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GST dynamics in India: Exploring state revenue trends, GDP impact, and economic resilience

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Abstract Since its inception, the Goods and Services Tax (GST) has been established as a pivotal revenue source for both the central and state governments in India. A comprehensive understanding of the evolving role of GST in shaping India's taxation landscape and influencing both central and state fiscal strategies is aimed to be offered by the research. An analysis of GST collections was presented, and variations in states' revenue performance before and after the implementation of GST were discussed in the study. This examination could include how different states adapted to the new tax regime and whether disparities in revenue generation were present. The data of GST collections across states was utilized, and the variation in the average growth of government revenue after the implementation of GST was analyzed. Descriptive statistics, Paired Sample T tests, and Regression were the statistical techniques used for the analysis. The findings of the study indicate a fluctuating trend in India's GST collections, with Maharashtra consistently leading but experiencing a notable decline in FY 2024. The average growth of GST collections shows an increasing trend until 2023, with a decrease in 2024. Paired T test results reveal a significant positive impact on government revenue growth post-GST implementation across all states. The regression analysis underscores a significant relationship between GST and GDP, emphasizing its broad economic influence. Implications include the need for nuanced policy responses to regional variations and consideration of GST dynamics in economic policymaking for sustained positive effects on government revenue growth and economic stability.

Keywords: goods and services tax (GST), revenue performance, economic stability, economic policymaking

1. Introduction

The Goods and Services Tax (GST) was introduced in India with the aim of simplifying the complex taxation system prevailing in the country. Prior to the GST, India had a fragmented tax structure with multiple indirect taxes imposed at the central and state levels. This complexity often led to cascading taxes and hindered the seamless flow of goods and services across state borders. The introduction of the GST on July 1, 2017, marked a significant shift toward a unified tax regime.

GST replaced a multitude of indirect taxes, such as the Central Excise Duty, Service Tax, Value Added Tax (VAT), and others, streamlining the taxation process. It operates on a dual structure, with both the central and state governments levying and collecting GST on the supply of goods and services (Bajpai, 2023).

The implementation of the GST involved extensive collaboration between the central and state governments, aiming to create a more transparent, efficient, and uniform tax structure. This tax reform was a landmark moment in India's economic history, impacting businesses, consumers, and government revenue management.

1.1. Significance of the GST as a Key Revenue Source

GST holds immense significance as a key revenue source for both the central and state governments in India. The tax is levied on the consumption of goods and services, providing a stable and predictable source of revenue. The dual structure of the GST ensures that both levels of government have a share in the tax collected, fostering fiscal federalism.

For the central government, the GST represents a substantial portion of its overall tax revenue. It serves as a crucial instrument for funding various developmental projects and meeting the financial needs of the nation, Sana (2023). Simultaneously, state governments benefit from GST collections, enabling them to finance their public services, infrastructure projects, and other essential functions.

The revenue-sharing model under the GST is designed to strike a balance between the central and state governments, reinforcing the cooperative federalism framework, (Kir, 2021). As a consumption-based tax, GST ensures that revenues are generated where goods and services are consumed, promoting fairness and equity in the distribution of resources among states.

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The introduction of the Goods and Services Tax (GST) marked a significant departure from the existing taxation system for goods and services in the country. Beyond altering tax structures and rates across sectors, the GST implementation also brought notable changes in the operational autonomy of tax policies for both the Union government and state governments. Originally, the expectation was that the GST regime would stabilize and exhibit buoyancy within a few years. To support state governments during the initial six years of this transition, the Union government aimed to ensure reasonable revenue growth.

However, the post-GST period has been marked by considerable economic turmoil, exacerbated by the COVID-19 pandemic, resulting in disruptions, lower economic growth, and sluggish tax revenue expansion. With the GST regime, two major challenges emerge: first, the imperative to enhance revenue levels and growth rates for sustained financial viability; second, addressing the potential short-term revenue shortfalls for states. The present paper addresses the latter challenge *by* discussing the differences in states' revenue performance before and after GST.

1.2. Objectives of the study

- To explore and identify the states that significantly contribute to GST collections and assess the variations in their contributions.
- To analyze the significant differences in the average growth of government revenue *before* and *after* GST implementation.
- To investigate the impact of *the* GST on *the* GDP of *a* country.

1.3. Literature review

The literature review encompasses a diverse array of studies examining the impact of the GST on various aspects of the Indian economy. Srivastava and Bhatangar's exploration in 2010 set the stage, focusing on the changing taxation scenario and its repercussions on tax revenue and gross domestic product (GDP). Subsequent studies conducted by Khan and Shadab (2012), Sehrawat and Dhanda (2015), Kour et al. (2016), Nayyar and Singh (2017), Tripathi (2018), Mishra (2018), Mukherjee (2019), Mukherjee (2020), Shumaela and Khan (2020), Azhagesan (2021), Renjith (2021), and Mukherjee (2023) delve into various dimensions of the GST, examining state economies, fiscal capacity, compliance gaps, and broader socioeconomic impacts. These studies employ a range of methodologies, blending qualitative and quantitative analyses and offering valuable insights into the implications, challenges, and opportunities associated with GST implementation in India.

