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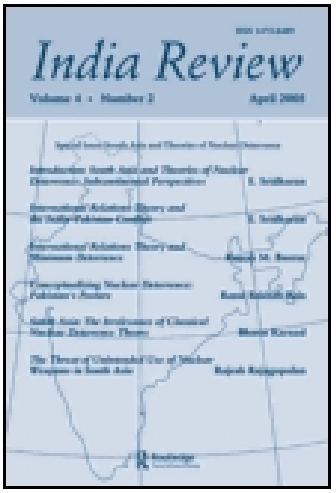

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Two States: A Comparative Analysis of Gujarat and Bihar's Growth Performance Between 1981-2011

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Two States: A Comparative Analysis of Gujarat and Bihar's Growth Performance Between 1981–2011

MAITREESH GHATAK and SANCHARI ROY

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Introduction

The recently concluded Indian parliamentary election—where more than half a billion voters queued up in nearly a million polling booths over 6 weeks—was fought largely on the plank of development. The newly elected Prime Minister, Narendra Modi of the Bharatiya Janata Party (BJP), won a decisive majority and his party ran its campaign largely revolving around his personality, and his track record as the Chief Minister of the prosperous state of Gujarat since 2001. Exploiting well the widespread discontent over economic slowdown, inflation and corruption scandals of the previous government under the United Progressive Alliance (UPA), the BJP managed to set the terms of the debate by touting the model of development pursued by Modi in Gujarat as a prototype for the remainder of India.[1]

While Modi's Gujarat model has been in the forefront of discussions due to his elevation to a Prime Ministerial candidate by a major national party, and of course, his subsequent electoral success, another state and another leader, until recently also received a fair bit of attention in the media as well as in policy and academic circles: Bihar under the leadership of Nitish Kumar.[2] Bihar's case is interesting for almost the opposite reasons. At one level, the two states could not be more different: they are indeed in very different stages in terms of the development process, as well as have vastly different historical, economic, and geographic fundamentals. Gujarat is a prosperous coastal state in the West which is famous for its business and entrepreneurial culture, whereas Bihar is a largely agricultural state in the East and was considered a perfect example of underdevelopment until recently, languishing at the bottom of state rankings in terms of per capita income, as well as being notorious for law and order problems, and social conflicts along caste and tribal lines. Bihar has experienced a turnaround since Nitish Kumar came to power, and perhaps because of the benchmark of low expectations, received widespread praise from all circles. There have been sceptics that questioned the extent of the actual economic turnaround in both states.[3] It has also been pointed out that there are other states, for example, Tamil Nadu and Himachal Pradesh, whose performance has been notable in some dimensions.[4] However, there is no question that Gujarat and Bihar, and their respective CMs Modi and Kumar, received the most attention from the press and policy circles, and that this was responsible for

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elevating Modi from the CM of a state to the Prime Ministerial candidate of a major national political party. It is possible that the personalities and leadership skills of these CMs may have played an important role in attracting this attention. The contrast posed by a state in the bottom of the league suddenly showing improvement versus one of the top ranking states suddenly showing apparent acceleration may have played a role as well, a point to which we will return at the end.

In earlier work, we looked at the comparative economic performance of various states,[5] with special emphasis on Gujarat and Bihar. Our earlier work had two key features.

First, we applied a difference-in-difference methodology to evaluate the performance of states under a given regime or over a given period relative to the national average.[6] This is a standard method to evaluate policies or regimes. In essence it has the idea that it is not enough to show that a state performed better than the national average during the period under consideration (say, Modi or Kumar's regime) because it could be benefitting from a growth spurt that started earlier. One has to compare the growth performance of a state relative to the national average in terms of the relevant economic indicator in the period under consideration with the comparable figure in the earlier period.[7]

Second, rather than focus on a few states, we looked at all the sixteen major states in terms of population,[8] as well as several dimensions of economic performance, such as state income, poverty, the Human Development Index, and inequality.

