Trend Analysis of State GSDP in India.

Abstract

India's states grew at a median of 10.6% a year in nominal terms and 5.8% a year in real terms between 2011-12 and 2023-24, but price growth, rather than faster real output growth, largely explains the curvature in their nominal trends. This paper examines twelve years of Gross State Domestic Product (GSDP) for 30 states and Union Territories, using the 2011-12 base series published by the Ministry of Statistics and Programme Implementation. We combine time-series trend analysis, linear and quadratic regression on time, and compound annual growth rates (CAGR), and we run every test at current and at constant prices. Nominal GSDP ended at between 2.3 and 4.6 times its initial level, with CAGRs from 7.2% (Goa) to 13.5% (Mizoram). A linear trend explains 90–99% of nominal variation in every state, yet a quadratic term is statistically justified (F-test, 5% level) in 20 of 30 states, always with upward curvature. At constant prices the quadratic is justified in only 3 states, so real growth is close to a constant absolute increment per year. Initial economic size is unrelated to subsequent real growth ($r = 0.07$, $p = 0.70$). The 2020-21 contraction pushed 29 of 30 states below their real linear trend, and the median real growth rate after 2019-20 (4.8%) fell short of the pre-pandemic rate (6.5%).

Keywords:gross state domestic product; trend analysis; compound annual growth rate; polynomial regression; Indian states; regional growth.

1. Introduction

Whether a regional economy is expanding by a roughly constant amount each year, or by an accelerating amount, determines how its growth should be measured and projected. In India this question matters at state level, because states differ widely in size, structure and policy, and because fiscal transfers, borrowing limits and public investment are planned against state output.

The literature on Indian regional growth has mostly asked whether poorer states are catching up with richer ones, and how growth changed after the reforms of the early 1990s (Cashin and Sahay, 1996; Ahluwalia, 2002). A separate econometric tradition asks whether macroeconomic series follow deterministic trends or stochastic ones (Nelson and Plosser, 1982). This paper is more modest. It describes the shape of each state's GSDP trajectory over a common twelve-year window, and it tests whether a simple polynomial trend is justified by the data.

We address four questions:

1. How much did GSDP grow in each state, in absolute terms, in percentage terms and as a compound annual rate?
2. Is a linear time trend an adequate description of the path?
3. Does a quadratic trend improve on it, and if so, is the curvature a real or a nominal phenomenon?
4. How did the 2020-21 pandemic shock interact with the long-run trend?

The main finding is that the answer to the third question depends on the price basis. At current prices most states show accelerating trends. At constant prices most do not.

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2. Data

The data are the state-wise GSDP series with base year 2011-12, compiled by the Directorate of Economics and Statistics of each State/UT government and published on the Ministry of Statistics and Programme Implementation dashboard (release of 15 April 2026). Values are in ₹ crore. Each state has a current-price series and a constant-price (2011-12) series.

The file covers 30 states and Union Territories for 2011-12 to 2025-26. We use 2011-12 to 2023-24, giving 13 annual observations and 12 years of growth, for three reasons. First, it is the longest window with complete data for all 30 units. Second, the 2024-25 estimates were checked only by applying growth rates in line with 2023-24 and were not compared by the National Statistical Office. Third, 2025-26 consists of Advance Estimates and is missing for 15 units.

Assam, Haryana, Nagaland and Ladakh are not yet in the file, so the sample is not a complete census of Indian states. The Jammu and Kashmir series includes Ladakh to 2018-19 and covers the Union Territory alone from 2019-20, which creates a definitional break. Because the base year is 2011-12, initial GSDP is identical at current and constant prices.

3. Methodology

Let Y_t denote GSDP in year t, with t = 0 for 2011-12 and t = 12 for 2023-24. Four measures are computed for each state, separately for current-price and constant-price series.

Growth measures. Absolute growth is $Y_{12} - Y_0$, and percentage growth is $(Y_{12} - Y_0)/Y_0$. The compound annual growth rate is the constant yearly rate that would carry $Y_0 to Y_{12}$:

$$\text{CAGR} = \left(\frac{Y_{12}}{Y_0}\right)^{1/12} - 1$$

CAGR uses only the end points, so it is insensitive to the path in between. Dividing (1 + nominal CAGR) by (1 + real CAGR) and subtracting one gives the implied average annual price growth, which we call the price effect.

Linear trend. Ordinary least squares on time:

$$Y_t = a + b\,t + \varepsilon_t$$

The slope b is the average absolute gain per year in ₹ crore.

Quadratic trend. We add a squared term:

$$Y_t = c + b\,t + a\,t^2 + \varepsilon_t$$

A positive a means annual gains are themselves increasing (acceleration), and a negative a means they are shrinking (deceleration).