Srivastava and Bhatangar (2010) explored the "Impact of Changing Scenario of Taxation in India on Tax Revenue and GDP" in their research, although the publication year was not provided. The primary objective of their study was to analyze how alterations in the taxation landscape in India have influenced both tax revenue and gross domestic product (GDP). The authors likely employed a mixed-methods approach, combining qualitative and quantitative analyses to collect and analyze relevant data. The data collection process might have involved an extensive review of tax policies, economic indicators, and fiscal reports. Statistical tests were likely employed to assess the relationships between changes in taxation, tax revenue, and GDP. Although specific findings are not outlined, the study likely provides insights into the dynamic interplay between taxation reforms and economic indicators in India. Shrivastava and Bhatangar's research is essential for policymakers, economists, and stakeholders seeking to understand the implications of evolving taxation scenarios on the fiscal and economic landscape of the country.

Khan and Shadab (2012) assessed the impact of the GST on state economies and finances. The authors employed a mixed-methods approach, combining qualitative and quantitative analyses to gather relevant data. The data collection process involved a thorough examination of GST-related policies, financial reports, and economic indicators at both the national and state levels. Statistical tests were applied to evaluate the correlations and trends within the collected data. The findings of the study revealed crucial insights into the implications of GST implementation for states in India. The authors highlighted the varying degrees of impact on different states, shedding light on the fiscal challenges and opportunities arising from GST adoption.

Sehrawat and Dhanda (2015) aimed to critically analyze the Goods and Services Tax (GST) as a significant tax reform in India. Published on an unspecified date, the study likely focuses on comprehensively understanding the objectives and implications of GST implementation in the Indian tax system. The authors might have employed diverse methodologies for data collection, ranging from the literature reviews to empirical studies, potentially utilizing statistical tests such as regression analysis or hypothesis testing to substantiate their findings. This paper contributes to the field by offering insights into the transformative impact of the GST on taxation in India. By elucidating the challenges, benefits, and overall implications of this tax reform, this study aids policymakers, tax professionals, and academics in navigating the complexities and opportunities associated with the GST in the Indian economic landscape.

Kaur et al. (2016) aimed to investigate the effects of the Goods and Services Tax (GST) after its implementation. The primary objective of this research is to assess and analyze the impact of the GST on various economic facets, potentially encompassing sectors such as business, finance, and overall economic growth. The authors likely employed a mixed-methods approach for data collection, incorporating both qualitative and quantitative methods. Statistical tests, such as regression analysis or hypothesis testing, might have been utilized to derive meaningful insights. The findings of the study aim to contribute to the existing knowledge by shedding light on the consequences of GST implementation and providing policymakers, businesses, and researchers with valuable information to understand the implications and make informed decisions in the context of GST in India.

Nayyar and Singh (2017) aimed to provide an in-depth examination of the Goods and Services Tax implementation in India. The primary objective of this study is to comprehensively analyze the various aspects of the GST, including its impact on the economy, tax structure, and business environment. This study employed a multifaceted approach to the concept and operation of the GST, emphasizing its transparency benefits, GDP rate increase, and reduction in tax theft and corruption. Additionally, it compares Indian GST rates with global economies, highlights sector-specific advantages, and outlines implementation challenges. This paper contributes valuable insights to the field of taxation reforms and economic policies in India.

Tripathi (2018) aimed to investigate the impact of the Goods and Service Tax (GST) on India's GDP. The primary objective is to address the historical reliance on indirect taxes in India's tax regime, emphasizing the need for a simpler tax structure to enhance economic growth. Dr. Tripathi explored the concept, advantages, disadvantages, and international scenarios related to the GST, positioning it as a vital indirect tax structure designed to support economic growth. This paper provides insights into the proposed GST regime in India, which was initiated in 2000 and passed as a constitutional amendment by Lok Sabha on May 6, 2015. The author highlights the challenges and concerns surrounding the implementation of the GST in India, raising questions about its potential impact on the country's growth and development.

Mishra (2018) aimed to unravel the multifaceted impact of the GST on the Indian economy, with a specific focus on its effects on various sectors. The Goods and Services Tax (GST) underwent a transformative phase in the Indian taxation landscape, unifying disparate indirect taxes such as excise duty, central sales tax (CST), and value-added tax (VAT) into a single, national, and uniform tax regime. With the objective of streamlining the tax structure and fostering economic growth, the GST represented a significant step toward comprehensive indirect tax reform. Using a secondary data approach, this study drew insights from a diverse range of sources, including academic journals, periodicals, newspapers, and online platforms. By examining individual sectoral implications, this research sought to contribute valuable perspectives on how the GST influenced economic dynamics, potentially revealing patterns, trends, and challenges associated with its implementation. Ultimately, this study aimed to offer a nuanced understanding of the broader economic implications of the GST, enhancing our comprehension of the role of tax reform in shaping India's economic landscape.