In this article, we extend our earlier work in some directions, and make three contributions. First, focusing on state incomes[9] we look at the evidence of trend breaks in the growth rates in both Gujarat and Bihar relative to the national average after these respective leaders came to power. Second, we decompose growth rates in these two states by sector, that is, agriculture, industry and services, and try to ascertain where any potential growth spurt may have come from. Third, we look at the evidence on trend break in growth of real wages in these states relative to the national average as a first-step to understand how growth may or may not have trickled down to the poorer sections.

Our key findings are as follows. There is no evidence of any significant acceleration in aggregate growth in Gujarat in the 2000s. Looking at growth rates by sector, we find that Gujarat experienced a significantly higher rate of agricultural growth post-2001 relative to the remainder of India, although this finding is not robust across all specifications. However, the higher relative agricultural growth rates in Gujarat in the 2000s did not translate into higher wages for the state's rural population. Bihar, on the other hand, appears to have experienced significant acceleration in aggregate growth relative to the remainder of India post-2005, primarily driven by growth in the industrial sector. However, this growth spurt has not had a significant effect on real wages.

The remainder of the article is organized as follows. This introduction is followed by the second section that provides a general overview of the economic performance of Gujarat and Bihar in comparison to the remainder of the Indian states, based on descriptive statistics over the last three decades. The third section provides details on the data used and the empirical strategy employed to analyze the data more carefully. The fourth section discusses the empirical findings, and the last section has some concluding

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observations that relate our findings to broader discussions about the growth process and its impact on the lives of the poor.

Overview

As a political slogan, "development" resonates well with the aspirations of a growing country like India, where more than half the population is under 24 and the number of first-time voters in the last general election around 150 million. It is generally believed to have played an important part in Modi's election as PM. The voters believed that his model of governance that worked well in Gujarat could turn things around at the national level.

What does the evidence behind the Gujarat model tell us about its ability to fulfil the aspirations of the voters? Our back-of-the-envelope calculations, based on the latest available data, reveal that Gujarat has had, on average, the third highest level of per capita state income during the last decade (see Table 1),while its average growth rate since 2001, when Modi became the Chief Minister, has been the highest among the sixteen major Indian states in terms of population (see Table 2).

We can see that Gujarat grew at an average of approximately two percentage points above the national growth rate during the 2000s. That is undoubtedly an impressive record and clearly the one that appealed to many voters in the national elections, given the margin of BJP's electoral victory, which in turn has been attributed by political commentators to the leadership of Modi and his development agenda.[10] However, Gujarat grew faster than the national average by a comparable margin in the previous decade as well. Therefore, a very cursory look at the numbers suggest that while Modi can claim credit for sustaining an already good growth performance which, in itself, is no mean achievement,[11] there appears to be no evidence in favour of the view that Modi

TABLE 1
AVERAGE RANKING OF PER CAPITA GSDP LEVEL OVER DECADES: 16 MAJOR STATES

State	1981–90	1990–2000	2000–11
Andhra Pradesh	9	9	9
Assam	8	12	13
Bihar	16	16	16
Gujarat	5	4	3
Haryana	2	3	1
Himachal Pradesh	4	5	4
Karnataka	10	8	8
Kerala	6	7	6
Madhya Pradesh	14	13	14
Maharashtra	3	2	2
Odisha	11	14	12
Punjab	1	1	5
Rajasthan	13	11	11
Tamil Nadu	7	6	7
Uttar Pradesh	15	15	15
West Bengal	12	10	10

Source: Centre for Monitoring Indian Economy (CMIE) website at www.cmie.com. The rankings were generated by first calculating the decadal averages of per capita GSDP level for each state, and then ranking them. We begin from 1981 instead of 1980 since population figures are obtained for 1981.

