP (debt/GSDP > μ)	**6.413***	**0.078**
Optimal/Threshold debt/GSDP (μ)	**27.291****	**0.004**
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

In short, public debt financed spending does not contribute to economic growth in both low and high capex share states, and significantly deteriorates growth in high capex states beyond a threshold debt-output ratio of 27.3%. On the other hand, primary balance in both low and high capex share states is not responsive to accumulation of public debt below a threshold debt-GSDP ratio of 30%. Public debt accumulation significantly deteriorates primary balance beyond 30% of debt-GSDP ratio in both low and capex states. **The findings suggests public debt financed spending does not contribute to economic growth in both low and high capex states, and beyond a threshold range of debt-output ratio, it is detrimental for both growth and primary balance.**

7.4 States with low vs. high growth rate of real GSDP

Next, we explore the effect of public debt on primary surplus for the states with low versus high growth rate of real GSDP, using a dynamic dummy variable. The dummy variable takes value 1 if the real growth rate of a state in year t is higher than the average real growth rate of the 18 states in that year, otherwise zero. ***The marginal effect of debt to GSDP ratio in high growth states is captured by an interaction term of debt to GSDP ratio with the dummy variable representing states with high growth rates.***

Table B.3 in Appendix B lists the states above and below the average real growth rate of the selected states in selected years. Among the below average growth states in 2001-02, Andhra Pradesh, Madhya Pradesh, Punjab and

Rajasthan transited to the group of above average growth states in 2019-20, over a period of two decades. On the other hand, Kerala, Maharashtra, Haryana, Uttarakhand and West Bengal transited from the group of above average growth in 2001-02 to the below average growth in two decades.

Table 7.7: Response of primary surplus/GSDP ratio to an increase in debt/GSDP ratio: States with low vs. high real income growth

Explanatory variables	Primary surplus to GSDP ratio (%) Low vs. high growth states	
	Coefficient	**p-value**
Primary surplus/GSDP (-1)	0.415***	0.000
Real growth	0.043*	0.072
Debt/GSDP in low growth states	**0.060****	**0.002**
Debt/GSDP in high growth states	2.08e-07	1.000
Constant	-2.802***	0.000
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

Empirical evidence do not support non-linearity in the relation between primary surplus and public debt for both low and high growth states (see Table C.2 in Appendix C). ***We find that public debt is sustainable in both low and high growth states (Table 7.7), and the effects of public debt accumulation on primary surplus do not vary across the two type of states.*** *We also find that higher growth improves primary balance in these states.*

An increase in debt-GSDP ratio reduces economic growth in both low and high real growth states below a debt to output ratio of 24% (Table 7.8). Degree of the impact for high growth states is smaller than that of the low growth states. Capital spending contributes to growth below this threshold debt-output ratio. ***Public debt becomes growth enhancing in both high and low growth states beyond the threshold debt-output ratio of 24, indicating a U-shaped relation between economic growth and public debt-output ratio. Again the effect for low growth states are higher than the effect for the high growth states.*** *Public debt accumulation is mildly growth enhancing beyond a threshold capex to output ratio of 2%.*

The implication of our findings is that an increase in the debt-output ratio up to 25% in the major states of India will be growth enhancing for both low and high growth states in India, with their public debt dynamics being sustainable. Low growth states will have larger benefit in terms of larger

positive impact on growth from rising debt-GSDP ratio compared to the high growth states.

Table 7.8: Response of real GSDP growth to an increase in debt/GSDP ratio: States with low vs. high real income growth

	Real GSDP growth (%)	
Explanatory variables	**Low vs. high growth states**	
	Coefficient	**p-value**
Debt/GSDP in low growth states (debt/GSDP < μ)	**-1.647****	**0.015**
Debt/GSDP in high growth states (debt/GSDP < μ)	**0.631****	**0.002**
Capex/GSDP (debt/GSDP < μ)	4.796**	0.012
Constant	-43.133*	0.081
Debt/GSDP in low growth states (debt/GSDP > μ)	**1.771***	**0.102**
Debt/GSDP in high growth states (debt/GSDP > μ)	**-0.529****	**0.010**
Capex/GSDP (debt/GSDP > μ)	2.034	0.539
Optimal/Threshold debt/GSDP (μ)	**24.000*****	**0.000**
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