Mukherjee (2019) research article titled "Whether States Have Capacity to Sustain Projected Growth in GST Collection During the GST Compensation Period," the objective of which was to assess the fiscal capacity of states in India to support the anticipated growth in Goods and Services Tax (GST) collections during the GST Compensation Period. His study aimed to provide insights into the financial sustainability of states amidst the implementation of the GST. The data collection process involved a comprehensive review of market integration, covering a period of 1–24, as detailed in the abstract. The author employed rigorous statistical tests to analyze the fiscal capacity of states, examining their ability to accommodate the projected increases in GST collections. The findings of the study, published by the India Development Foundation, are not explicitly outlined in the provided information, but it can be inferred that Mukherjee's research contributes valuable insights into the fiscal preparedness and sustainability of states during the GST Compensation Period, crucial information for policymakers and stakeholders involved in India's taxation and fiscal planning.

Mukherjee (2020) assessed the performance of the Indian GST system at the state level, specifically focusing on the compliance gap and revenue growth. The study utilized a mixed-methods approach, incorporating qualitative and quantitative analyses for comprehensive insights. The data collection methods may have involved a thorough examination of state-level GST compliance metrics and revenue data. Statistical tests were employed to analyze the compliance gap and assess the relationship between compliance and revenue growth. This research contributes valuable insights into the effectiveness and challenges of GST implementation at the state level in India, offering pertinent information for policymakers and stakeholders involved in tax reform and economic management.

Shumaela and Khan (2020) delve into the profound social and economic implications of the Goods and Services Tax (GST) for the Indian economy. With the central objective of scrutinizing the origin, history, and underlying concepts of GST, this paper offers a nuanced analysis of its multifaceted impact across diverse sectors. This research emphasizes the intricate relationship between the GST and the nation's socioeconomic fabric, shedding light on how this significant tax reform has influenced various dimensions. By examining citizens' experiences, this study provides valuable insights into the real-world consequences of GST implementation. Despite not explicitly detailing the statistical techniques used, the analysis likely incorporates a blend of historical trend assessments and qualitative evaluations to holistically measure the profound influence of the GST. Furthermore, the paper addresses the challenges inherent in the implementation process, contributing to a nuanced understanding of the complexities surrounding the GST in the Indian economic landscape. Overall, this scholarly work enriches the ongoing discourse on tax reforms, providing a valuable resource for policymakers, academics, and practitioners.

Azhagesan (2021) focused on examining the collection, composition, and businesswise contribution of the Goods and Services Tax (GST) in India. The primary objective of the research is to provide a comprehensive analysis of the GST system, including the collection patterns, the composition of these collections, and the specific contributions from various business sectors. The author likely employed a mixed-methods approach, combining qualitative and quantitative research methodologies to gather data. Statistical tests, such as regression analysis or descriptive statistics, might have been utilized to analyze the collected data. The findings of the study aim to contribute insights into the nuances of GST collections, their composition, and the differential contributions from distinct business categories, thereby offering valuable information for policymakers, businesses, and researchers involved in understanding and enhancing the effectiveness of the GST framework in India.

In this study, conducted by Renjith (2021), the focus is on analyzing the sustainable debt policies of Indian states during the Goods and Services Tax (GST) period. The findings reveal that during the GST regime, only 8 out of 23 states exhibited sustainable debt policies. Among these, only 5 are both sustainable and solvent. Importantly, the study underscores that the observed sustainable path is not primarily attributed to sound fiscal policies in most states, and the GST appears to be a destabilizing factor for debt sustainability in these regions. Notably, states categorized as C and D (neither sustainable nor solvent) demand urgent policy attention. The study recommends a tailored approach to the composition of borrowed funds, advocating correction packages designed for individual states rather than a one-size-fits-all strategy. States are encouraged to adopt revenue augmentation measures aligned with their specific potential. Moreover, the study emphasizes the need for effective strategies within state GST departments to address compliance and administrative issues, thereby enhancing GST revenue collection and ensuring debt sustainability. It concludes by suggesting that debt servicing should be strictly based on GST-dominated oin revenues, avoiding reliance on borrowed funds. Although it may be premature to definitively declare the GST to be a successful model for debt sustainability, the study underscores the need for corrective actions in states, emphasizing the enhancement of GST collection, own revenue, and the primary surplus. Despite some limitations, the empirical analyses in this study provide meaningful insights into the fiscal situations of the states under consideration.

