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The Evolution of Manufacturing Efficiency: Evidence from Indian States

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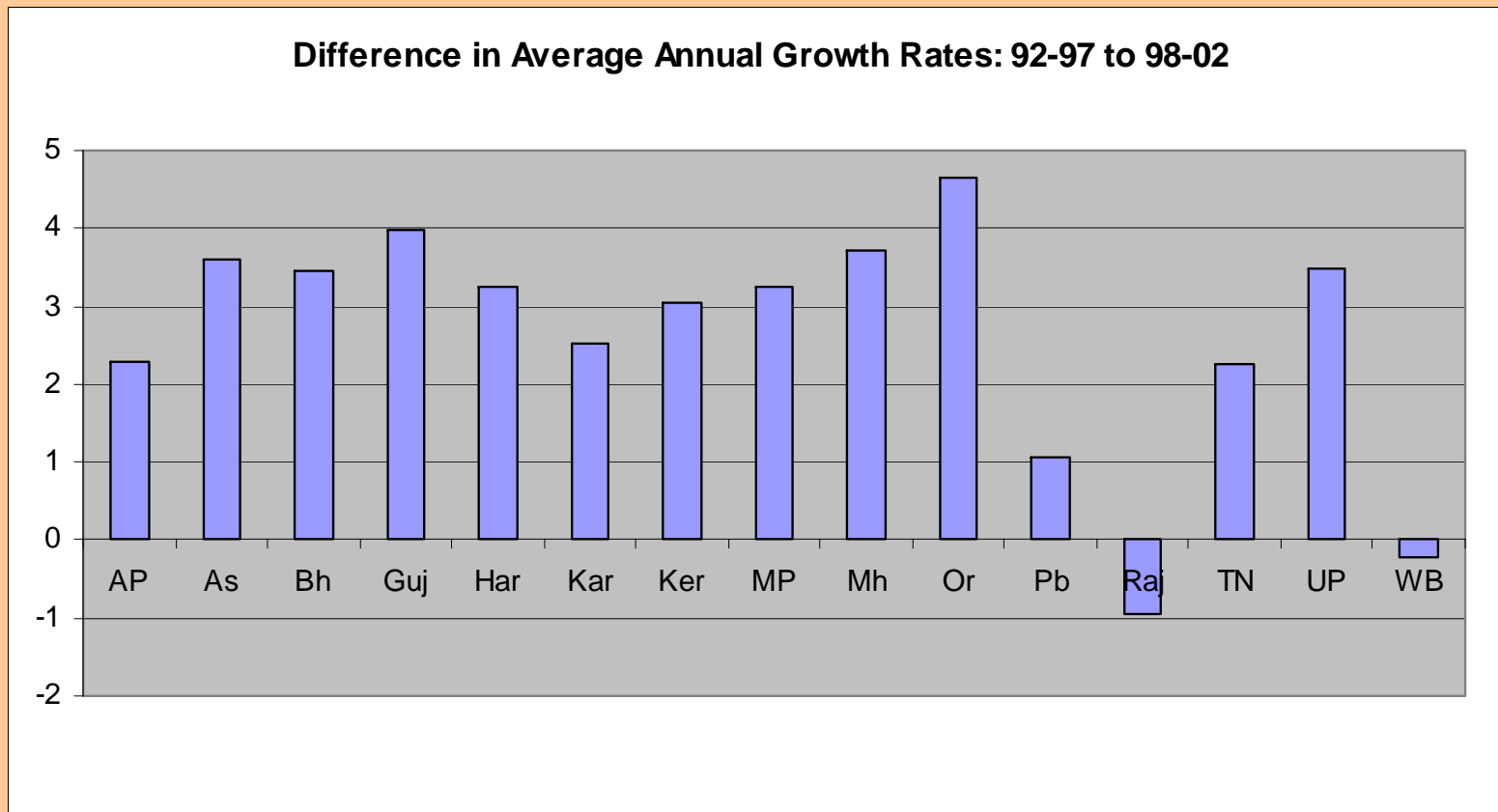
Goals

- Pattern of overall industrial efficiency changes across Indian states
- Highlight large industry-specific fluctuations across regions and states
- Identify regional comparative advantage as potential growth drivers

Goals

- Primary focus on pattern of efficiency changes
 - Importance of India's federal structure: Differential effect of Central Govt. reform policies
 - Analysis contributes to a broader debate
 - Resource endowments, agriculture/services focus, etc as growth drivers
 - Importance of other policies: health, education, infrastructure, etc

Fig. 1: Average Growth Rates



Source: Central Statistical Office

Methodology and Data



- 15 states – 95% of population
- 18 industries
- Stochastic Frontier Analysis
 - Repeated for each individual industry group
 - Consistency of production technology across states
- Two time sub-groups (1992-97, 1998-02)
 - Analysis constrained by data availability

Overall Performance of States

Example



Ranking	15	16	17	18	19	20
1	West Bengal	Bihar	Karnataka	Rajasthan	Maharashtra	Maharashtra
2	Andhra Pradesh	Madhya Pradesh	Madhya Pradesh	Haryana	Kerala	Assam
3	Gujarat	Kerala	Kerala	Karnataka	Haryana	Orissa
4	Orissa	Punjab	West Bengal	Orissa	Karnataka	Haryana
5	Uttar Pradesh	Karnataka	Maharashtra	Maharashtra	Rajasthan	Madhya Pradesh
6	Haryana	Tamil Nadu	Orissa	Tamil Nadu	Uttar Pradesh	Rajasthan