7.5 States with low vs. high share of spending on economic services

We explore the effect of public debt accumulation on primary surplus for the states with low versus high share of expenditure on economic services in total expenditure, using a dynamic dummy variable. The dummy variable takes value 1 if the share of expenditure on economic services in total spending of a state in year t is higher than the average share of the 18 states in that year, otherwise zero. *The marginal effect of debt to GSDP ratio in states with high spending on economic services is captured by an interaction term of debt to GSDP ratio with the dummy variable representing high economic service expenditure states.*

Table B.4 in Appendix B lists the states below and above the average share of spending on economic services in total expenditure in some selected years. Among the states which were above the average share initially in 2001-02, Andhra Pradesh shifted to the group of the states with below average share by 2019-20. From the group of states with below average spending on economic services in 2001-02, Odisha, Punjab, Rajasthan and Uttar Pradesh moved upward to the group of above average spending states in two decades by 2019-20.

Empirical evidence does not show nonlinearity in the relationship between primary surplus and public debt.[13] We estimate the relationship using linear dynamic panel framework. ***We find that primary surplus responds positively with public debt accumulation in states with both high and low share of expenditure on economic services, while the impact is lower in the states with above average share of expenditure on economic services (Table 7.9).***

Table 7.9: Response of primary surplus/GSDP ratio to an increase in debt/GSDP ratio: States with low vs. high share of spending on economic services

Explanatory variables	Primary surplus to GSDP ratio (%) States with low vs. high share of spending on economic services	
	Coefficient	**p-value**
Primary surplus/GSDP (-1)	0.407***	0.000
Real growth	0.044**	0.023
Debt/GSDP in states with low share of spending on economic services	**0.073***	**0.000**
Debt/GSDP in states with high share of spending on economic services	**-0.032**	**0.007**
Constant	-2.748***	0.000
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

Accumulation of public debt contributes to economic growth in the states with both low and high share of spending on economic services upto an optimal debt-GSDP ratio of 24.9% (Table 7.10). *The degree of impacts are same across the states with both low and high share of spending on economic services. Also public debt is found to be growth enhancing beyond a threshold capex to GSDP ratio of 2.1%.*

The findings suggest that ***public debt financed spending is conducive for economic growth in the states with both low and high share of spending on economic services, with similar growth enhancing effects upto an optimal debt-GSDP ratio of 25%, while their public debt dynamics remains sustainable.***

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[13] We do not report all the detailed supplementary results to avoid cluttering the draft. The detailed supplementary results are available upon request to the authors.

Table 7.10: Response of real GSDP growth to an increase in debt/GSDP ratio:
States with low vs. high share of spending on economic services

	Real GSDP growth (%)	
Explanatory variables	States with low vs. high share of spending on economic services	
	Coefficient	**p-value**
Debt/GSDP in states with low share of spending on economic services (debt/GSDP < μ)	**5.722****	**0.009**
Debt/GSDP in states with high share of spending on economic services (debt/GSDP < μ)	-0.560	0.157
Capex/GSDP (debt/GSDP < μ)	-11.998*	0.014
Constant	-6.323	0.272
Debt/GSDP in states with low share of spending on economic services (debt/GSDP > μ)	**-6.323****	**0.031**
Debt/GSDP in states with high share of spending on economic services (debt/GSDP > μ)	0.454	0.282
Capex/GSDP (debt/GSDP > μ)	15.450**	0.004
Optimal/Threshold debt/GSDP (μ)	**24.900*****	**0.000**
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

7.6 States with low vs. high share of spending on social services

We explore the effect of public debt accumulation on primary surplus and growth for the states with low versus high share of expenditure on social services in total expenditure using a dynamic dummy variable. The dummy variable takes value 1 if the share of expenditure on social services in total spending of a state in year t is higher than the average share of the 18 states in that year, otherwise zero. *The marginal effect of debt to GSDP ratio in states with high spending on social services is captured by an interaction term of debt to GSDP ratio with the dummy variable representing high social service expenditure states.*

Table B.5 in Appendix B lists the states below and above the average share of spending on social services in total expenditure in some selected years. Chhattisgarh, Jharkhand, Tamil Nadu, Kerala, which belonged the states with above average spending on social services in the initial year of 2001-02, became low spending states after two decades in 2019-20. Again Andhra Pradesh and Madhya Pradesh shifted from below average social spending states in 2001-02 to the group of above average social spending states in 2019-20.