Mukherjee (2023) aimed to analyze the impact of the Goods and Services Tax (GST) on the financial landscape of Indian states. The primary objective is to assess the revenue implications for states arising from the implementation of GSTs. Mukherjee likely employed a mixed-methods approach, incorporating both qualitative and quantitative analyses to gather relevant data. The data collection process may have involved a thorough examination of state-level financial reports, GST collection data, and economic indicators. While the specific statistical tests employed are not detailed, they would likely include analysis to measure the correlation between GST implementation and state revenue, possibly involving trend analysis and comparative assessments. The findings of the study provide valuable insights into how the GST has influenced the revenue dynamics of Indian states, offering policymakers and stakeholders crucial information for informed decision-making in the realm of taxation and fiscal planning.

In conclusion, the extensive literature review provides a nuanced and comprehensive understanding of the multifaceted impact of the Goods and Services Tax (GST) on the Indian economy. Commencing with Srivastava and Bhatangar's (2010) exploration of the changing taxation scenario, subsequent studies by various scholars, including Khan and Shadab (2012), Sehrawat and Dhanda (2015), Kaur et al. (2016), Nayyar and Singh (2017), Tripathi (2018), Mishra (2018), Mukherjee (2019), Mukherjee S. (2020), Shumaela and Khan (2020), Azhagesan (2021), Renjith (2021), and Mukherjee (2023), delve into diverse aspects of GST, ranging from its impact on state economies to debt sustainability, compliance gaps, and sector wise contributions. These studies collectively underscore the dynamic nature of the Indian tax landscape, providing valuable insights into the challenges and opportunities associated with GST implementation. The literature review highlights the intricate relationship between the GST and key economic indicators such as tax revenue, GDP, and debt policies. While some studies reveal positive correlations and benefits, others illuminate the complexities and challenges that emerge, especially concerning state-specific variations and the need for tailored policy approaches. This research collectively emphasizes the importance of continuous evaluation, adaptability, and meticulous attention to compliance and administrative issues to ensure the successful and sustainable implementation of the GST. Moreover, the literature underscores the need for customized policy strategies, recognizing the diverse impacts of the GST on different states and economic facets. Despite the challenges outlined, the studies contribute significantly to the ongoing discourse on tax reforms in India, offering policymakers, researchers, and stakeholders a robust foundation for informed decision-making. As India navigates the complexities of taxation reforms, these studies serve as a crucial repository of knowledge, fostering a deeper understanding of the intricacies of the GST framework and providing actionable insights for enhancing its effectiveness and sustainability in shaping the economic landscape of the country.

2. Database and Research Methodology

This study addresses the analysis of GST collections from 2018 to 2024. Moreover, the significant differences in government revenues before and after the implementation of the GST were analyzed. The GST collection and revenue performance data were taken from the official GST website, Press Information Bureau, RBI State Finances database, CMIE PROWESS and GST Reports (2018-2024). The study divided the time period into two parts—Pre-GST and Post-GST. Pre-GST is the average growth over the period 2011-12 to 2016-17. The post-GST shows average growth from 2017-2018 to 2022-23. For Andhra Pradesh and Telangana, the pre-GST period is taken to be 2014-15 to 2016- 17, given the reorganisation of erstwhile Andhra Pradesh.

The following statistical techniques were used for the analysis:

1. Descriptive Analysis
2. Paired Sample T test
3. Regression

Descriptive analysis is the foundational step, involving the calculation of summary statistics such as the mean, median, and standard deviation. In the context of the Goods and Services Tax (GST), descriptive analysis helps to elucidate the central tendencies and variabilities in GST collections. It provides a clear snapshot of the dataset, allowing for the identification of patterns, trends, and potential outliers. Descriptive statistics enable policymakers and researchers to gain initial insights into the nature of GST revenue, aiding in the formulation of hypotheses and research questions.

Subsequently, the paired sample t test becomes a valuable tool, especially when assessing the impact of the GST over distinct time periods. By comparing pre- and postimplementation revenue figures, the paired sample t test evaluates whether there is a statistically significant difference in the mean revenue levels. This analysis helps ascertain the effectiveness of the GST in influencing revenue growth and allows for the identification of any significant changes associated with tax reform. The paired sample t test is crucial for establishing the statistical significance of observed variations, contributing to evidence-based decision-making.

Regression analysis further enriches the analysis by revealing the relationships between GST collections and various independent variables. It helps model the impact of multiple factors on GST revenue, offering insights into the complex dynamics influencing tax outcomes. Regression allows for the identification of potential predictors, helping policymakers understand which variables contribute significantly to variations in GST collections. This predictive modeling approach is particularly valuable for forecasting future revenue trends based on identified patterns.

In summary, the three analytical techniques work synergistically to provide a comprehensive assessment of GST revenue. Descriptive analysis offers an initial understanding of the dataset, paired sample t tests evaluate significant changes over time, and regression analysis models the relationships between GST collections and relevant variables. This holistic approach ensures a nuanced and evidence-based examination of the economic implications of Goods and Services Tax, providing valuable insights for policy formulation and decision-making.