Aggregate State Performances



State ranks in 1992-97

	Rank=1	Top 3	Bottom 4	Rank=15
Andhra Pradesh	1	5	3	0
Assam	1	4	2	0
Bihar	2	4	9	4
Gujarat	1	2	6	2
Haryana	0	2	2	0
Karnataka	4	8	6	2
Kerala	4	10	1	0
Madhya Pradesh	0	5	7	1
Maharashtra	2	5	3	2
Orissa	2	5	4	2
Punjab	0	1	12	5
Rajasthan	2	5	5	1
Tamil Nadu	0	4	4	1
Uttar Pradesh	0	0	6	0
West Bengal	2	3	6	1

Aggregate State Performances



State ranks in 1998-02

	Rank=1	Top 3	Bottom 4	Rank=15
Andhra Pradesh	0	1	6	3
Assam	2	6	2	1
Bihar	1	2	7	2
Gujarat	2	4	1	0
Haryana	0	6	3	1
Karnataka	4	8	3	0
Kerala	1	4	3	0
Madhya Pradesh	1	2	2	0
Maharashtra	4	8	1	0
Orissa	0	1	4	0
Punjab	0	1	14	7
Rajasthan	2	6	6	2
Tamil Nadu	1	4	5	1
Uttar Pradesh	0	1	5	0
West Bengal	1	3	6	2

Key Highlights



- Western states improved performance
- Performance of Eastern and Southern states more mixed
 - Eastern states appear to outperform Southern states, which is surprising
 - Bihar: moves away from extremes
- Northern states perform poorly
 - Punjab: Worst performing state

Context and Caveats



- Efficiency rankings say nothing about:
 - Size of a particular industry in a given state
 - Growth rates of the industries or states
- Technical Efficiency is simply how well an industry uses inputs to create output
- Same number of industries, across time, may not correspond to same industries
- Manufacturing relative to other sectors

Disaggregated Results – Highlights of Regional Performance

East



- Generally good/improved performance in heavy industries
 - Chemicals, Paper, Electrical Machinery, Basic Metals, Fabricated Metals
- Bihar: maintained 1st and 3rd ranks in Basic Metals and Motor Vehicles
- Assam: top ranks in Paper and Wood Products
- WB: top rank in Furniture industry

East

- Relatively poor performance in light, labour-intensive industries
- Orissa and Bihar lost 8 ranks each in Rubber/Plastics and Tobacco, resp. (1st to 9th)
- Assam: lowest rank in Food Products
- WB: lost 13 ranks to reach 14th in Food Products
- Orissa and WB: generally poor performance
 - Mostly confined to moderate ranks (incl. improvements)

West



- Greatest overall efficiency improvements
- Significant ranking fluctuations in heavy industries; moderate in light industries
- *Guj.* and *Mah.* lost efficiency in only 6/18 and 7/18 industries, respectively
 - Almost all ranking reductions were marginal

West



- *Mah*: top rank in Refined Petroleum Products, Non-Metallic Mineral Products, and Publishing/Recorded Media
 - In first two of these, made large efficiency gains
- Further large gains in Food/Beverages (15th to 2nd) and Paper/Paper Products (15th to 3rd)
- Rajasthan: mixed experience
 - Top rank in Chemicals & Fabricated Metal Products
 - Large drops in Motor Vehicles, Wood, Paper, Furniture

South



- No consistent pattern of performance across light or heavy industries
- AP: general declining pattern; 2 exceptions
 - Motor Vehicles (14th to 1st rank)
 - Office and Computing Machinery (8th to 2nd)
- Kerala: lost efficiency rankings in 2/3rd industries (12 out of 18)
 - 5/6 industries with efficiency improvements are labour-intensive industries

South

- Karnataka: significant improvements
 - Wood and Wood Products (13th to 2nd)
 - Rubber and Plastic Products (14th to 1st)
 - Electrical Machinery and Apparatus (15th to 1st)
 - *Relatively moderate declines in Leather and Refined Petroleum Products industries*
- TN: Relatively static performance
 - Most efficiency changes are of moderate magnitude

North



- Punjab: mostly confined to intermediate or low efficiency rankings
 - Lost 13 ranks (2nd to 15th) in Electrical Machinery industry
 - Particularly poor performance in light industries
- Haryana: gains in Refined Petroleum Products and Printing/Publishing industries
 - No consistent pattern across H/L industries
- UP: overall poor performance in heavy industries; mixed results in light industries

State Strengths: Some Conjectures and Hypotheses



- These results, along with other (anecdotal) information, allows informed hypotheses about comparative advantage of states/regions:
- West and East have CA in manufacturing
 - Eastern growth driven by resource endowments, Western growth by entrepreneurship and investment climate
- South and North regions have relatively poor efficiency performance
 - High literacy not enough for industrial efficiency
 - Scope for services led growth in the South
 - Northern states, especially Punjab, are more agriculture-dependent; little scope for services-led growth

Conclusions



- Validate several conventional beliefs about state and regional strengths, with some surprises!
- Identify current/potential areas of state comparative advantage and growth drivers
- Results, in conjunction with other information, can contribute to future policy
- Efficiency effects limited in first decade of reforms, but may become more important over time.

Thank you!