It is interesting to note that states are not necessarily mutually exclusive in terms of spending on economic and social services. For example, Gujrat perpetually remained in the group of the states with above average share of spending on both economic and social services during 2001-02 to 2019-20. Bihar and West Bengal remained perpetual high social spending states, while Punjab and Haryana were the perpetual low social spending states over two decades. Again, Haryana, Chhattisgarh, Jharkhand and Madhya Pradesh were the perpetual high economic services spending states, while Bihar and West Bengal remained perpetual low economic services spending states over the past two decades.

Table 7.11: Response of primary surplus/GSDP ratio to an increase in debt/GSDP ratio: States with low vs. high share of spending on social services

	Primary surplus to GSDP ratio (%)	
Explanatory variables	**States with low vs. high expenditure share on social services**	
	Coefficient	**p-value**
Debt/GSDP in states with low social expenditure share (debt/GSDP < γ)	-0.452	0.608
Debt/GSDP in states with high social expenditure share (debt/GSDP < γ)	**-0.314****	**0.008**
Real growth (debt/GSDP < γ)	0.170	0.375
Constant	4.145	0.843
Debt/GSDP in states with low social expenditure share (debt/GSDP > γ)	0.091	0.927
Debt/GSDP in states with high social expenditure share (debt/GSDP > γ)	0.373**	0.005
Real growth (debt/GSDP > γ)	-0.468*	0.100
Optimal/Threshold debt/GSDP (γ)	**23.25*****	**0.000**
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

States with high social spending requires a threshold public debt to GSDP ratio of 23.3% for debt-financed spending to generate enough revenue compared to expenditure, so that the primary balance improves (Table 7.11). Public debt accumulation does not affect primary balance of the states with average and below average share of spending on social services.

Table 7.12: Response of real GSDP growth to an increase in debt/GSDP ratio:
States with low vs. high share of spending on social services

Explanatory variables	Real GSDP growth (%)	
	States with low vs. high share of spending on social services	
	Coefficient	**p-value**
Debt/GSDP in low share of expenditure on social services (debt/GSDP < μ)	-2.527	0.188
Debt/GSDP in states with high share of expenditure on social services (debt/GSDP < μ)	**-0.761***	**0.106**
Capex/GSDP (debt/GSDP < μ)	-6.344	0.319
Constant	-80.152*	0.066
Debt/GSDP in states with low share of expenditure on social services (debt/GSDP > μ)	2.653	0.197
Debt/GSDP in states with high share of expenditure on social services (debt/GSDP > μ)	**0.954***	**0.037**
Capex/GSDP (debt/GSDP > μ)	**9.818****	**0.034**
Optimal/Threshold debt/GSDP (μ)	**21.003****	**0.003**
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

Public debt contributes to growth in the above average social service spending states beyond an optimal value of debt GSDP ratio of 21% (Table 7.12), while it does not contribute to growth rate in below average spending states.

Our findings suggest that increase in debt to GSDP ratio beyond a threshold of 23.3% contributes to economic growth in high social spending states, with the debt dynamics being sustainable. Public debt accumulation has no significant impact on primary balance and economic growth in low social spending states.

8.   Summary of the findings and policy implications

The major findings of our study for the period 2001-02 to 2019-20 can be summarised as follows:

1.   **Overall, for the 18 major states in India, public debt is sustainable up to an optimal debt-GSDP ratio of 25%. Public debt financed spending can contribute to real economic growth beyond a threshold of 22% of debt-GSDP ratio and a threshold of 2% capex spending of the GSDP.**

2.   **However, the nature of the impact of an increase in public debt to GSDP ratio to 25% on growth and primary balance varies significantly when state-level heterogeneities are considered in terms of** (i) low vs. high per capita income; (ii) low vs. high share of capex spending in total expenditure; (iii) below and above average growth rates; (iv) low vs high spending on economic or social services. In this context, our major findings are:

i.   *An increase in the debt-output ratio beyond a threshold of 24% will be growth enhancing for both low and high growth states in India, with their public debt dynamics being sustainable.* **Low growth states will have larger benefit in terms of larger impact on growth from rising debt-GSDP ratio compared to the high growth states.**

ii.   **An increase in debt to GSDP ratio beyond a threshold of 23.3% can contribute to economic growth in high social spending states, with the debt dynamics being sustainable.** *Public debt accumulation has no significant impact on primary balance and economic growth in low social spending states.*

iii.   Public debt financed spending **is growth enhancing in the states with both low and high share of spending on economic services, with similar growth enhancing effects** *up to an optimal debt-GSDP ratio of 25%, while their public debt dynamics remains sustainable.*

iv.   Increase in debt-GSDP ratio up to 27.3% can increase *economic growth of the states with above average capex share to GSDP, without affecting their public debt sustainability scenario. However, the effect is not statistically significant.*