Test for the polynomial. A quadratic always fits at least as well as a line, so a higher R^2 alone is no justification. We test the added term with an F-test comparing the nested models, using R^2 from each:

$$F = \frac{\left(R^2_{quad} - R^2_{lin}\right)/1}{\left(1 - R^2_{quad}\right)/(n-3)}, \quad n = 13$$

F is compared with an F distribution with 1 and 10 degrees of freedom. The quadratic is retained only if $p < 0.05$. Cubic and higher orders are not tried, because 13 observations leave too few degrees of freedom to separate a real pattern from noise.

All figures were computed in a spreadsheet with live formulas (SLOPE, RSQ, LINEST, FDIST) and cross-checked against an independent Python calculation; the two agree to within rounding.

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4. Results

4.1 Growth over twelve years

The median state grew at 10.6% a year in nominal terms and 5.8% in real terms, so prices added about 4.7 percentage points a year. Dispersion is moderate: the standard deviation of CAGR across states is 1.5 percentage points nominal and 1.4 real. Table 1 summarises the cross-state distribution.

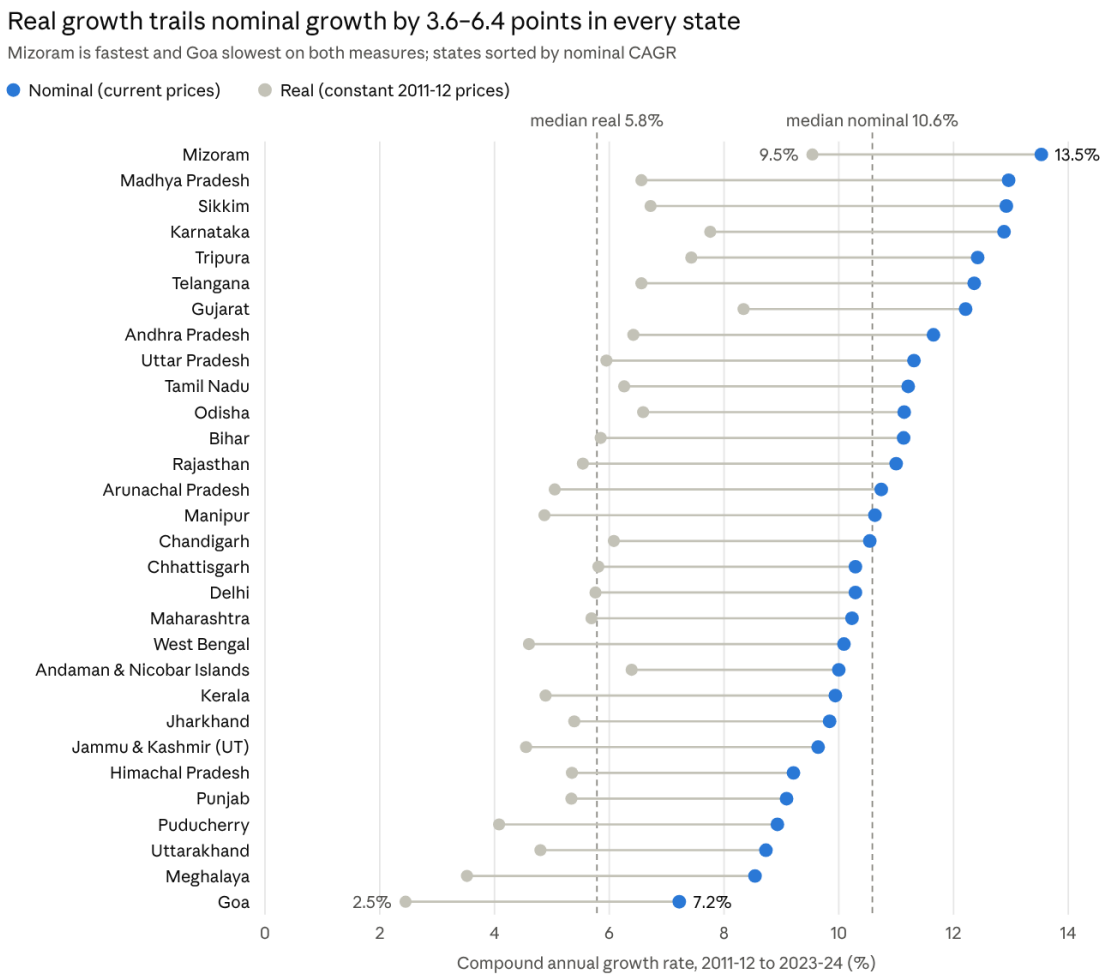
Measure (2011-12 to 2023-24)	Mean	Median	Std. dev.	Minimum	Maximum
Nominal CAGR (%)	10.69	10.59	1.50	7.22 (Goa)	13.53 (Mizoram)
Real CAGR (%)	5.81	5.79	1.40	2.45 (Goa)	9.54 (Mizoram)
Price effect (% a year)	4.62	4.66	0.69	3.39 (Andaman & Nicobar)	6.01 (Madhya Pradesh)
Nominal growth over period (%)	242.3	234.5	55.5	130.9 (Goa)	358.4 (Mizoram)
Real growth over period (%)	99.1	96.4	32.5	33.8 (Goa)	198.5 (Mizoram)