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TABLE 2
AVERAGE ANNUAL GROWTH RATES OF GSDP OVER DECADES: 16 MAJOR STATES

State	1980–90	1990–2000	2000–11
Andhra Pradesh	4.22	5.23	8.01
Assam	3.51	2.36	5.30
Bihar	4.55	3.25	7.11
Gujarat	4.95	7.07	9.82
Haryana	6.23	5.07	8.71
Himachal Pradesh	4.91	6.17	7.58
Karnataka	5.16	6.87	7.41
Kerala	3.51	5.59	7.81
Madhya Pradesh	4.46	5.19	6.76
Maharashtra	5.85	6.43	8.78
Orissa	4.20	3.99	8.32
Punjab	5.18	4.62	6.22
Rajasthan	6.39	5.94	7.44
Tamil Nadu	5.24	6.34	8.63
Uttar Pradesh	4.83	3.92	6.15
West Bengal	4.60	6.49	6.36
India	5.15	5.92	7.66

Source: Center for Monitoring Indian Economy (CMIE) website at www.cmie.com. We estimate the decadal average growth rates by using a log-linear trend model where, for each state, we regress log of state income on a trend variable for each decade.

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had a transformative effect on the Gujarat economy given that it was already on a high income growth path relative to the national average since the early 1990s, as we have pointed out in our earlier work.[12] We will examine this issue more rigorously in the next section.

Turning to the case of Bihar,[13] it is observed to have been consistently at the bottom of the league in terms of per capita state income among the sixteen largest states of India. In the 2000s, however, Bihar had among the highest growth rates. This has not been enough to change its rank, but it can expect to improve its rank if it maintains its recent high growth rate. Not just that, Bihar seems to have achieved a trend break relative to the national growth performance since the 2000s, something that Gujarat does not appear to have experienced. Indeed, if any state could claim that its performance relative to the remainder of India actually improved significantly in the 2000s compared to previous decades, that state is Bihar.

The discussion thus far has been based on a comparison of simple decadal averages of growth indicators by states. However, this does not adjust for differences in initial conditions across states, macro shocks or other state-specific characteristics that determine their respective growth paths. Hence, we now proceed to using regression analysis that enables us to undertake a more detailed analysis of these issues employing rigorous estimation techniques.

Data and Empirical Strategy

Data

We use data on gross state domestic product (GSDP) at factor costs (constant prices, base year: 2004–05), both at the aggregate level as well as by sectors, from the Center

for Monitoring Indian Economy (CMIE) website at www.cmie.com.[14] We use sixteen major states of India (covering close to 90 percent of the population of the country), and the years 1981–2011. Real agricultural wage data is obtained from Yoshifumi Usami's work.[15]

Figure 1 presents the simple plots of the aggregate and sector-wise GSDP series for Gujarat over time, while Figure 2 does the same for Bihar, both relative to remainder of India.[16] In the case of Gujarat, we can see that the state's performance is above that of the remainder of India for most of the outcome variables, and systematically so right from early 1990s, and in case of industrial output, from early 1980s. The most notable exception is agricultural GSDP (Figure 1), as there is a clear suggestion of a trend break in 2001 in Gujarat.

In fact, we also observe distinct, although much less sharp, dips in the industrial and service sector outputs of Gujarat around 2000–01. This is very clearly picking up the effect of the Bhuj earthquake that wreaked widespread destruction in 2000–01. Hence, in our empirical analysis in the following section, we check the robustness of our results to the exclusion of the year 2000.

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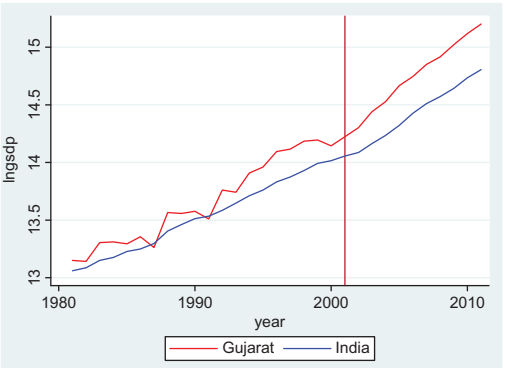
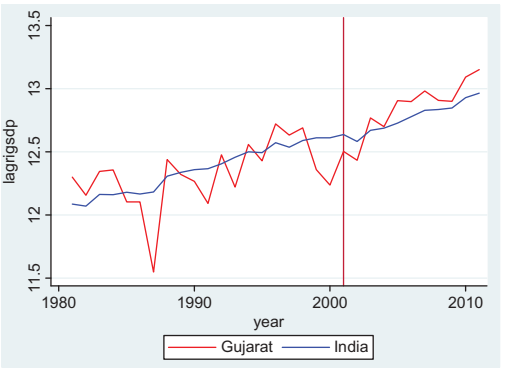
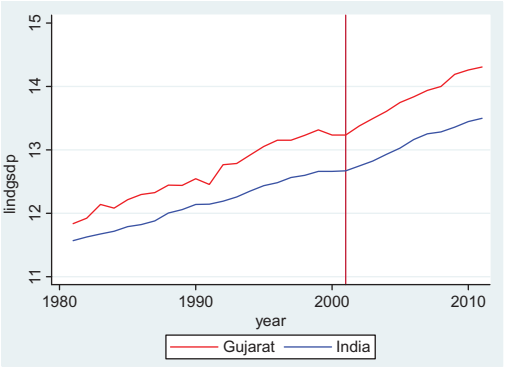
FIGURE 1
SIMPLE PLOTS OF VARIOUS GSDPs FOR GUJARAT AND THE REMAINDER OF INDIA, 1981–2011.[29]