The major policy Implications: *Allowing the major states of India to increase their public debt to GSDP ratio up to 25% would be growth enhancing while the debt dynamics remaining sustainable.* **This would benefit states with average and below average growth rate more in terms of growth enhancing impact of public debt accumulation, compared to the states with above average growth rates. The increase in debt to GSDP ratio to 25% would also contribute to economic growth in the states with above average share of spending on social services.** *This would also benefit states with both low and high share of spending on economic services equally in terms of boosting growth.*

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Appendix A

Table A.1: Public debt to GSDP and Components of debt as a percent of public debt (%)

States	Public Debt to GSDP			Internal Debt to Public Debt							Loans and Advances to Public Debt	Public Debt to Outstanding Liabilities
	Average (2001-02 To 2022-23)	2021-22	2022-23	SDL	Power Bonds	Compensation and Other Bonds	NSSF	WMA	Loan from Banks & Other Financial Institutions	Total Internal Debt		
Andhra Pradesh	32.46	28.01	27.79	58.10	2.56	0.37	16.25	0.27	5.49	82.46	17.54	80.83
Bihar	29.44	32.26	31.41	47.23	2.60	0.05	26.67	-0.04	4.00	80.29	19.71	74.63
Chhattisgarh	13.49	20.40	20.43	44.71	2.61	0.00	26.59	-0.20	6.96	80.55	19.45	68.41
Gujarat	21.09*	17.20	-	48.00	1.29	0.00	33.69	0.16	4.53	87.07	12.93	80.24
Haryana	18.72	25.79	24.95	50.68	9.49	0.00	24.07	0.47	6.63	90.22	9.78	76.26
Himachal Pradesh	31.15	27.36	28.36	50.52	2.82	0.00	19.72	0.58	18.11	91.13	8.87	69.56
Jharkhand	19.64	23.17	24.12	43.50	7.32	0.05	27.68	-0.03	7.90	85.44	14.56	79.11
Karnataka	13.64	18.17	18.49	54.27	0.59	0.00	23.32	0.00	3.59	81.40	18.60	70.23
Kerala	19.54*	25.34	-	60.11	1.89	0.00	16.92	0.70	7.80	86.36	13.64	64.67
Maharashtra	15.18*	15.56	-	46.09	4.14	0.00	23.05	0.19	6.56	79.38	20.62	76.08
Madhya Pradesh	21.52	23.51	24.11	48.41	0.85	0.00	36.20	0.00	4.46	89.77	10.23	72.39
Odisha	17.54	11.16	11.03	31.70	2.56	0.00	22.26	0.87	15.61	71.48	28.52	58.18
Punjab	32.01	39.82	39.32	45.86	3.77	0.00	26.82	0.46	12.20	88.60	11.40	80.90
Rajasthan	25.23	28.50	29.57	49.60	7.69	1.69	24.21	0.40	4.49	86.64	13.36	71.74
Tamil Nadu	17.82	26.15	26.88	57.43	4.32	0.00	20.38	0.39	6.75	87.32	12.68	80.16
Uttar Pradesh	27.29	28.54	27.99	44.92	5.24	0.86	25.13	0.12	9.05	84.81	15.19	71.61
Uttarakhand	20.01	22.50	22.45	52.58	2.05	0.03	29.05	0.56	8.44	92.42	7.58	75.24
West Bengal	36.39	34.50	33.77	47.82	0.61	0.00	34.51	0.33	5.15	88.35	11.65	85.72
Average of 18 states	22.90	24.89	26.04	48.97	3.47	0.17	25.36	0.29	7.65	85.20	14.80	74.22
*Average for the period 2001-02 to 2021-22												

Notes:

1.   Data on the components of liabilities for the years 2001-02, 2002-03, and 2003-04 are taken from the RBI Handbook on Indian States 2019. The data for the years 2004-05 to 2022-23 is from the RBI Handbook on Indian States 2023.

2.   Following the classifications of "Status Paper on Government Debt for 2018-18", (April, 2020), DEA, Ministry of Finance, the total Public Debt is defined as the sum of Internal debt and Loans and advances from the centre. Total internal debt is defined as the sum of borrowings under SDL, Power Bonds, Compensation and other bonds, NSSF, Ways and Means Advances, Banks and other Financial Institutions.