Table 1. Cross-state distribution of growth measures, 30 states and Union Territories.

The fastest nominal growers were Mizoram, Madhya Pradesh, Sikkim, Karnataka and Tripura, and the slowest were Goa, Meghalaya, Uttarakhand, Puducherry and Punjab. Mizoram and Sikkim start from very small bases (₹7,259 crore and ₹11,165 crore in 2011-12), so their high rates reflect small absolute gains. In absolute terms Maharashtra added the most, ₹28.4 lakh crore at current prices, followed by Karnataka, Tamil Nadu and Uttar Pradesh, each close to ₹19–20 lakh crore. Aggregating the 30 units gives a nominal CAGR of 11.1% and a real CAGR of 6.1%, above the unweighted medians, reflecting the above-median growth of several large economies such as Karnataka, Gujarat and Tamil Nadu (Maharashtra, the largest, grew slightly below the median).

Goa is an outlier. Its current-price series fell from ₹42,367 crore in 2011-12 to ₹35,921 crore in 2013-14 before recovering, and its real CAGR of 2.5% is the lowest in the sample. Figure 1 plots both CAGRs for every state. Rankings should be read with such early drops in mind, since a CAGR anchored on a trough or peak year can mislead.

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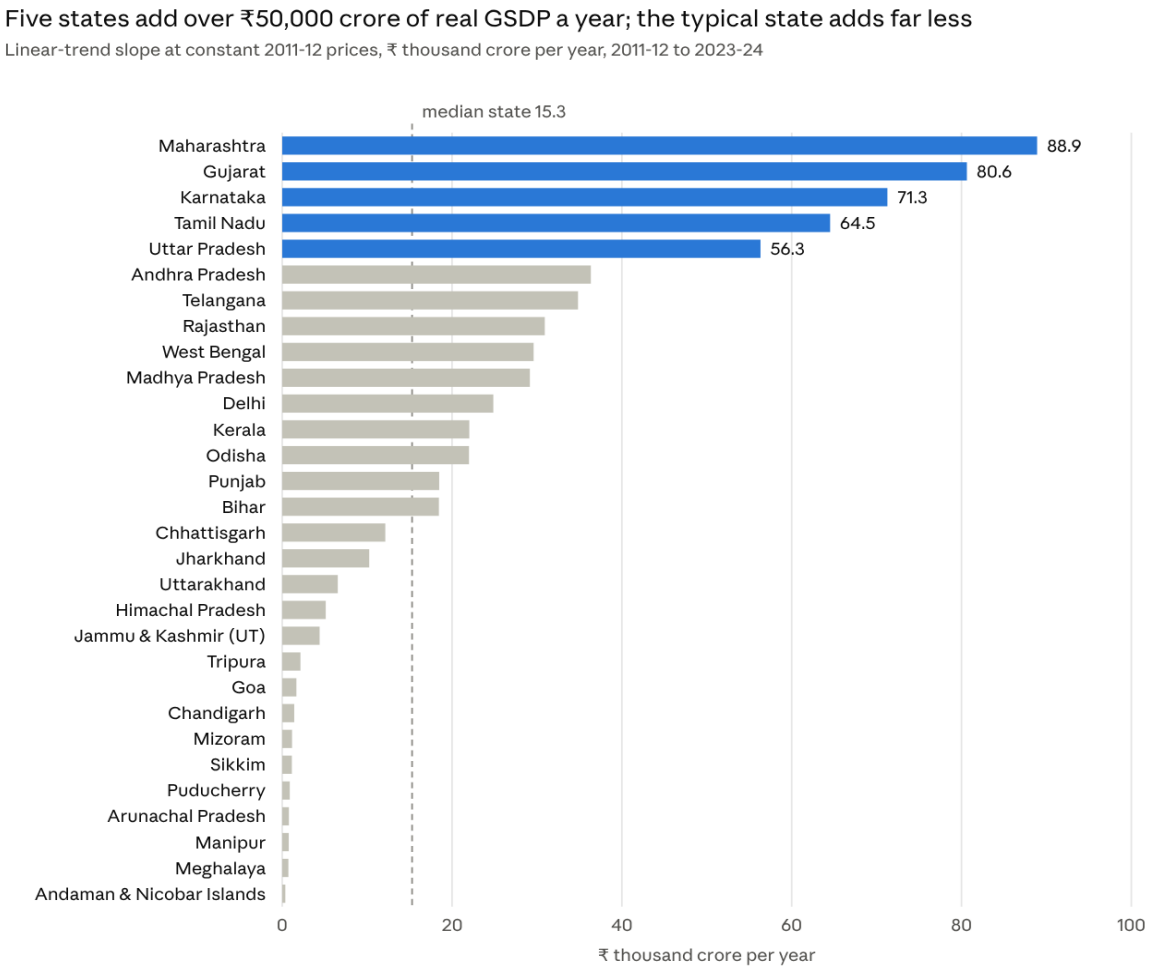
MoSPI state-wise GSDP, base 2011-12 · 30 states/UTs · CAGR 2011-12 to 2023-24

