

# Relative Growth Performance of Gujarat

## A Comment on the Recent Debate

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EPW has been publishing a number of articles on the relative economic performance of Gujarat, and on growth and human development in India under the United Progressive Alliance vs the National Democratic Alliance (28 September 2013, 12 April and 19 April 2014). These articles attract critical comment here from Ravindra H Dholakia and Sugata Marjit. Continuing the debate, R Nagaraj, and Maitreesh Ghatak and Sanchari Roy respond to Dholakia, while Ghatak et al respond to Marjit.

Reconceived conclusions often drive authors to sacrifice scientific rigour and objectivity in their analysis and become biased and selective in interpreting statistical evidence to “prove” their point. Two articles recently published in EPW (“Did Gujarat’s Growth Rate Accelerate under Modi?”, Maitreesh Ghatak and Sanchari Roy, 12 April 2014 and “Have Gujarat and Bihar Outperformed the Rest of India?”, R Nagaraj and Shruti Pandey, 28 September 2013) on the relative growth performance of Gujarat over time belong to this category. Both the articles, using a similar approach and methods have argued that the relative growth performance of Gujarat during the last decade was not exceptional since it had all along been “one of the richest” states in the country with a higher growth rate than the nation, and had experienced the same margin of difference during the last decade as during the previous one (Ghatak and Roy 2014). The other argument is that the ranking of the state has not changed and so also its share in national output (Nagaraj and Pandey 2013).

However, both these arguments appear contradictory because if Gujarat has grown at a substantially higher rate than the nation over the last two decades, its share in national output cannot be the same. And if Gujarat ranks ninth among states, it cannot be considered as having been one of the richest states in the country all along. We need to examine their conclusions in the light of statistical evidence.

We begin by considering the statistical evidence reported in their articles that was conveniently ignored by them. We also point out the obvious inadequacy of their methods to arrive at conclusions.

Finally, we present some additional empirical evidence appropriate to the debate.

### Inconsistency and Limitations

Ghatak and Roy (2014) conclude that their “results do not change qualitatively” with either log-linear trend fitting or taking the average of year-on-year growth rates for the growth rates in Gujarat over the 1980s. On the contrary, their results in Tables 1(a) and 2(a) and Tables 1(b) and 2(b) show that not only are the growth rates substantially different, but also the growth differential between Gujarat and the nation during the 1980s differs both in sign and magnitude. Since this evidence was against their argument, it was ignored and conveniently misinterpreted. Similarly, Figure 2 shows that per capita incomes in Gujarat and India were almost the same in two years in the late 1980s and early 1990s. Still, they argue that Gujarat has always been “one of the richest” states in India.

The main argument of Ghatak and Roy (2014) is that “there is no evidence to suggest that Gujarat succeeded in widening its lead over the national average in 2000s, relative to the 1990s”. This is thoroughly contradicted by Figure 3 in their article, where they plot differences in growth rates between Gujarat and India with 95% confidence intervals. During the 1990s, there are hardly three years when the difference is above 2 percentage points against eight such years during the 2000s. Similarly, during the 1990s, the difference shows an inverted-u-shape behaviour, whereas during the last decade it shows a continually rising behaviour. Again, the growth differences between Gujarat and India are statistically significant at the 5% level only between 1993 and 1999, whereas all the differences during the last decade are statistically significant. Moreover, Table 2(a) based on log-linear trend rates shows that Gujarat’s lead over the national average increased during the 2000s compared to the 1990s. Thus, considering their methodology of taking difference-on-difference, their own empirical evidence has enough to

support the better relative growth performance of Gujarat during the 2000s compared to the 1990s.