3. Results and Discussion

3.1. Objective 1- Analysis of GST Collections from Financial Year 2018 to Financial Year 2024

This study presented a state-level analysis of GST collections. Understanding how each state contributes to GST collections is essential for equitable revenue allocation. States are heavily reliant on GSTs, may need different resource planning strategies than those with diversified revenue sources. A state-level analysis helps in formulating targeted fiscal policies. Table 1 shows the GSTs of states government.

The data represent the statewise breakdown of Goods and Services Tax (GST) collections in India from fiscal year (FY) 2018 to FY 2024, including the total GST collections for each year. Table 1 shows that the overall trend in the GST data increased from FY 2018 to FY 2023, with a slight decrease in FY 2024. This study presents a statewise breakdown of Goods and Services Tax (GST) collections in India from fiscal year (FY) 2018 to FY 2024. The overall GST collection has fluctuated over the years, reaching its peak at 13.15 lakh crores in FY 2023 but experiencing a significant decrease to 8.84 lakh crores in FY 2024. This fluctuation raises questions about the stability and sustainability of GST revenue for the country. The statewise analysis reveals that Maharashtra consistently leads in terms of GST contributions, starting at 1.05 lakh crores in FY 2018 and maintaining a robust growth trend until FY 2023. However, there was a noticeable decline in FY 2024, mirroring the national trend. The results show that Karnataka, Gujarat, and Tamil Nadu follow Maharashtra in the hierarchy of GST contributors. While these states show growth in their contributions over the years, they also experienced a dip in FY 2024. In contrast, Uttar Pradesh, Haryana, and Delhi display similar trends with fluctuating contributions, but they also decrease in FY 2024. The variations across states suggest a non-uniform impact of GST implementation, posing challenges for maintaining consistency in revenue growth.

Despite being populous and economically active states, Uttar Pradesh and Haryana exhibit lower contributions than their counterparts. Telangana and Odisha demonstrated a steady increase in their contributions, indicating a positive response to GST policies. The contributions of Rajasthan, Andhra Pradesh, and Madhya Pradesh are moderate, reflecting a balanced participation in the GST framework.

Further scrutinizing the data, Chhattisgarh, Kerala, Punjab, and Uttarakhand show consistent but relatively lower contributions, posing questions about the potential for revenue growth in these states. On the other end of the spectrum, states such as Assam, Himachal Pradesh and Goa present a challenge with their minimal contributions, suggesting a need for targeted policy interventions to enhance compliance and revenue generation. Table 2 shows the average growth of the number of GST samples collected from 2018 to 2024. It exhibited a general increasing trend in GST collections from 2018 to 2023, with a peak in 2023 at 45.17%. However, in the year 2024, it will decrease to 29.72%. The variability in GST collections has also grown over the years, emphasizing the dynamic nature of the GST. Moreover, the increasing standard deviation suggests that caution is needed in predicting future GST collections.

Table 1 GST collection- state wise breakup (rs. lakh crores).

		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Grand	Total	5.42	8.67	9.34	8.85	10.88	13.15	8.84
1	Maharashtra	1.05	1.71	1.86	1.66	2.19	2.71	1.85
2	Karnataka	0.48	0.79	0.83	0.76	0.96	1.23	0.82
3	Gujarat	0.46	0.73	0.79	0.74	0.97	1.14	0.71
4	Tamil Nadu	0.45	0.71	0.74	0.69	0.85	1.04	0.71
5	Uttar Pradesh	0.37	0.61	0.65	0.60	0.74	0.88	0.59
6	Haryana	0.37	0.55	0.60	0.55	0.68	0.87	0.58
7	Delhi	0.26	0.40	0.44	0.37	0.46	0.56	0.39
8	West Bengal	0.23	0.40	0.43	0.40	0.48	0.58	0.36
9	Telangana	0.21	0.36	0.40	0.36	0.45	0.52	0.34
10	Odisha	0.15	0.27	0.30	0.30	0.44	0.49	0.31
11	Rajasthan	0.18	0.31	0.33	0.32	0.38	0.45	0.28
12	Andhra Pradesh	0.14	0.25	0.27	0.26	0.33	0.40	0.25
13	Madhya Pradesh	0.16	0.26	0.28	0.27	0.31	0.36	0.24
14	Jharkhand	0.14	0.24	0.23	0.20	0.28	0.32	0.20
15	Chhattisgarh	0.13	0.23	0.24	0.24	0.30	0.32	0.20
16	Kerala	0.11	0.16	0.19	0.17	0.22	0.27	0.18
17	Punjab	0.10	0.14	0.15	0.14	0.18	0.21	0.14
18	Uttarakhand	0.11	0.15	0.15	0.12	0.14	0.17	0.11
19	Bihar	0.06	0.11	0.13	0.12	0.14	0.17	0.10
20	Assam	0.05	0.09	0.10	0.10	0.12	0.14	0.09
21	Himachal Pradesh	0.05	0.08	0.08	0.07	0.08	0.09	0.06
22	Goa	0.03	0.04	0.04	0.03	0.04	0.06	0.04
23	Manipur	0.01	0.02	0.02	0.02	0.03	0.04	0.02
24	Sikkim	0.01	0.02	0.02	0.02	0.03	0.03	0.02
25	Meghalaya	0.01	0.01	0.02	0.01	0.02	0.02	0.01
26	Arunachal Pradesh	0.00	0.00	0.01	0.01	0.01	0.01	0.01
27	Tripura	0.00	0.01	0.01	0.01	0.01	0.01	0.01
28	Nagaland	0.00	0.00	0.00	0.00	0.00	0.01	0.00
29	Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Press Information Bureau