Figure 1. Nominal and real compound annual growth rate by state.

4.2 Linear trend

A straight line fits every state's nominal series closely. The coefficient of determination ranges from 0.90 (Meghalaya) to 0.99, with a median of 0.97. At constant prices the median is 0.96, but the range is wider, from 0.67 (Goa) to 0.99, because several small economies have irregular real paths. The estimated slope, the average annual gain, is largest for Maharashtra at ₹2.1 lakh crore a year at current prices and ₹88,900 crore a year at constant prices. Figure 2 shows the constant-price slope for every state: five states add more than ₹50,000 crore a year, while 25 add less than ₹40,000 crore.

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MoSPI state-wise GSDP, base 2011-12 · linear-trend slope at constant prices · 2011-12 to 2023-24

Figure 2. Average annual gain in real GSDP by state (linear trend).

A high R^2 on a trending series is weak evidence that a line is the right model, since any two smoothly rising series correlate strongly. The informative question is whether adding curvature helps, which section 4.3 tests.

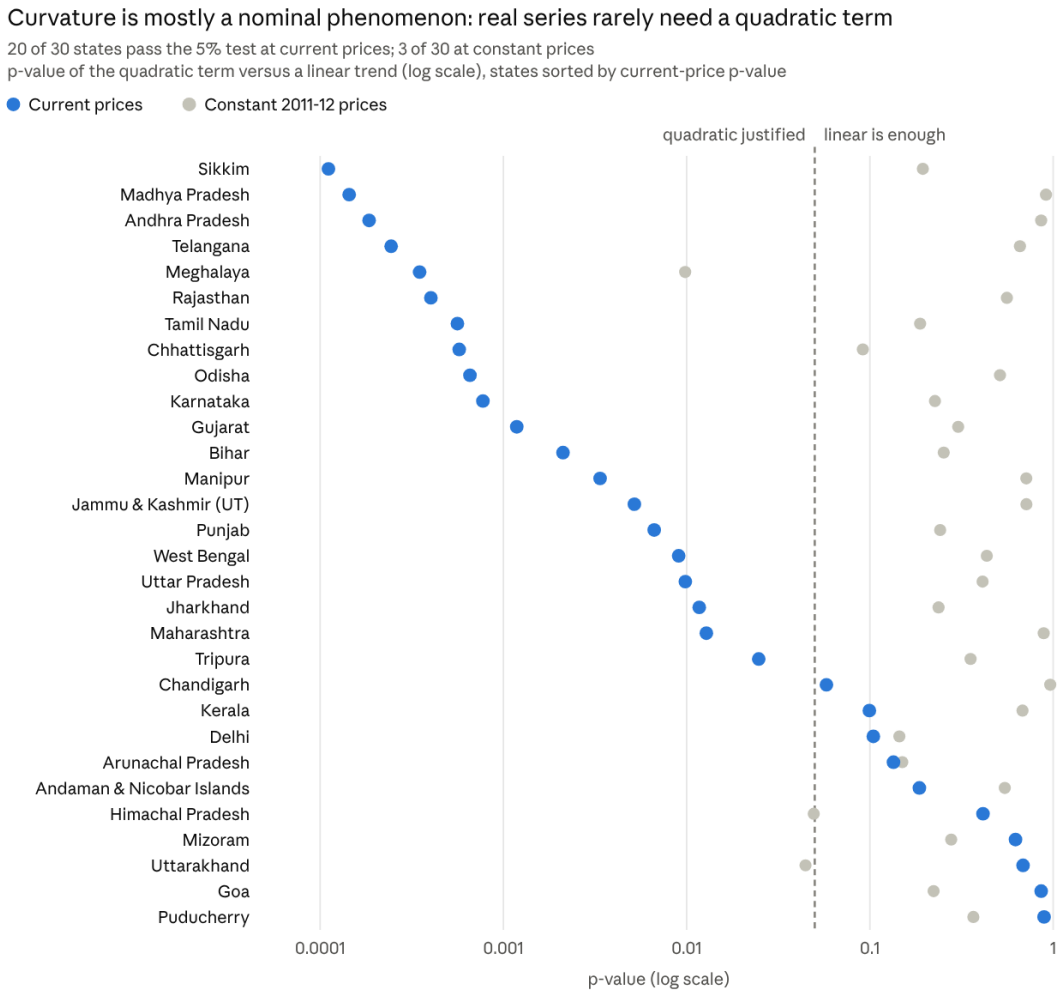
4.3 Polynomial trend

