



Impact Of GST Reforms On Revenue Performance And Tax Compliance In India: A Pre- And Post-GST Empirical Analysis

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Abstract

With the goal of enhancing effectiveness, transparency, and revenue performance, the GST is a significant change to India's indirect taxation structure. By contrasting Period before GST and Period after GST periods, the current study investigates the effects of GST on tax income and compliance behaviour. Secondary time-series data spanning 10 years—five years prior to and five years following the introduction of GST—are the basis for the analysis. Karl Pearson's correlation coefficient, an independent sample t-test, and comparative analysis are all used in this descriptive and analytical study. The t-test confirms that there was a large rise in tax collections during the Period after GST period. Additionally, correlation research shows a strong positive association between revenue and the number of registered taxpayers in both periods, with increased efficacy noted following the introduction of the GST. The results indicate that through a larger taxpayer base and better administrative procedures, GST has increased revenue generation and reinforced tax compliance. The study comes to the conclusion that GST has improved India's tax system's efficiency, but ongoing enhancements are needed to maintain long-term gains.

Keywords: GST, Tax Revenue, Tax Compliance, Indirect Taxation, Comparative Analysis, t-Test, Correlation Analysis

Introduction

Maintaining fiscal restraint and promoting economic expansion require a well-designed tax system. Prior to the implementation of the GST, India's indirect tax system consisted of several levels of taxation, such as excise duty, service tax, and state-level levies like VAT. The effectiveness of the tax system was ultimately impacted by this disjointed structure, which led to problems including tax cascading, a lack of standardization, and an increased burden of compliance for enterprises. GST was introduced in July 2017 as a comprehensive indirect tax reform to solve these issues. It sought to create a destination-based taxing model and combine several taxes into a single, cohesive system. Using technology-driven techniques to increase transparency and decrease tax evasion was one of the main goals of GST. The introduction of online return filing, e-invoicing, and integrated digital platforms has played a significant role in transforming the tax administration process. In the initial years, GST implementation encountered several operational and compliance-related difficulties, such as frequent policy changes, technological issues, and adjustment challenges for small businesses. However, with continuous policy refinements and improved administrative measures, the system has gradually stabilised. Both revenue generation and compliance behaviour have advanced in recent years, as seen by a discernible improvement in tax collections and a consistent rise in the number of registered taxpayers. While a number of studies have looked at various facets of GST, the most of them only look at revenue performance or compliance behaviour. Few studies combine the two aspects to assess the overall effectiveness of the tax system. Furthermore, a systematic comparison of the Period before GST and Period after GST eras can offer more profound understanding of this reform's efficacy. In light of this, the current study examines how GST affects revenue performance and tax compliance practices in India. In order to investigate the connection between taxpayer base and revenue collection, it takes a comparative method encompassing pre- and Period after GST periods and uses time-series and correlation analysis. The goal of the study is to present empirical data regarding the impact of GST reforms on the effectiveness and operation of India's indirect tax system.

Review of Literature

The introduction of the GST in India has attracted significant academic attention, particularly in relation to its impact on revenue performance and tax compliance behaviour. Existing literature highlights both the structural advantages of GST and the challenges associated with its implementation.

Sijbren Cnossen (2013) emphasised that a well-designed value-added tax system enhances tax efficiency by reducing cascading effects and improving neutrality. The study suggests that unified tax structures, such as GST, contribute to higher revenue productivity and better compliance due to simplified tax administration.

Arbind Modi (2017) analysed GST as a major reform in indirect taxation and argued that GST has the potential to broaden the tax base and improve revenue mobilisation. The study highlighted that integration of multiple taxes into a single system reduces tax evasion and enhances transparency.

Sharma and Verma (2020) conducted a comparative study of pre- and Period after GST revenue performance and found that GST has significantly improved tax collections. The authors observed that the expansion of the tax base played a key role in increasing revenue and strengthening the tax system.

Basu and Banerjee (2020) examined the impact of GST on small and medium enterprises (SMEs). The study concluded that GST improved transparency and reduced cascading taxation, but also increased compliance costs for small firms, which may affect voluntary compliance behaviour.

Thyagaraju N (2020) highlighted that GST has enhanced tax system efficiency by improving revenue generation and reducing tax evasion. However, the study emphasised that compliance behaviour remains a critical factor determining the success of GST reforms.

Haldankar et al. (2022) analysed GST revenue trends and found a consistent increase in tax collections, indicating improved revenue performance. The study also pointed out that administrative efficiency and digital monitoring contributed to better compliance.

