“A Statistical Study of Sectoral Composition and Economic Growth in Gujarat (2011–12 to 2023–24)”

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Abstract:

This paper examines the sectoral composition, growth trends and structural transformation of the economy of Gujarat during 2011-12 to 2023-24. This analysis is based on secondary data collected from government sources and focuses on the primary, secondary and tertiary sectors of the economy. For studying sectoral Performance and differences among sectors, statistical methods such as trend analysis, compound annual growth rate (CAGR), Welch's ANOVA and Games–Howell post hoc tests were adopted. The results suggest an upward trend for the economy of Gujarat with the secondary sector being the top contributor followed by the tertiary sector. The CAGR analysis indicates that the secondary sector had a highest growth rate during study period which is indicating rapid industrial growth. Statistical inference indicated significant differences between the primary and secondary sectors and also significant difference identified between primary and tertiary sector, also there is no significant differences identified between the secondary and tertiary sectors. These results confirm that Gujarat's economy is undergoing a structural transformation from an agriculture-based economy to an industrial and service-oriented economy. The study indicates that Gujarat is witnessing an increasing importance of industrialization and services for long term economic growth.

Introduction:

Economic growth and structural change are important indexes for regional economic development. Gross State Domestic Product (GSDP) is an indicator of the economic performance of a state and gives the contribution of the different sectors to the economic activity. Structural transformation in developing economies generally implies a gradual shift from agriculture-based activities to industrialisation and services. This transition is an important aspect of increasing productivity, employment opportunities, income generation and overall economic development.

Gujarat is one of the fastest growing states of India and has emerged as a major industrial and commercial hub of the country. Good industrial development, development of infrastructure, urbanisation and increased activity in the service sector have led to rapid economic growth in the state. Over the years, the share of secondary and tertiary sectors in the economy of Gujarat has increased considerably, whereas the relative importance of the primary sector has gradually decreased. This changing sectoral composition reflects the process of structural transformation of the state economy.

It is important to analyze the sectoral composition to understand the changing pattern of economic growth and to identify the major drivers of the development. An analysis of growth trends in primary, secondary and tertiary sectors helps in assessing the contribution of

different sectors to the overall growth of GSDP. Sectoral performance analysis also provides insight into the pace and direction of economic transformation.

In this backdrop, the present study tries to examine the sectoral composition and growth pattern of Gujarat's economy for the period 2011-12 to 2023-24. The study focused on the role of all the three economic sectors of Gujarat which is mainly known as primary sector which associated with agriculture, secondary sector which contains manufacturing and last one is tertiary sectors which is also known as service sector, and this study tests for the existence of significant differences in sectoral outputs using statistical techniques. The study also attempts to understand the structural transformation taking place in the economy of Gujarat and the growing importance of industrial and service sectors in the long-term economic development.

Literature Review

Development economics is fertile ground for studies on economic growth and structural transformation. The changing sectoral composition of economies and the role of different sectors in promoting economic development have been studied by several researchers.

Lewis (1954) explained structural transformation through the dual sector model which emphasized the transfer of labour and resources from the traditional agricultural sector to the modern industrial sector. Similarly, Kuznets (1966) noted that economic development is generally associated with the declining importance of agriculture and the rising importance of industry and services.

Chenery and Syrquin (1975) examined patterns of growth across countries and discovered that structural transformation was an important feature of economic growth. Their study found that with the development of economies, the share of the primary sector shows downward trend and the other sectors expand.

There are many studies made on sectoral changes and economic growth in Indian context. Ahluwalia (2002) studied the structural transformation of India, and noted, in particular, the growing significance of the service sector in economic development. As pointed out by Bosworth, Collins and Virmani (2007), services have also been a major driver of India's economic growth in recent decades.

More recent work has also focused on the prediction of economic growth using advanced statistical and machine learning techniques. Zhang (2003) gives a hybrid model in which ARIMA combined with neural network models for the forecasting of time-series data. His study resulted that hybrid models gives better forecasting results than traditional models. Khashei and Bijari (2011) says that the integration of statistical and artificial intelligence

methods in hybrid forecasting models leads to significant improvement in forecasting performance.

Research Objective:

The main objective of this study is given below:

1. To study the sectoral composition of Gujarat's economy across the primary, secondary, and tertiary sectors from 2011–12 to 2023–24.
2. To examine the growth trends of different sectors using statistical techniques such as trend analysis and compound annual growth rate (CAGR).
3. To evaluate the contribution of each sector to overall economic growth and structural transformation.
4. To check whether there is a significant difference in sectoral outputs among primary, secondary, and tertiary sectors.

Research Methodology:

This study uses a quantitative research approach to analyze the structural transformation of Gujarat's economy.