3.   The components of debt for the years 2001-02 and 2002-03 have **market loans** instead of **SDLs** (for the years 2003-04 to 2022-23).

4.   There is an additional component of 'Other Loans' for the years 2001-02 and 2002-03 (comes under the head 'Loans from Banks & FIs'), which has not been used explicitly in the study.

5.   Power Bonds are seen as components of liabilities from the year 2003-04 onwards.

6.   Observation: UDAY Bond appears as a separate component of liabilities from the year 2016 onwards in RBI STATE FINANCES: A STUDY OF BUDGETS. However, in the RBI Handbook on Indian States, everything comes under the head 'Power Bonds'.

Table A.2: States with perpetual primary deficits (for the period 2017-18 to 2022-23)

States	Remarks
Bihar	Primary deficit shot up by 1287.44% in 2020-21 (covid) from the preceding year, and debt increased by 19.64% in 2020-21. Deficit increased by 259% in 2021-22, and declined in 2022-23 while remaining in deficit.
Kerala	Primary deficit shot up by 332.49% in 2020-21 (covid) from the preceding year, public debt increased by 17.64% in 2020-21 from the previous year. The deficit decreased in 2022-23 from the preceding year.
Andhra Pradesh	Primary deficit increased by 59.55% in 2020-21 (covid) from the preceding year.
Chhattisgarh	Primary deficit shot up by 180.15% in 2019-20 (pre-covid) from the preceding year, in the same year debt increased by 20.88%. The deficit decreased during the covid and the post-covid years.
Gujarat	Primary deficit shot up by 661.13% in 2020-21 (covid) from the preceding year, debt increased by 15.33% in the same year. Deficit in the post-covid years were less than the deficit incurred during the covid years.
Haryana	Primary deficit increased in 2019-20 & 2020-21 (covid) from the preceding years respectively. (No notable change)
Jharkhand	Primary deficit shot up by 234.56% in 2020-21 (covid) from the preceding year, debt increased by 16.33% in the same year. In 2020-21, primary deficit increased by 81.04%, and debt increased by 45.11% in the same year. Deficits decreased in the post-covid years.
Karnataka	Primary deficit shot up by 129.96% in 2020-21 (covid) from the preceding year, debt increased by 31.43% in the same year.
Madhya Pradesh	Primary deficit in 2019-20 & 2020-21 (covid) from their preceding years
Rajasthan	Primary deficit shot up by 143.91% in 2020-21 (covid) from the preceding year
Tamil Nadu	Primary deficit shot up by 103.87% in 2020-21 (covid) from the preceding year, and debt increased by 23.40% in the same year.
West Bengal	Primary deficit shot up by 111.23% in 2020-21 (covid) from the preceding year, debt increased by 12.93% in the same year. Deficits are perpetually increasing in the post-covid period.

Source: RBI Handbook of Statistics on Indian States

Notes:

1.   Deficits increased in the states during covid year for all the states except Chhattisgarh, Haryana, Himachal Pradesh, Odisha (decreased by 75.37%), Uttarakhand.

2.   During covid year, debt of the stares increased from their previous years in the above-mentioned states: Chhattisgarh (by 21.58%), Haryana (by 13.10%), Himachal Pradesh (by 13.84%), Odisha (by 16.16%), and Uttarakhand (by 13.69%).

Table A.3: States experiencing reversal of the status of primary balance

State	Pre-Covid	Post-Covid	Remarks
Maharashtra	2017-18, 2018-19		Reversal from surplus to deficit by 284.68% in 2019-20 from the previous period, debt increased by 9.71% in 2019-20. Public debt further increased by 16.61% in 2020-21, while deficit increased by 70.17% during the same period. State remains in deficit in post-covid period.
Himachal Pradesh	2018-19		Reversal from deficit to surplus by 736.59% in 2018-19 from previous year. Reversed to deficit by 362.07% in 2019-20, and public debt in the same year increased by 11.39%. The State is in deficits (increasing every year in post-covid period) thereafter.
Odisha		2021-22	Primary deficit increased by 192.77% in the year 2019-20. Primary deficit had reduced during the year 2020-21 by 75.36%. Reversal from deficit to surplus by 213.78% in 2021-22, and in the same year debt reduced by 5.83%. Reversal from surplus to deficit by 467.02% in 2022-23
Punjab	2017-18, 2018-19, 2019-20		Primary surplus was incurred until the covid period. Reversal from surplus to deficit by 698.11% in 2020-21 from the previous period, and debt increased by 14.95% in the same year. The State remains in deficit post-covid.
Uttar Pradesh	2017-18, 2019-20		Reversal from deficit to surplus by 1551.95% in 2019-20, and debt increased by 11.64% in the same year. Deficits in post-covid period.
Uttarakhand		2021-22	Reversal from deficit to surplus by 257.51% in 2021-22. Reversal from surplus to deficit by 336.99% in 2022-23 from the previous period, debt increased by 10.96% in the same year.