Bhattacharya and Singh (2022) focused on compliance costs and observed that although GST improved transparency and standardisation, increased compliance requirements created operational challenges, particularly for smaller businesses.

Mehta and Singh (2022) examined the role of GST in economic formalisation and found that GST encourages businesses to maintain proper records, thereby improving compliance behaviour and contributing to higher revenue collection.

Agarwal and Arora (2023) analysed the impact of GST on micro enterprises and concluded that digitalisation under GST has improved transparency and compliance, although technological barriers remain for small firms.

Garg et al. (2024) adopted behavioural approaches and found that taxpayer attitudes and awareness significantly influence compliance behaviour. The study suggests that policy design must consider behavioural factors to improve tax compliance.

Goyal M (2024) and Shacheendran V (2024) highlighted that compliance burden, procedural complexity, and lack of digital literacy continue to affect taxpayer behaviour, especially in the informal sector.

Soni U (2025) emphasised the role of digitalisation in improving compliance and reducing tax evasion. The study concluded that technological integration is a key driver of tax system efficiency.

Research Gap

- Most studies analyse revenue performance and compliance behaviour separately, lacking an integrated approach.
- Limited research provides empirical linkage between taxpayer base and revenue generation.
- Few studies conduct a systematic Period before GST and Period after GST comparative analysis using time-series data.

Objectives of this Study

- To evaluate and contrast how the GST reforms affected India's tax revenue performance before and after the GST.
- To use empirical analysis to investigate the connection between tax income and tax compliance behaviour (as indicated by the rise in registered taxpayers).

Research Methodology

In order to investigate the effects of GST reforms on tax revenue and tax compliance behaviour in India, this study uses a descriptive and analytical research design. While the analytical technique uses correlation analysis to look at the relationship between these factors, the descriptive approach explains trends in revenue and taxpayer growth.

Type of Data

Since all of the data used in this study is secondary, authenticity and dependability are guaranteed. The information was gathered from reliable and official sources, including:

- Ministry of Finance (GST Revenue Press Releases – PIB)
- GSTN official portal
- Economic Survey of India
- Central Board of Indirect Taxes and Customs (CBIC)

These sources provide consistent and validated data related to GST revenue trends, taxpayer registration, and compliance indicators.

Sample Size

The study is based on time-series secondary data covering a period of 10 years, divided into:

- **Period before GST:** 2012–2017 (5 years)
- **Period after GST:** 2019–2024 (5 years)

Thus, the total sample size consists of 10 observations representing annual data points on tax revenue and the number of registered taxpayers. The year 2017–18 has been excluded from the analysis as it represents the transition phase of GST implementation and may not reflect stable tax conditions.

Unit of Analysis

The unit of analysis in the present study is annual aggregated data, which includes:

- **Tax Revenue (₹ Lakh Crore):** Represents the total indirect tax collection in the Period before GST period and GST collection in the Period after GST period.
- **Number of Registered Taxpayers (Crore):** Represents tax compliance behaviour under both periods.

Each observation corresponds to a financial year, making the analysis suitable for examining trends and relationships over time.

Data Presentation

Table 1: Period before GST Data (2012–2017)

Year	Revenue (₹ Lakh Crore)	Taxpayers (Crore)
2012–13	5.63	0.52
2013–14	6.28	0.55
2014–15	7.2	0.58
2015–16	8.12	0.62
2016–17	9.1	0.65

Source: Economic Survey of India; CBIC

Table 2: Period after GST Data (2019–2024)

Year	Revenue (₹ Lakh Crore)	Taxpayers (Crore)
2019–20	12.22	1.22
2020–21	11.37	1.24
2021–22	14.76	1.33
2022–23	19.62	1.38
2023–24	20.18	1.41

Source: Ministry of Finance (PIB); GSTN

Variables of the Study

Dependent Variable (Y)	Independent Variable (X)
Tax Revenue	Number of Registered Taxpayers

Tax revenue reflects the performance of the tax system, while the taxpayer base represents tax compliance behaviour.

Method of Analysis

The analysis is carried out in two stages:

1. **Comparative Analysis:** A comparison of Period before GST and Period after GST data is made to examine changes in revenue and taxpayer base.
2. **t-Test Analysis:** To ascertain whether the increase in revenue following GST is statistically significant, a comparative t-test analysis is used to compare the mean tax revenue of Period before GST and Period after GST periods.
3. **Correlation Analysis:** Correlation is calculated separately for Period before GST and Period after GST periods to evaluate the strength of the relationship between taxpayer base and revenue.