Data Description:

The study is based on secondary time-series data collected from official government statistical sources. The dataset covers the period from 2011–12 to 2023–24. The data include sector-wise Gross State Value Added (GSVA) for all three sectors of Gujarat's economy.

Variables

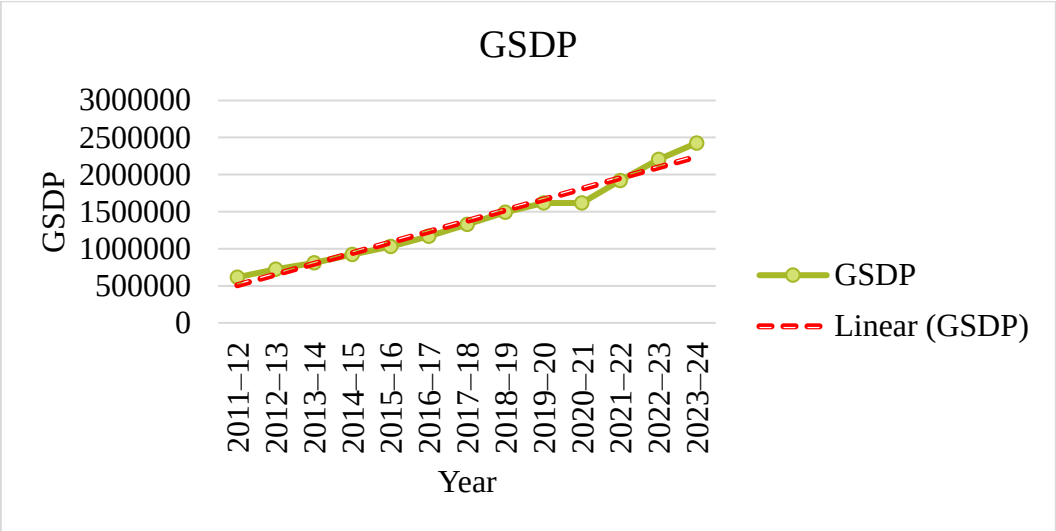
- ✓ Gross State Domestic Product
- ✓ GSVA of Primary Sector
- ✓ GSVA of Secondary Sector
- ✓ GSVA of Tertiary Sector

Statistical Techniques

- **Analysis of Trend:** Used to identify long-term growth patterns in sectoral output and GSDP.
- **Compound Annual Growth Rate (CAGR):** Measures the average annual growth rate of different sectors.
- **Sectoral Share Analysis:** Calculates the percentage contribution of primary, secondary, and tertiary sectors to total GSDP.
- **Kruskal Wallis test**: To check the significant difference in output of all the sectors.

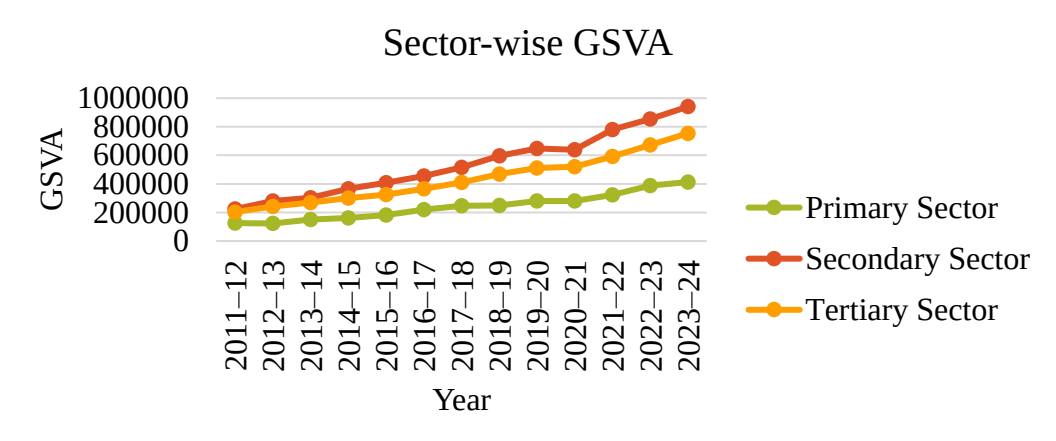
Data Analysis & Results

GSDP Growth Trend (2011-2024)



The Gujarat's GSDP shows a consistent upward trend, with a clear disruption in the year 2020–21. The decline is mainly attributed to the economic impact of the COVID-19 pandemic that impacted industrial production, trade activities and service sector operations across the country. Lockdowns, supply chain disruptions and weaker economic activity led to a temporary slowdown in some sectors, notably manufacturing and transport-related services. The economy showed strong resilience despite this disruption and recovered significantly in the subsequent years with strong growth from 2021-22 onwards. The trends indicate that the secondary and tertiary sectors have been the major contributors in the growth of Gujarat's economy whereas the primary sector has grown at a relatively slow pace. These findings focuses the ongoing structural transformation of the economy toward industry and services, reflecting broader patterns of economic development.