Source: RBI Handbook of Statistics on Indian States

Appendix B

Table B.1: States Above and Below the Average GSDP Per Capita of Selected States		
2001-02	**2019-20**	
Above average:	**Above average:**	**GSDP Per Capita (Rs.)**
Punjab	Haryana	190265.73
Haryana	Gujarat	186980.19
Himachal Pradesh	Karnataka	173787.41
Maharashtra	Uttarakhand	169154.06
Karnataka	Himachal Pradesh	165397.20
Kerala	Tamil Nadu	163873.98
Tamil Nadu	Maharashtra	163221.17
Gujarat	Kerala	160506.06
Andhra Pradesh	Punjab	133230.73
	Andhra Pradesh	125829.34
Below average:	**Below average:**	
Uttarakhand	Odisha	87939.95
Rajasthan	Rajasthan	86931.05
Chhattisgarh	Chhattisgarh	86818.98
West Bengal	West Bengal	78335.28
Odisha	Madhya Pradesh	68460.39
Madhya Pradesh	Jharkhand	61449.56
Jharkhand	Uttar Pradesh	50148.73
Uttar Pradesh	Bihar	33040.22
Bihar		
Note: The debt to GSDP ratios for above and below average per capita GSDP states in the year 2019-20 stood at **22.09% and 22.53%** respectively.		

Source: RBI Handbook on Indian States and Authors' Calculations

Table B.2: States Above and Below the Average Capital Expenditure share of Selected States		
2001-02	**2019-20**	
Above average:	**Above average:**	**Capital Expenditure to GSDP (%)**
Himachal Pradesh	Odisha	3.77
Jharkhand	Uttar Pradesh	3.53
Andhra Pradesh	Punjab	3.32
Haryana	Himachal Pradesh	3.25
Bihar	Jharkhand	3.18
Rajasthan	Madhya Pradesh	3.15
Uttar Pradesh	Chhattisgarh	2.49
Odisha	Haryana	2.41
Below average:	**Below average:**	
Madhya Pradesh	Uttarakhand	2.26
Chhattisgarh	Karnataka	2.21
Karnataka	Bihar	2.11
Gujarat	Gujarat	1.59
Uttarakhand	Rajasthan	1.47
Punjab	Tamil Nadu	1.47
Tamil Nadu	Maharashtra	1.37
Maharashtra	West Bengal	1.35
West Bengal	Andhra Pradesh	1.32
Kerala	Kerala	1.04
Note: The debt to GSDP ratios for above and below average capital expenditure states in the year 2019-20 stood at **23.00% and 21.71%** respectively.		

Source: RBI Handbook on Indian States and Authors' Calculations

Table B.3: States Above and Below the Average Real GSDP Growth Rate		
2002-03	**2019-20**	
Above average:	Above average:	Real GSDP Growth Rate (%)
Bihar	Gujarat	6.95
Kerala	Karnataka	5.87
Maharashtra	Rajasthan	5.21
Gujarat	Madhya Pradesh	4.46
Haryana	Bihar	4.44
Himachal Pradesh	Himachal Pradesh	4.10
Karnataka	Punjab	4.10
Uttar Pradesh	Uttar Pradesh	4.03
Uttarakhand	Andhra Pradesh	3.70
West Bengal		
Below average:	**Below average:**	
Andhra Pradesh	Tamil Nadu	3.25
Chhattisgarh	West Bengal	3.11
Jharkhand	Odisha	2.79
Madhya Pradesh	Chhattisgarh	2.76
Odisha	Maharashtra	2.42
Punjab	Haryana	2.12
Rajasthan	Uttarakhand	1.97
Tamil Nadu	Jharkhand	1.08
	Kerala	0.90
Note: The debt to GSDP ratios for above and below average Real GSDP Growth Rate states in the year 2019-20 stood at **23.77% and 20.79%** respectively.		