Data Analysis

Comparison of Revenue: Period before GST vs Period after GST (t-Test)

A comparative t-test analysis is used to compare the mean revenue of the Period before GST and Period after GST periods in order to determine if the adoption of the GST resulted in a significant increase in tax income.

Data:

Period before GST Revenue (₹ Lakh Crore): X ₁	Period after GST Revenue (₹ Lakh Crore): X ₂
5.63	12.22
6.28	11.37
7.2	14.76
8.12	19.62
9.1	20.18

Mean Calculation

$$\bar{X}_1 = \frac{5.63 + 6.28 + 7.20 + 8.12 + 9.10}{5} = \frac{36.33}{5} = 7.27$$

$$\bar{X}_2 = \frac{12.22 + 11.37 + 14.76 + 19.62 + 20.18}{5} = \frac{78.15}{5} = 15.63$$

Variance and Standard Deviation

Period before GST

X_1	$X_1 - 7.27$	$(X_1 - 7.27)^2$
5.63	-1.64	2.6896
6.28	-0.99	0.9801
7.2	-0.07	0.0049
8.12	0.85	0.7225
9.1	1.83	3.3489
Total	—	7.746

Period before GST Calculation

Step 1: Mean

$$\bar{X}_1 = 7.27$$

Step 2: Square Differences

$$\sum(X - \bar{X})^2 = 7.746$$

Step 3: Variance (Shortcut Form)

$$s_1^2 = \frac{\sum(X - \bar{X})^2}{n - 1} = \frac{7.746}{5 - 1} = \frac{7.746}{4} = 1.94$$

Step 4: Standard Deviation

$$s_1 = \sqrt{1.94} \approx 1.39$$

Period after GST

X_2	$X_2 - 15.63$	$(X_2 - 15.63)^2$
12.22	-3.41	11.6281
11.37	-4.26	18.1476
14.76	-0.87	0.7569
19.62	3.99	15.9201
20.18	4.55	20.7025
Total	—	67.1552

Step 1: Mean

$$\bar{X}_2 = 15.63$$

Step 2: Square Differences

$$\sum(X - \bar{X})^2 = 67.1552$$

Step 3: Variance

$$s_2^2 = \frac{67.1552}{5 - 1} = \frac{67.1552}{4} = 16.79$$

Step 4: Standard Deviation

$$s_2 = \sqrt{16.79} \approx 4.10$$

t-Test Formula

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Substitution

$$t = \frac{7.27 - 15.63}{\sqrt{\frac{1.9365}{5} + \frac{16.7888}{5}}}$$

$$t = \frac{-8.36}{\sqrt{0.3873 + 3.3578}} = \frac{-8.36}{\sqrt{3.7451}}$$

$$t = \frac{-8.36}{1.935} \approx -4.32$$

Decision Rule

- Degrees of freedom (df) = 5 + 5 - 2 = 8
 - Critical t-value (5% level) ≈ **2.306**
- | t | = 4.32 > 2.306

Result and Interpretation

The Period before GST period's standard deviation was 1.39, whereas the Period after GST periods was 4.10, suggesting that revenue fluctuated more after GST. The difference between Period before GST and Period after GST revenue is statistically significant since the computed t-value is higher than the critical value. This demonstrates unequivocally that tax income has increased dramatically since the GST was implemented, indicating increased system efficiency and compliance.

Period before GST Correlation Analysis

To examine the relationship between tax revenue and taxpayer base in the Period before GST period, Karl Pearson's correlation coefficient has been calculated.

X (Taxpayers)	Y (Revenue ₹ Lakh Crore)
0.52	5.63
0.55	6.28
0.58	7.2
0.62	8.12
0.65	9.1

Mean Calculation

$$\bar{X} = \frac{0.52 + 0.55 + 0.58 + 0.62 + 0.65}{5} = 0.584$$

$$\bar{Y} = \frac{5.63 + 6.28 + 7.20 + 8.12 + 9.10}{5} = 7.27$$

Calculation Table

X	Y	X- \bar{X}	Y- \bar{Y}	(X- \bar{X})(Y- \bar{Y})	(X- \bar{X}) ²	(Y- \bar{Y}) ²
0.52	5.63	-0.064	-1.64	0.10496	0.004096	2.6896
0.55	6.28	-0.034	-0.99	0.03366	0.001156	0.9801
0.58	7.2	-0.004	-0.07	0.00028	0.000016	0.0049
0.62	8.12	0.036	0.85	0.0306	0.001296	0.7225
0.65	9.1	0.066	1.83	0.12078	0.004356	3.3489
Total	—	—	—	0.29028	0.01092	7.746