At current prices, the quadratic term is statistically justified in 20 of 30 states ($p < 0.05$; Figure 3), and in all 20 it is positive. Among them the gain in R^2 over the linear model has a median of 0.024. At constant prices the quadratic is justified in only 3 states: Meghalaya (accelerating) and Himachal Pradesh and Uttarakhand (both decelerating). For the other 27, a straight line is adequate. Table 2 compares the two bases.

Price basis	Median R^2, linear	Median R^2, quadratic	Quadratic justified (of 30)	Accelerating	Decelerating
Current prices	0.968	0.988	20	20	0

Price basis	Median R^2, linear	Median R^2, quadratic	Quadratic justified (of 30)	Accelerating	Decelerating
Constant 2011-12 prices	0.958	0.964	3	1	2

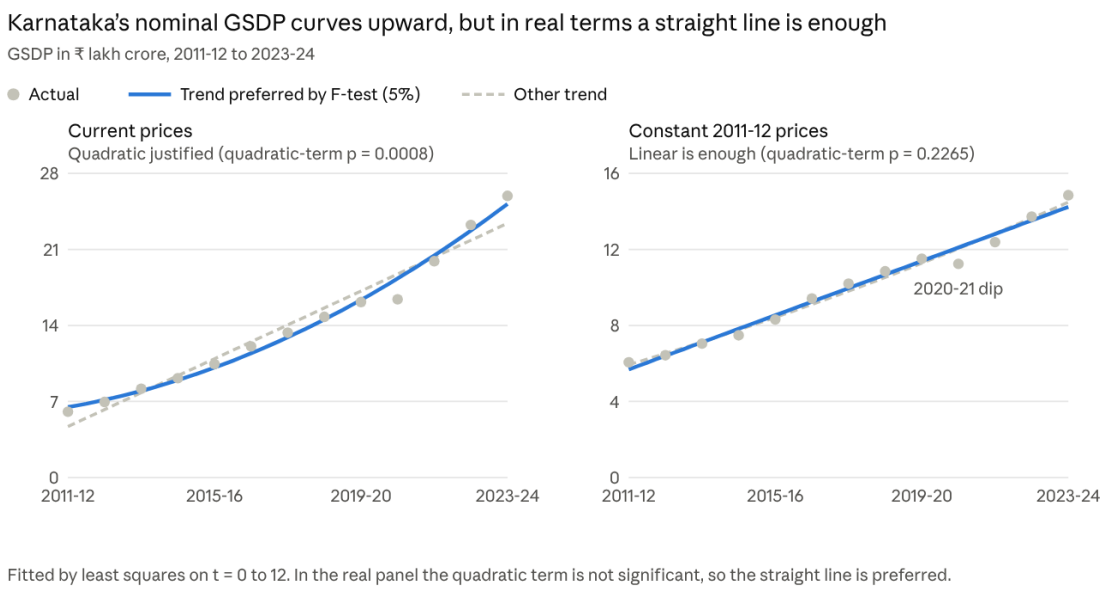
Table 2. Linear versus quadratic trend, F-test at the 5% level.



F-test p-values of the quadratic term, from the Trend_Models sheet · 30 states/UTs · 2011-12 to 2023-24

Figure 3. p-value of the quadratic term by state, current and constant prices.

The contrast is the central result of the paper. A state whose real output rises by a roughly constant amount each year will still show an accelerating nominal path, because inflation scales each year's increment upward. Figure 4 illustrates this for Karnataka, where the nominal quadratic term is strongly significant ($p = 0.0008$) while the real series is well described by a line ($R^2 = 0.98$, $p = 0.23$ for the quadratic term).



MoSPI state-wise GSDP, base 2011-12 · Karnataka · 2011-12 to 2023-24 · OLS fits computed from the plotted rows.