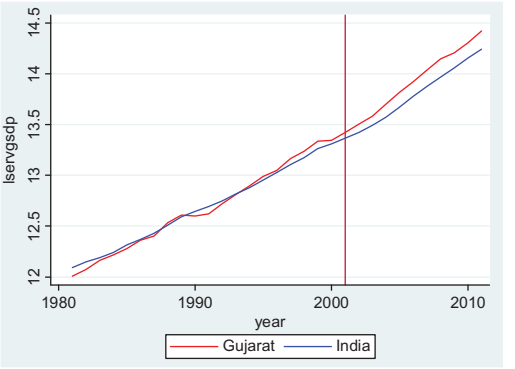
A. Log (GSDP)



B. Log (Agricultural GSDP)

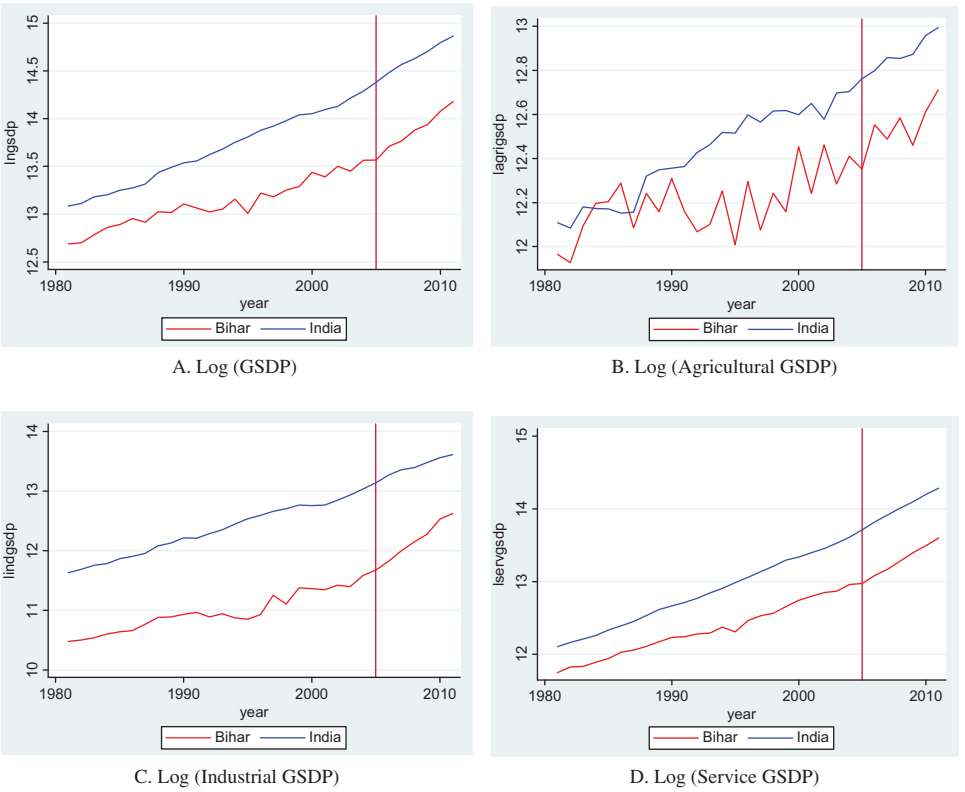


C. Log (Industrial GSDP)



D. Log (Service GSDP)

FIGURE 2
SIMPLE PLOTS OF VARIOUS GSDPs FOR BIHAR AND THE REMAINDER OF INDIA, 1981–2011.[30]