Correlation Formula

$$r = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum(X - \bar{X})^2 \cdot \sum(Y - \bar{Y})^2}}$$

Calculation

$$r = \frac{0.29028}{\sqrt{0.01092 \times 7.746}}$$

$$r = \frac{0.29028}{\sqrt{0.08456}} = \frac{0.29028}{0.2908}$$

$$r \approx 0.998$$

Interpretation

In the Period before GST era, there was a very high positive association between taxpayer base and tax revenue, according to the correlation coefficient value. However, because of the disjointed tax system, the expansion was slow.

Period after GST Correlation Analysis

X (Taxpayers)	Y (Revenue ₹ Lakh Crore)
1.22	12.22
1.24	11.37
1.33	14.76
1.38	19.62
1.41	20.18

Mean Calculation

$$\bar{X} = \frac{1.22 + 1.24 + 1.33 + 1.38 + 1.41}{5} = 1.316$$

$$\bar{Y} = \frac{12.22 + 11.37 + 14.76 + 19.62 + 20.18}{5} = 15.63$$

Calculation Table

X	Y	X- \bar{X}	Y- \bar{Y}	(X- \bar{X})(Y- \bar{Y})	(X- \bar{X}) ²	(Y- \bar{Y}) ²
1.22	12.22	-0.096	-3.41	0.32736	0.009216	11.6281
1.24	11.37	-0.076	-4.26	0.32376	0.005776	18.1476
1.33	14.76	0.014	-0.87	-0.01218	0.000196	0.7569
1.38	19.62	0.064	3.99	0.25536	0.004096	15.9201
1.41	20.18	0.094	4.55	0.4277	0.008836	20.7025
Total	—	—	—	1.322	0.0281	67.1552

Calculation

$$r = \frac{1.322}{\sqrt{0.0281 \times 67.1552}}$$

$$r = \frac{1.322}{\sqrt{1.887}} = \frac{1.322}{1.374}$$

$$r \approx 0.96$$

Interpretation

A strong positive relationship is observed between the number of taxpayers and tax revenue during the Period after GST period. The growth in revenue suggests better compliance behaviour and improved effectiveness of the GST framework.

Comparative Analysis

- Strong relationship exists in both periods.
- Revenue and taxpayer base increased significantly after GST.
- Period after GST period shows higher efficiency and better revenue outcomes.

Discussion and Conclusion

The analysis of data across the Period before GST and Period after GST periods highlights a clear shift in the performance of India's indirect tax system after the implementation of GST. A comparison of the two periods shows that both tax revenue and the number of registered taxpayers has increased notably in the Period after GST phase, indicating an improvement in the overall functioning of the tax structure. The results obtained from the t-test demonstrate that the rise in tax revenue after GST is not merely incidental but statistically significant. This suggests that the reform has contributed meaningfully to strengthening revenue collection. The introduction of a unified tax system, along with improved administrative mechanisms, appears to have reduced inefficiencies that existed in the earlier multi-tax framework. At the same time, the correlation analysis shows a strong positive association between the number of taxpayers and revenue in both periods. However, the Period after GST period reflects a more effective linkage between these two variables. This indicates that as more taxpayers enter the system,

revenue increases at a higher rate, pointing towards improved compliance behaviour. The role of technology-driven processes such as online filing and monitoring has likely supported this improvement. Taken together, the findings suggest that GST has enhanced both revenue performance and tax compliance. The expansion of the taxpayer base and the strengthening of administrative systems have contributed to a more efficient and transparent tax environment. In conclusion, the study finds that GST has had a positive impact on India's tax system by improving revenue generation and encouraging compliance. While the results are encouraging, continued efforts toward simplification of procedures and better support for smaller taxpayers will be important to sustain these gains over time.

Limitations of the Study

- This study is based on secondary data, which may have limitations in terms of accuracy and availability.
- The analysis covers a limited time period (5 years Period before GST and 5 years Period after GST), which may not reflect long-term effects.
- The study uses aggregate data only, and does not consider sector-wise or state-wise variations.
- The analysis is based on simple statistical tools (t-test and correlation) and does not include advanced econometric techniques.

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