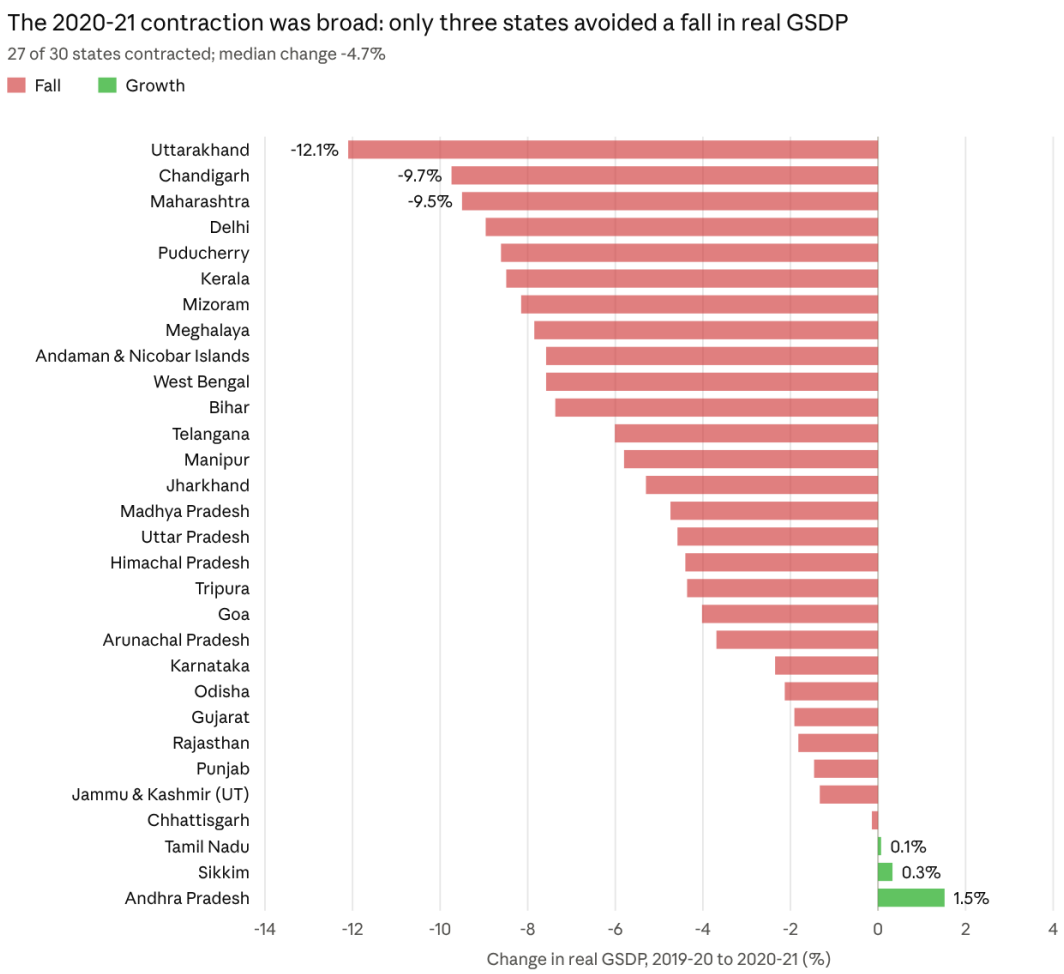
Figure 4. Karnataka GSDP with linear and quadratic trends, current and constant prices.

This does not mean real growth was uniform. It means that, over twelve annual observations, a constant absolute increment cannot be rejected for most states once prices are removed, whereas a constant absolute increment is rejected at current prices for two thirds of them.

4.4 The 2020-21 shock

The pandemic year is the clearest departure from any smooth trend. Real GSDP fell in 27 of 30 states in 2020-21, with a median change of −4.7%. Uttarakhand (−12.1%), Chandigarh (−9.7%), Maharashtra (−9.5%) and Delhi (−9.0%) fell most, while Andhra Pradesh was the only state to grow by more than 1%. In 29 of 30 states, real GSDP in 2020-21 lay below the fitted linear trend. Figure 5 shows the change for every state.