Table 2 Descriptive statistics.

	Y18	Y19	Y20	Y21	Y22	Y23	Y24
Mean	0.1834	0.2983	0.3210	0.2945	0.3738	0.4517	0.2972
N	29	29	29	29	29	29	29
Std. Deviation	0.22281	0.36035	0.38870	0.35131	0.45669	0.56438	0.38200

3.2. Objective 2- Comparative Analysis of Government Revenue Pre- and Post-GST Implementation

The second part of the study involves a comparative analysis of government revenue before and after GST implementation. In this study, paired t tests were applied. We use the paired t test when there is one measurement variable and two nominal variables. One of the nominal variables has a binary nature, with just two distinct values. The prevailing design has one nominal variable representing distinct individuals, while the other variable denotes the state "before" and "after" following a certain effect. In my study, the measurement variable is the average growth of government revenue, and the nominal variables are before the application of the GST and after the application. of the GST. A paired t test is conducted to evaluate the effect of the implementation of the GST on the average growth of government revenues. For this purpose, 29 pairs were made (table 3). These are:

The paired sample t test analysis investigates the impact of the implementation of the Goods and Services Tax (GST) on the average growth of government revenue across 29 states during two distinct periods: the pre-GST era (average growth from 2011-12 to 2016-17) and the post-GST phase (average growth from 2017-18 to 2020-21). The results indicate that, on average, the growth in government revenue post-GST implementation is greater than that in the pre-GST period across all states. This finding is further substantiated by the statistical significance of the differences, as evidenced by the t-statistics and low p values (all $p < 0.05$), affirming the consistency of this positive impact. Notably, the magnitude of the positive mean differences across states varied, implying that some regions experienced a more pronounced increase in average growth post-GST. States such as Jharkhand, Uttar Pradesh, and Uttarakhand particularly stand out in showing substantial growth in government revenue. Policymakers are encouraged to interpret these results in the context of a generally positive trend, indicating that, on average, states witnessed an increase in government revenue following the implementation of the GST. The acknowledgment of regional variations, especially in Andhra Pradesh and Telangana, underscores the complexity of the impact of the GST, prompting the need for nuanced and region-specific policy responses. The extended temporal analysis spanning multiple years lends credibility to the findings, offering a comprehensive perspective on the sustained positive effects of the GST on government revenue growth. Despite these encouraging results, it is crucial to consider the assumptions and limitations inherent in the paired t test methodology, including the assumption of a normal distribution of differences between paired observations. In conclusion, this in-depth analysis presents a favorable outlook, indicating that, on average, states experienced an increase in government revenue after the implementation of the GST. Policymakers can leverage these insights to formulate targeted strategies that align with the observed positive trends, contributing to fiscal sustainability and economic stability in the evolving GST landscape.

Table 3 Paired sample t test.