Gujarat's Sectoral growth analysis



From the above chart we can say that secondary sector become the major contributor to the economic growth of Gujarat and the tertiary sector is also highlighted with significant growth and become the second largest contributor to the state economy. The growth of the primary sector has been slower in comparison. This trend indicates a gradual structural transition in the economy of Gujarat where economic activities are gradually shifting away from agriculture to industrial and service-based sectors. Such a transition is part of the overall development process, with industrialization and the growth of the service sector being central to long-term economic growth. The analysis indicates that the economy of Gujarat has undergone structural transformation which is characterized by gradual decline in share of primary sector and increasing contribution of secondary and tertiary sectors. This is consistent with the general trend of economic development found in emerging economies.

Compound Annual Growth Rate (CAGR):

$$CAGR = \left(\frac{V_f}{V_i}\right)^{\frac{1}{n}} - 1\ ;$$

Where,

V_f = Value at End (Year 2023-24)

V_i = Value at Start (Year 2011-12)

n = Number of years

CAGR table

Sector	Start Value (2011–12)	End Value (2023–24)	CAGR (%)
Primary Sector	125870	412464	**10.40%**
Secondary Sector	223417	940638	**12.73%**
Tertiary Sector	202633	754067	**11.57%**
GSDP	615606	2425804	**12.11%**

The above table of the Compound Annual Growth Rate (CAGR) shows substantial growth in all the three sectors of Gujarat's economy. The major contributor of economy i.e. secondary sector, registered with the highest growth rate at 12.73 percent, indicating a strong expansion in the state. The tertiary sector also experienced substantial growth with a CAGR of 11.57 percent, reflecting the increasing importance of services including trade, transport, finance, and real estate. On other side, the primary sector shows a relatively lower rate of 10.40 percent, suggesting a gradual decline in its relative importance in the overall economic structure. The overall GSDP growth rate of 12.11 percent demonstrates robust economic

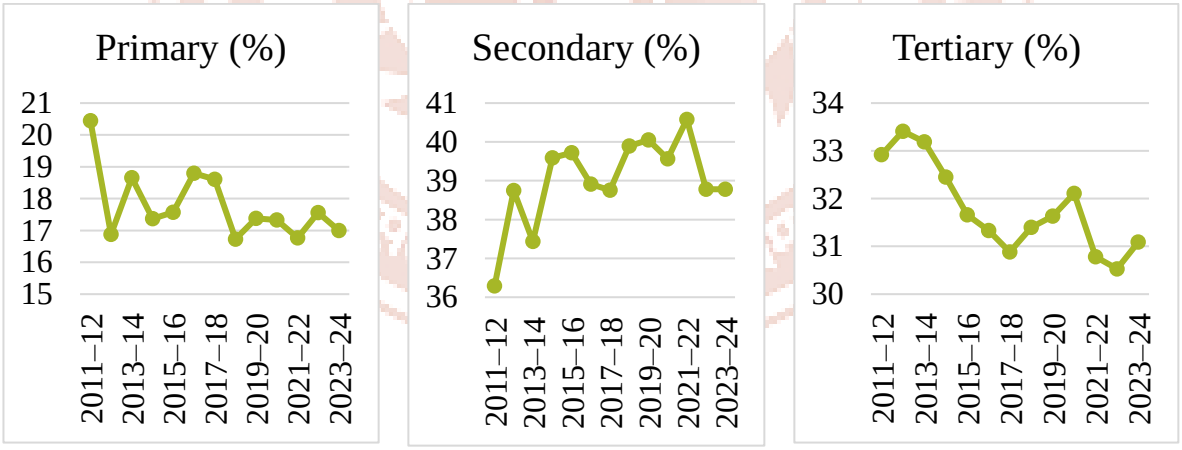
performance in Gujarat, supported largely by the rapid development of industrial and service sectors.