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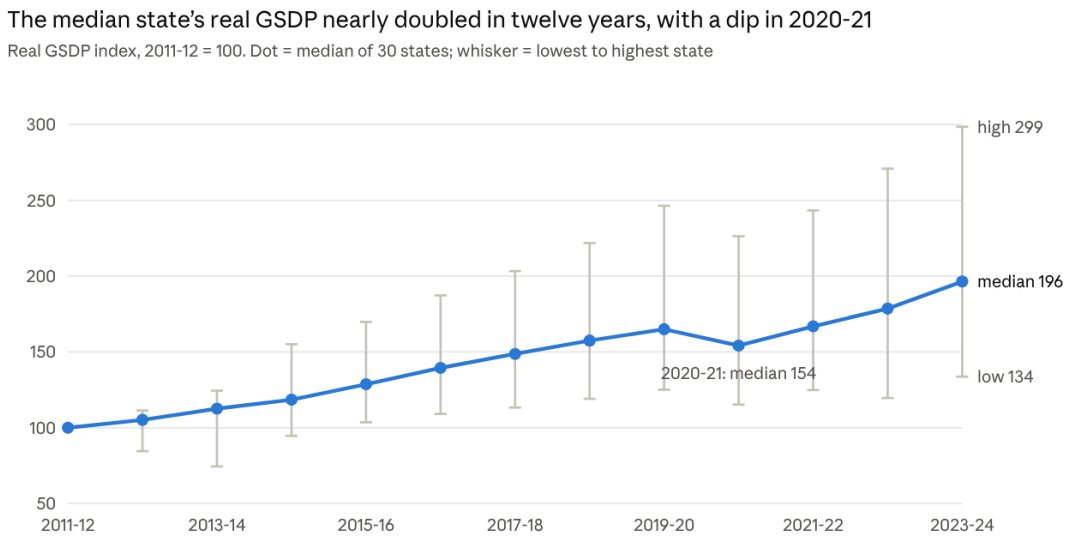


MoSPI state-wise GSDP at constant 2011-12 prices · 2019-20 to 2020-21 · 30 states/UTs

Figure 5. Change in real GSDP in 2020-21 by state.

Splitting the window shows a slowdown. The median real CAGR was 6.5% from 2011-12 to 2019-20 and 4.8% from 2019-20 to 2023-24, and the median nominal CAGR fell from 11.0% to 10.0%. The later window spans the contraction, so its end-point CAGR carries the year of lost output. The rebound itself was fast: the median real CAGR from 2020-21 to 2023-24 was 7.9%, above each state's own pre-pandemic rate in 21 of 30 states, and 20 states had regained their 2019-20 real level by 2021-22. Figure 6 traces the median path and the range across states. A single quadratic cannot represent a dip followed by a rebound, which is one reason we do not extend the polynomial order.

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MoSPI state-wise GSDP at constant 2011-12 prices · index 2011-12 = 100 · median and range of 30 states/UTs

Figure 6. Real GSDP index: median state and range across states, 2011-12 to 2023-24.

4.5 Size and growth

Did larger economies grow faster or slower? The correlation between the logarithm of initial GSDP and real CAGR is 0.07 ($p = 0.70$), and with nominal CAGR it is 0.11. There is no evidence in this window of either convergence, where small states grow faster (Barro and Sala-i-Martin, 1992), or divergence. The correlation between nominal and real CAGR across states is high (Pearson $r = 0.88$), so the ordering of states is broadly robust to the price basis.

5. Conclusion

Over twelve years, the median Indian state in this sample grew 10.6% a year at current prices and 5.8% at constant prices, with wide differences between Mizoram at the top and Goa at the bottom. Nominal GSDP follows an accelerating path in two thirds of states, but that curvature largely disappears once prices are removed, leaving near-linear real growth in 27 of 30. The pandemic contraction was the main departure from trend, and recovery was quick. Future work could add unit-root tests, per-capita measures, and a break at 2020-21, and could extend the series once the 2024-25 and 2025-26 estimates are finalised.

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References

1. Ahluwalia, M. S. (2002). State-level performance under economic reforms in India. In A. O. Krueger (Ed.), *Economic Policy Reforms and the Indian Economy*. University of Chicago Press.
2. Barro, R. J., and Sala-i-Martin, X. (1992). Convergence. *Journal of Political Economy*, 100(2), 223–251.
3. Cashin, P., and Sahay, R. (1996). Internal migration, center-state grants, and economic growth in the states of India. *IMF Staff Papers*, 43(1), 123–171.
4. Hamilton, J. D. (1994). *Time Series Analysis*. Princeton University Press.
5. Ministry of Statistics and Programme Implementation, Government of India. State-wise Gross State Domestic Product, base year 2011-12 (dashboard release of 15 April 2026). Source data: Directorate of Economics and Statistics of the respective State/UT governments.
6. Nelson, C. R., and Plosser, C. I. (1982). Trends and random walks in macroeconomic time series. *Journal of Monetary Economics*, 10(2), 139–162.

Appendix: results for all states

Table A1 lists every state and Union Territory, sorted by nominal CAGR. "Slope" is the linear trend at current prices. "Trend" is the model preferred by the F-test at 5%: Linear, or Quadratic (Quad.) with acc. = accelerating and dec. = decelerating.