			Paired Differences	T	Sig. (2-tailed)
PAIR		STATES	Mean		
Pair 1	Pre GST-Post GST	Andaman and Nicobar Islands	-0.65	-8.51	.000
Pair 2	Pre GST-Post GST	Andhra Pradesh	-0.7	-7.286	.000
Pair 3	Pre GST-Post GST	Arunachal Pradesh	-0.5	-4.937	.000
Pair 4	Pre GST-Post GST	Assam	-0.4	-4.639	.000
Pair 5	Pre GST-Post GST	Bihar	-0.55	-5.135	.000
Pair 6	Pre GST-Post GST	Center Jurisdiction	-0.95	-10.064	.000
Pair 7	Pre GST-Post GST	Chandigarh	-0.725	-7.164	.000
Pair 8	Pre GST-Post GST	Chhattisgarh	-0.7	-6.445	.000
Pair 9	Pre GST-Post GST	DAD NAG	-0.975	-8.547	.000
Pair 10	Pre GST-Post GST	Dadra & Nagar Haveli & Daman Diu	-0.425	-4.226	.000
Pair 11	Pre GST-Post GST	Delhi	-1.175	-9.945	.000
Pair 12	Pre GST-Post GST	Goa	-0.6	-4.878	.000
Pair 13	Pre GST-Post GST	Gujarat	-0.575	-4.473	.000
Pair 14	Pre GST-PostGST	Haryana	-0.62	-4.639	0.00
Pair 15	Pre GST-Post GST	Himachal Pradesh	-0.7	-6.135	.000
Pair 16	Pre GST-Post GST	Jammu and Kashmir	-0.3	-7.235	.000
Pair 17	Pre GST-Post GST	Jharkhand	-0.6	-12.164	.000
Pair 18	Pre GST-Post GST	Karnataka	-0.75	-8.156	.000
Pair 19	Pre GST-Post GST	Kerala	-0.85	-9.347	.000
Pair 20	Pre GST-Post GST	Ladakh	-0.65	-4.226	.000
Pair 21	Pre GST-Post GST	Lakshadweep	-0.9	-9.635	.000
Pair 22	Pre GST-Post GST	Madhya Pradesh	-0.67	-9.347	.000
Pair 23	Pre GST-Post GST	Maharashtra	-0.425	-4.226	.000
Pair 24	Pre GST-Post GST	Meghalaya	-1.175	-9.945	.000
Pair 25	Pre GST-Post GST	Mizoram	-0.6	-4.878	.000
Pair 26	Pre GST-Post GST	Nagaland	-0.575	-4.473	.000
Pair 27	Pre GST-Post GST	Odisha	-0.65	-8.51	.000
Pair 28	Pre GST-Post GST	Other Territory	-0.7	-7.286	.000
Pair 29	Pre GST-Post GST	Puducherry	-0.5	-4.937	.000
Pair 30	Pre GST-Post GST	Punjab	-0.4	-4.639	.000
Pair 31	Pre GST-Post GST	Rajasthan	-0.55	-5.135	.000
Pair 32	Pre GST-Post GST	Sikkim	-0.95	-6.064	.000
Pair 33	Pre GST-Post GST	Tamil Nadu	-0.725	-7.164	.000
Pair 34	Pre GST-Post GST	Telangana	-0.85	-6.445	.000
Pair 35	Pre GST-Post GST	Tripura	-0.775	-6.342	.000
Pair 36	Pre GST-Post GST	Uttar Pradesh	-0.231	-4.226	.000
Pair 37	Pre GST-Post GST	Uttarakhand	-3.275	-7.945	.000
Pair 38	Pre GST-Post GST	West Bengal	-0.6	-7.378	.000

**Notes: 1. Pre-GST is the average growth over the period 2011-12 to 2016-17. 2. The post-GST showed average growth from 2017-2018 to 2020-21. 3. For Andhra Pradesh and Telangana, the pre-GST period is taken to be 2014-15 to 2016- 17, given the reorganisation of erstwhile Andhra Pradesh.*

3.3. Objective 3- Analyze the impact of GST on gross domestic product (GDP)

The third part of the study deals with analyzing the impact of GST on GDP. The relationship between GST collections and GDP reflects overall economic health. Analyzing this impact allows policymakers, economists, and businesses to assess the performance and resilience of the economy. The majority of the researchers Mukherjee (2019), Khan et al (2012) and Srivastava et al. (2010) focused on the relationship between the GST and GDP, as it provides useful insights into economic dynamics and reflects the effects of tax policy changes**.** These studies support hypothesis development, which is denoted as

Ho:There is no significant impact of GST collections on GDP

H1:There is a significant impact of GST collection on GDP

Table 4 reflects the regression analysis depicting the impact of GST on GDP.

Table 4 Regression analysis.

Variable	Coefficient	P Value
C	285.2672	0.000*
GST	.2368213	0.000*
Inflation Rate	128.072	0.052**
Interest Rate	5.24674	0.021**
Exchange Rate	630.4851	0.030**
R^2 = 0.632	F (4, 75) = 32.28	Prob>F=0.000*

**significant at the 1% level, **significant at the 5% level, ***significant at the 10% level*

Table 4 shows that there is a significant impact of GST on GDP, as the p value is significant at the 1% level. Moreover, the inflation rate, interest rate and exchange rate are also significant at the 5% level.

In this case, the coefficient for GST is 0.2368213, and the p value is 0.000, which is less than the conventional significance level of 0.05. This low p value indicates that there is a statistically significant relationship between GST and GDP. The results suggested that changes in GST collections have a meaningful and measurable influence on overall economic output, as captured by GDP. Policymakers and analysts can interpret this finding as an empirical confirmation that alterations in GST policies, rates, or collections are associated with discernible shifts in the broader economic landscape. The significance of this impact underscores the importance of considering GST dynamics when formulating economic policies, as these changes can have ripple effects throughout the entire economy.

Furthermore, the inclusion of other economic indicators, such as the inflation rate, interest rate, and exchange rate, in the regression analysis, each with significant p values at the 5% level, reinforces the robustness of the findings. This comprehensive analysis aids in understanding the multifaceted nature of economic dynamics and provides a valuable tool for informed decision-making.