Source: RBI Handbook on Indian States and Authors' Calculations

Table B.4: States Above and Below the Average Share of Spending on Economic Services		
2001-02	**2019-20**	
Above average:	**Above average:**	**Economic Expenditure as percent of total expenditure (%)**
Haryana	Chhattisgarh	40.31
Madhya Pradesh	Karnataka	37.27
Gujarat	Jharkhand	35.43
Karnataka	Madhya Pradesh	34.41
Andhra Pradesh	Punjab	33.37
Jharkhand	Odisha	33.32
Uttarakhand	Haryana	32.27
Chhattisgarh	Rajasthan	31.77
Himachal Pradesh	Uttar Pradesh	30.60
	Gujarat	30.56
Below average:	**Below average:**	
Bihar	Himachal Pradesh	27.99
Kerala	Tamil Nadu	25.97
Maharashtra	Maharashtra	25.81
Odisha	Bihar	24.80
Punjab	Uttarakhand	21.28
Rajasthan	West Bengal	20.66
Tamil Nadu	Andhra Pradesh	20.42
Uttar Pradesh	Kerala	14.41
West Bengal		
Note: The debt to GSDP ratios for above and below average Economic Spending states in the year 2019-20 stood at **21.55% and 23.20%** respectively.		

Source: RBI Handbook on Indian States and Authors' Calculations

Table B.4: States Above and Below the Average Share of Spending on Economic Services		
2001-02	**2019-20**	
Above average:	**Above average:**	**Economic Expenditure as percent of total expenditure (%)**
Haryana	Chhattisgarh	40.31
Madhya Pradesh	Karnataka	37.27
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Karnataka	Madhya Pradesh	34.41
Andhra Pradesh	Punjab	33.37
Jharkhand	Odisha	33.32
Uttarakhand	Haryana	32.27
Chhattisgarh	Rajasthan	31.77
Himachal Pradesh	Uttar Pradesh	30.60
	Gujarat	30.56
Below average:	**Below average:**	
Bihar	Himachal Pradesh	27.99
Kerala	Tamil Nadu	25.97
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Tamil Nadu	Andhra Pradesh	20.42
Uttar Pradesh	Kerala	14.41
West Bengal		

Note: The debt to GSDP ratios for above and below average Economic Spending states in the year 2019-20 stood at **21.55% and 23.20%** respectively.

Source: RBI Handbook on Indian States and Authors' Calculations

Appendix C

Table C.1: Response of real GSDP growth to an increase in debt/GSDP ratio across low vs. high per capita GSDP states: Results from non-linear model

	Real GSDP growth (%)	
Explanatory variables	Low vs. high per capita GSDP states	
	Coefficient	p-value
Debt/GSDP (debt/GSDP < μ)	0.339	0.719
Debt/GSDP high income states (debt/GSDP < μ)	-0.475*	0.056
Capex/GSDP (debt/GSDP < μ)	1.948	0.479
Constant	75.961	0.170
Debt/GSDP (debt/GSDP > μ)	-1.805	0.417
Debt/GSDP high income states (debt/GSDP > μ)	0.212	0.526
Capex/GSDP (debt/GSDP > μ)	-2.417	0.296
Optimal/Threshold debt/GSDP (μ)	27.291*	0.108
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

Table C.2: Response of primary surplus/GSDP ratio to an increase in debt/GSDP ratio across low and high growth states: Results from non-linear model

	Primary surplus to GSDP ratio (%)	
Explanatory variables	Low vs. high per capita GSDP states	
	Coefficient	p-value
Debt/GSDP (debt/GSDP < γ)	-0.006	0.990
Debt/GSDP high income states (debt/GSDP < γ)	0.087	0.409
Real growth (debt/GSDP < γ)	0.104	0.603
Constant	21.189**	0.046
Debt/GSDP (debt/GSDP > γ)	-0.415	0.457
Debt/GSDP high income states (debt/GSDP > γ)	-0.083	0.417
Real growth (debt/GSDP > γ)	-0.328*	0.073
Optimal/Threshold debt/GSDP (γ)	23.249*	0.113
Number of units	18	
Number of time period	18	

Source: Authors' estimates

"***", "**", and "*" indicate significance at 1%, 5% and 10% level of significance respectively.

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