Nagaraj and Pandey (2013) recognise upfront “the wild fluctuations in the official data” at the state level, but ignore it to make comparisons of the share in the national product in different years with the one attained in 1996-97. If fluctuation is their concern, they should compare moving averages of three to four years. Their conclusion based on an examination of the share of gross state domestic product (GSDP) is contradicted by Figure 2 in their article where the share of Gujarat in total GSDP is shown to be an *N*-shaped curve over 1993-2012 with the minima at 2000-01. Although they have not acknowledged it, Figure 2 in their article shows that the high growth performance in Gujarat compared to the nation during the mid-1990s was not sustained during the latter half of the decade, but there was a continuously higher performance in Gujarat during 2000-12. Their ranking of states includes 32 territories, defying logic and justification. If we take the ranking of Gujarat among the major states as is usually done in meaningful analyses, it improved its rank from the fifth richest state in 1993-94 to the third in 2011-12. If this is not a significant movement in relative terms, what else would be?

Turning to the argument of Nagaraj and Pandey on the industrial performance that “Gujarat’s industrial lead is mainly on account of petroleum refining”, it is interesting to note from their Tables 2 and 3 that Gujarat’s rank in GSDP in manufacturing was constant at No 2 in all years from 1998-99 to 2009-10 when the petroleum industry’s share in gross value added in registered manufacturing went on increasing from 6.5% in 1998-99 to 32.2% in 2005-06, and then fell to 22.8% in 2009-10. There therefore is no logic, no correlation, and no justification for their conclusion. Moreover, their supposition that the manufacturing sector in Gujarat is otherwise stagnant is misplaced and misinformed because the share of manufacturing in the state has been continuously rising not only in GSDP, but also in total

employment (DE&S, GOG; NSSO 55th, 61st and 66th rounds).

### Inadequacy of Methodology

Ghatak and Roy (2014) employ the method of taking the arithmetic mean of year-on-year growth rates and prefer it to the trend rate with statistical significance obtained by fitting a log-linear trend regression on the annual data. It is well known that the arithmetic mean will always be greater than the geometric mean. If we add (+1) to year-on-year growth rates and take their geometric mean, it would give the compound

**Table 1: Comparison of Annual Growth of GDP for Gujarat and All-India GDP at Constant 2004-05 Prices**

Period (Years)	Average Growth Rate (%)		Coefficient of Variation		Period (Years)	Trend Rate (%)	
	Gujarat	All India	Gujarat	All India		Gujarat	All India
2001-02 to 2010-11	10.34	7.64	27.35	24.03	2000-01 to 2010-11	10.44*	7.91*
1991-92 to 2000-01	6.1	5.7	187.03	34.59	1990-91 to 2000-01	7.07*	6.09*
1981-82 to 1990-91	5.75	5.4	258.64	40.83	1980-81 to 1990-91	4.55*	5.28*
1971-72 to 1980-81	4.23	3.16	381.42	137.75	1970-71 to 1980-81	4.47*	3.43*
1961-62 to 1970-71	5.13	3.75	177.41	93.90	1960-61 to 1970-71	3.29*	3.48*

\* Indicates statistically significant at 1%.

Source: Department of Economics and Statistics, Government of Gujarat and *Economic Survey 2011-12*, Government of India, February 2012.

annual growth rate (CAGR) between the two end points after deducting (+1). Therefore, when we take the arithmetic average of the year-on-year growth rates, it will always overstate the growth rate compared to the CAGR, but both are similar measures in character. The log-linear trend rate is considered a more reliable and representative measure because it considers all observations and provides standard error and statistical significance of the estimated growth rate. A simple illustration can demonstrate the serious limitations of the method used by Ghatak and Roy.

Let us consider an income of 100 in year 1, 50 in year 2, and 100 in year 3. The year-on-year growth rate would be (-)50% in years 1 and 2, and +100% in years 2 and 3. Therefore, Ghatak and Roy would consider the average growth rate during years 1 to 3 as 25% per annum, although actually there is no growth. If, however, the income series does not show wild fluctuations in growth over time, growth rates calculated by different methods would be very similar in magnitude. It is for this reason that national growth rates that show lower fluctuations are very similar when different methods are used, but state-level

growth rates that fluctuate heavily are substantially different. Both Ghatak and Roy (2014) and Nagaraj and Pandey (2013) are quite wrong in their rejection of the log-linear trend rate over other less rigorous methods. To demonstrate the difference, we can consider Table 1 taken from Dholakia and Sapre (2013).