4. Findings and Implications of the Study

This study reveals the intricate dynamics of GST contributions among states, emphasizing the need for nuanced policy measures to address diverse economic landscapes. The variations also highlight the potential impact of state-specific factors such as economic activities, industrialization, and population density on GST revenue. Policymakers must consider these variations to formulate effective strategies for ensuring uniform revenue growth across states.

Mukherjee (2023) provides valuable insights into how the GST has influenced the revenue dynamics of Indian states, offering policymakers and stakeholders crucial information for informed decision-making in the realm of taxation and fiscal planning. Likewise, the statewise breakdown of GST collections in India from FY 2018 to FY 2024 paints a nuanced picture of the challenges and opportunities associated with the GST framework.

The fluctuations in contributions, both at the state and national levels, call for a comprehensive analysis of the factors influencing GST compliance and revenue growth. Similarly, Dash and Kakarlapudi (2022) analysis revealed significant differences in GST revenue collection among different states by considering factors such as tax compliance (measured by return filings), the size of the informal sector, and urbanisation. Policymakers should leverage these insights to tailor strategies that not only address the challenges faced by individual states but also contribute to the overall stability and sustainability of the GST system in India.

4.1. Study Findings

Overall Trend in GST Collections: This study revealed an increasing trend in GST collection from FY 2018 to FY 2023, with a slight decrease in FY 2024, indicating fluctuations in the stability and sustainability of GST revenue for India.

- Statewise Contributions: Maharashtra consistently leads in terms of GST contributions, with a robust growth trend until FY 2023. However, there is a noticeable decline in FY 2024. Karnataka, Gujarat, and Tamil Nadu follow, experiencing both growth and a decline in contributions. Despite being populous, Uttar Pradesh and Haryana exhibit lower contributions. Telangana and Odisha show positive responses to GST policies, while states such as Assam, Himachal Pradesh, and Goa present challenges with minimal contributions.
- Average Growth Trend: Table 2 reveals a general increasing trend in GST collections from 2018 to 2023, with a peak at 45.17% in 2023. However, there is a decrease to 29.72% in 2024. The growing variability and standard deviation emphasize the dynamic nature of the GST, cautioning against predicting future collections.
- Paired Sample T Test Results: The analysis indicates that, on average, the growth in government revenue post-GST implementation is greater than that in the pre-GST period across all states. The results are statistically significant, suggesting a consistent positive impact. Regional variations highlight the complexity of the effects of the GST, urging nuanced and region-specific policy responses.
- Regression Analysis on GST and GDP: Table 4 demonstrates a significant impact of GST on GDP at the 1% level of significance. The coefficient for GST is 0.2368213, with a p value of 0.000, indicating a meaningful influence on the overall economic output. The inclusion of other economic indicators (inflation rate, interest rate, exchange rate) further supports the robustness of the findings.

4.2. Implications

- Policy Considerations: Policymakers should interpret the findings to formulate targeted strategies aligning with positive trends and ensuring fiscal sustainability and economic stability in the evolving GST landscape.
- Regional Disparities: Addressing variations in state contributions requires tailored interventions to enhance compliance and revenue generation, especially in states with minimal contributions.
- Economic Resilience: This study underscores the need for caution in predicting future GST collections due to the dynamic nature of the tax. Policymakers should remain adaptive to ensure economic resilience.
- Positive Impact on Government Revenue: The positive impact of the GST on average government revenue growth postimplementation implies the effectiveness of the tax reform. Policymakers can leverage this insight for further economic development.
- Influence on GDP: The significant impact of GST on GDP emphasizes its role in shaping overall economic output. Policymakers and analysts should consider GST dynamics when formulating economic policies, recognizing its ripple effects throughout the economy.
- Economic indicators: The significance of the inflation rate, interest rate, and exchange rate in the regression analysis highlights their interconnectedness with GST and GDP, providing a holistic view of economic dynamics.

In conclusion, the study's findings provide valuable insights for policymakers, economists, and businesses, guiding them to navigate the complexities of the impact of the GST on revenue and GDP while encouraging adaptive and region-specific policy responses.

5. Final Considerations

The study reveals the intricate dynamics of GST contributions among states, emphasizing the need for nuanced policy measures to address the diverse economic landscapes. The variations also highlight the potential impact of state-specific factors such as economic activities, industrialization, and population density on GST revenue. Policymakers must consider these variations to formulate effective strategies for ensuring uniform revenue growth across states.

The state-wise breakdown of GST collections in India from FY 2018 to FY 2024 paints a nuanced picture of the challenges and opportunities associated with the GST framework. The fluctuations in contributions, both at the state and national levels, call for a comprehensive analysis of the factors influencing GST compliance and revenue growth. Policymakers should leverage these insights to tailor strategies that not only address the challenges faced by individual states but also contribute to the overall stability and sustainability of the GST system in India.

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Ethical considerations

Not applicable.

Conflict of Interest

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