Sector contribution to GSDP

Here we measures the percentage share of each sector in total GSDP, helping to understand structural changes in the economy.

$$Sector\ Contribution(\%) = \frac{Sector\ Output}{Total\ GSDP} \times 100$$

Year	Primary (%)	Secondary (%)	Tertiary (%)
2011–12	20.45	36.29	32.92
2012–13	16.88	38.75	33.41
2013–14	18.66	37.44	33.19
2014–15	17.37	39.59	32.45
2015–16	17.57	39.72	31.66
2016–17	18.80	38.91	31.33
2017–18	18.61	38.76	30.88
2018–19	16.73	39.89	31.40
2019–20	17.38	40.05	31.63
2020–21	17.33	39.56	32.11
2021–22	16.77	40.58	30.78
2022–23	17.56	38.78	30.53
2023–24	17.00	38.78	31.09



The sectoral contribution analysis indicates a clear structural transformation in Gujarat's economy during the period 2011–12 to 2023–24. The share of primary sector in GSDP has gradually declined from 20.45 percent to around 17 percent indicating the diminishing relative importance of agriculture in the state economy. In contrast, the secondary sector has retained its dominant share of GSDP, increasing from around 36 percent to about 39-40 percent, highlighting the strong contribution of industrial activities like manufacturing and construction to spurring economic growth. The tertiary sector has been relatively steady

contributing around 31-33 per cent of the GSDP during the period of study. Overall, these trends suggest a gradual shift from agriculture toward industry and services, indicating a structural transformation consistent with the economic development process.

To check whether there is a significant difference in sectoral outputs among primary, secondary, and tertiary sectors.

- ✓ **Normality Test**

Hypothesis

H_0: Data are normally distributed.

V/s.

H_0: Data are not normally distributed.

Test Statistics

Variable	W Statistic	p-value
Primary	0.941	0.4723
Secondary	0.958	0.7249
Tertiary	0.957	0.7105

Interpretation

As P-value is >0.05, we can say that the data is normally distributed.

- ✓ **Welch ANOVA**

Hypothesis

H_0: $\mu_{Primary} = \mu_{Secondary} = \mu_{Tertiary}$

V/s.

H_0: At least one sector mean differs

Test Statistics

	F-value	p-value
Test Statistics	12.941	0.0002145

Interpretation

The test revealed a statistically significant difference among sectoral means. This indicates that the contribution levels of the sectors differ significantly within Gujarat's economy, reflecting structural transformation.

- ✓ **Post-Hoc test**

Comparison	Mean Difference	p-value	Result
Primary vs Secondary	297,497	0.001	Significant
Primary vs Tertiary	191,676	0.006	Significant

Secondary vs Tertiary	-105,821	0.389	Not Significant

Interpretation

Here we perform Games–Howell post hoc test which results that there are significant differences (i) between the primary and secondary sectors, and (ii) between the primary and tertiary sectors. However, no statistically significant difference was observed between the secondary and tertiary sectors. These findings indicate that Gujarat's economy is increasingly dominated by industrial and service sectors, reflecting ongoing structural transformation.

Findings

- ✓ If we except for a temporary slowdown during 2020–21 due to the COVID-19 pandemic then Gujarat's economy shows a continuous upward trend during the study period from 2011–12 to 2023–24.
- ✓ The secondary sector emerged as the largest contributor to Gujarat's economy, indicating strong industrial growth and expansion of manufacturing and construction activities. The tertiary sector also grew significantly, reflecting the growing importance of trade, transport, communication, finance and other services in the state economy. The growth in the primary sector was relatively slower showing a gradual decline in the relative importance of agriculture and allied activities.
- ✓ The CAGR analysis revealed that secondary sector has witnessed the highest growth rate among all the sectors during the study period.
- ✓ Welch's ANOVA results showed statistically significant differences between sectoral outputs of all three sectors. Post hoc test revealed that significant differences between (i) Primary and Secondary sectors and (ii) Primary and Tertiary sectors. No statistically significant difference was found between the secondary and tertiary sectors, indicating that both sectors contribute almost equally to Gujarat's economic development.

Limitation

The study is based on secondary data collected from official government sources for the period 2011–12 to 2023–24. The limited number of annual observations restricts the use of advanced econometric and forecasting techniques. The analysis is confined to broad sectoral categories and does not take into account detailed sub-sectoral variations, nor external economic factors such as inflation, policy changes and global economic factors. Also, the COVID-19 pandemic led to abnormal fluctuations in 2020–21, which could influence the consistency of trend analysis and statistical estimation.

Conclusion

The study concludes that during the period 2011–12 to 2023–24, there is a significant structural transformation of the economy of Gujarat. The analysis reveals that the secondary sector and territory sector plays a vital role and become main drives of economic growth during study period, while relatively declined contribution of the primary sector become subject under consideration. Also, the industrial and service sectors have shown a robust growth, which is a pointer to the increasing industrialization, urbanization and expansion of economic activities in the state. The statistical analysis further reveals that the primary sector is significantly different from the other two sectors and shows the changing economic structure of Gujarat. The secondary and tertiary sectors show no statistically significant difference which is indicate that both sectors are equally important for the sustainability of economic growth. Overall, the study concludes that Gujarat's economic development is increasingly driven by industry and services, which is in line with the broader pattern of structural transformation that is seen in developing economies.

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