Table 1 shows the arithmetic mean of year-on-year growth rates during different decades in columns 2 and 3; their coefficient of variations in columns 4 and 5; and log-linear trend rates in columns 7 and 8. It shows that state-level annual growth fluctuations are very

large compared to the national level and hence there are significant differences in the average growth rates and trend rates for Gujarat, but not for all-India. Moreover, variations in annual growth rates have been substantially falling since the 1970s in both Gujarat and India. It is only during the last decade that the variation in Gujarat has fallen almost to the same level as the nation. Thus, the last decade has brought in not only high growth but also much more stability, and therefore better quality of growth in Gujarat. Further, Table 1 here shows that the trend rate of growth in Gujarat was substantially lower than in the nation during the 1960s and 1980s. Similarly, taking difference-in-difference of annual trend rates of growth, the last decade shows an improvement in the relative growth performance of Gujarat over the nation from +0.98 during the 1990s to +2.53 during the 2000s.

### Fresh Empirical Evidence

When the contentious issue is whether a particular regime has achieved a distinctly better growth performance than in the past, the most appropriate method is to apply the trend-break analysis. We can allow the data set to endogenously

identify the break points using the Bai-Perron method (1998 and 2003). The identified trend break points would then provide distinctly different growth regimes. This method was employed to identify growth regimes in Gujarat over the period from 1960-61 to 2009-10 by Dholakia (2010) using GSDP at constant 1999-2000 prices. The endogenously identified break points were 1980-81, 1993-94, and 2002-03 with the corresponding 95% confidence intervals being, respectively, 1978-82, 1992-95, and 1998-2004. These results can be sensitive to the change in the base year of the series and since the latest base year is 2004-05, the whole GSDP series from 1960-61 was re-estimated at 2004-05 prices and the year 2010-11 was added to identify the break points again. The endogenously identified break points are 1971-72, 1984-85 and 1999-2000 with the corresponding 95% confidence intervals being, respectively, 1964-73, 1980-86 and 1998-2001. Moreover, these identified break dates remain the same

for the length of the segment varying from six to nine.

Although both these exercises identify somewhat different break dates depending on the base year for GSDP estimates and number of observations, identification of the last break point is fairly close and their confidence intervals are actually overlapping. It clearly supports the popularly held hypothesis that the last decade (the 2000s) saw a substantial improvement in the state's growth performance compared to the past and also compared to the nation, considering the difference-in-difference method applied to the log-linear trend rates of growth. Moreover, it is important to recognise that Gujarat had one of the highest immigration rates among all major states in the country during the last decade and yet it shows one of the lowest unemployment rates, irrespective of the measure used (Dholakia and Sapre 2011). This could happen only if the growth performance of Gujarat relative to the

rest of the country was significantly better in the decade. A biased analysis, and wrong methodology and a misinterpretation of the statistics have marred the debate on "the Gujarat model". Let objectivity, rigorous logic, and scientific methodology prevail.

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#### REFERENCES

- Bai, J and P Perron (1998): "Estimating and Testing Linear Models with Multiple Structural Changes", *Econometrica*, Vol 66, pp 817-58.
- (2003): "Computation and Analysis of Multiple Structural Change Models", *Journal of Applied Econometrics*, Vol 18, pp 1-22.
- Dholakia, Ravindra H (2010): "Has Agriculture in Gujarat Shifted to High Growth Path?" in R H Dholakia and Samar Datta (ed.), *High Growth Trajectory and Structural Changes in Gujarat Agriculture* (New Delhi: Macmillan), pp 1-14.
- Dholakia, Ravindra H and A Sapre (2011): "Gujarat's Growth Story", *Economic & Political Weekly*, Vol 46, No 32, pp 122-24.
- (2013): "Inter-sectoral Terms of Trade and Aggregate Supply Response in Gujarat and Indian Agriculture", IIMA Working Paper WP No 2013-07-02.