State / UT	GSDP 2011-12 (₹ cr)	GSDP 2023-24 (₹ cr)	Absolute growth (₹ cr)	Growth (%)	CAGR (%)	Real CAGR (%)	Slope (₹ cr/yr)	Trend, current	Trend, constant
Mizoram	7,259	33,277	26,018	358.4	13.53	9.54	2,124	Linear	Linear
Madhya Pradesh	315,562	1,362,421	1,046,860	331.7	12.96	6.56	85,084	Quad. (acc.)	Linear
Sikkim	11,165	47,988	36,823	329.8	12.92	6.72	3,054	Quad. (acc.)	Linear
Karnataka	606,010	2,593,567	1,987,557	328.0	12.88	7.76	155,900	Quad. (acc.)	Linear
Tripura	19,208	78,234	59,026	307.3	12.42	7.43	4,750	Quad. (acc.)	Linear
Telangana	359,434	1,455,383	1,095,949	304.9	12.36	6.56	88,277	Quad. (acc.)	Linear
Gujarat	615,606	2,452,736	1,837,130	298.4	12.21	8.34	144,958	Quad. (acc.)	Linear
Andhra Pradesh	379,402	1,423,900	1,044,497	275.3	11.65	6.42	85,784	Quad. (acc.)	Linear
Uttar Pradesh	737,070	2,666,950	1,929,879	261.8	11.31	5.95	145,663	Quad. (acc.)	Linear
Tamil Nadu	751,486	2,688,963	1,937,478	257.8	11.21	6.26	149,648	Quad. (acc.)	Linear

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State / UT	GSDP 2011-12 (₹ cr)	GSDP 2023-24 (₹ cr)	Absolute growth (₹ cr)	Growth (%)	CAGR (%)	Real CAGR (%)	Slope (₹ cr/yr)	Trend, current	Trend, constant
Odisha	230,987	820,852	589,865	255.4	11.14	6.59	47,338	Quad. (acc.)	Linear
Bihar	247,144	877,230	630,086	254.9	11.13	5.85	47,844	Quad. (acc.)	Linear
Rajasthan	434,837	1,522,063	1,087,226	250.0	11.00	5.54	84,464	Quad. (acc.)	Linear
Arunachal Pradesh	11,063	37,636	26,573	240.2	10.74	5.05	2,274	Linear	Linear
Manipur	12,915	43,425	30,511	236.2	10.63	4.87	2,440	Quad. (acc.)	Linear
Chandigarh	18,768	62,447	43,679	232.7	10.54	6.08	3,260	Linear	Linear
Chhattisgarh	158,074	512,073	353,999	223.9	10.29	5.81	27,582	Quad. (acc.)	Linear
Delhi	343,798	1,113,646	769,848	223.9	10.29	5.76	58,922	Linear	Linear
Maharashtra	1,280,369	4,118,375	2,838,006	221.7	10.23	5.69	210,110	Quad. (acc.)	Linear
West Bengal	520,485	1,650,115	1,129,630	217.0	10.09	4.60	89,501	Quad. (acc.)	Linear
Andaman & Nicobar Islands	3,978	12,485	8,506	213.8	10.00	6.39	722	Linear	Linear
Kerala	364,048	1,135,372	771,324	211.9	9.94	4.89	60,607	Linear	Linear
Jharkhand	150,918	465,638	314,720	208.5	9.84	5.39	23,889	Quad. (acc.)	Linear
Jammu & Kashmir (UT)	78,256	236,059	157,803	201.7	9.64	4.55	12,468	Quad. (acc.)	Linear
Himachal Pradesh	72,720	209,385	136,666	187.9	9.21	5.35	10,573	Linear	Quad. (dec.)
Punjab	266,628	757,627	490,998	184.2	9.09	5.34	38,340	Quad. (acc.)	Linear
Puducherry	16,818	46,945	30,127	179.1	8.93	4.08	2,419	Linear	Linear
Uttarakhand	115,328	314,973	199,645	173.1	8.73	4.80	15,265	Linear	Quad. (dec.)

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State / UT	GSDP 2011-12 (₹ cr)	GSDP 2023-24 (₹ cr)	Absolute growth (₹ cr)	Growth (%)	CAGR (%)	Real CAGR (%)	Slope (₹ cr/yr)	Trend, current	Trend, constant
Meghalaya	19,918	53,223	33,306	167.2	8.54	3.52	2,469	Quad. (acc.)	Quad. (acc.)
Goa	42,367	97,839	55,472	130.9	7.22	2.45	4,818	Linear	Linear

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