A. Log (GSDP)

B. Log (Agricultural GSDP)

C. Log (Industrial GSDP)

D. Log (Service GSDP)

In contrast, Bihar's performance has always been poorer compared to the remainder of India during our sample period. But what is striking is that both with respect to aggregate GSDP as well as industrial GSDP, we see a sharp improvement in Bihar's performance mid-2000s onward (Figure 2).

We investigate both Gujarat's and Bihar's relative performances more rigorously in the next sections.

Empirical Strategy

To argue that post-2001 there was a trend break in Gujarat's growth path, one could argue that Gujarat grew faster than other states during this period, or that it grew faster compared to its own previous growth record. Both methods are unsatisfactory. It is possible Gujarat increased its growth rate post-2001, but all-India growth rates may also have increased during the same period. Similarly, it is possible Gujarat grew faster than the remainder of India under Modi, but that may have been true in the earlier period too. Given this, the standard approach is to use the method of "difference-in-difference," where we compare the differences in outcomes after and before the treatment (in our case, Modi coming to power) for the group that is affected by the

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treatment (Gujarat) to the same difference for the unaffected or control group (remainder of India). Thus, we attempt to isolate the presence of any differential impact on Gujarat's economic outcomes relative to the remainder of India after 2001 compared to prior outcomes.

It is important to clarify at this point that we do not claim to identify the causal effect of change in Gujarat's state leadership in 2001 on its growth outcomes. This is because leader transitions are typically nonrandom and often driven by underlying economic conditions. Other things could have changed in Gujarat around 2001 that may have facilitated Modi's election as well as had implications for its growth performance, making a causal analysis of the "pure" effect of Modi's leadership problematic. Instead, we focus on examining whether Gujarat's relative economic performance post-2001 was systematically different from its performance in previous years, without attempting to ascribe our findings to Modi's leadership in a causal way. Rigorous analysis of the causal impact of national leaders on economic growth has been attempted in previous studies by exploiting the randomness introduced in leader transitions following the death of the leader due to natural causes rather than underlying economic conditions.[17]

The regression specification that we use here is provided by:

$$\log y_{st} = a + Post2001_t + Gujarat_s + \delta Gujarat_s * Post2001_t + \varepsilon_{st}, \quad (1)$$

where y_{st} is the dependent variable of interest; $Post2001_t$ is a dummy variable that switches on to 1 if the year is 2001 or later and remains zero otherwise; and $Gujarat_s$ is a dummy variable for Gujarat. The coefficient of interest is δ, which captures the average additional effect in Gujarat after 2001 compared to the remainder of India.

Including a full set of state, year, and state linear trends, the extended version of this equation takes the following form:

$$\log y_{st} = \alpha_s + \beta_t + \gamma_s t + \delta Gujarat_s * Post2001_t + \varepsilon_{st}. \quad (2)$$

State fixed effects control for the time-invariant unobservable characteristics of states that may affect the outcome variable, whereas year fixed effects control for common macro shocks for each year. State linear trends allow us to control for state-specific factors that change linearly over time and maybe correlated with the outcome. However, it is important to note that once the state and year fixed effects are included in the regression specification (2), the level effects for Gujarat and post-2001 can no longer be separately identified.

Results

Gujarat

We first look at the impact on aggregate GSDP. The results from estimating the aforementioned Equations (1) and (2) for aggregate GSDP are reported in Table 3. Column (1) presents the results from estimating Equation (1), that is, the simple diff-in-diff results. The remainder of India was, on average, growing faster after 2001 relative to

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TABLE 3
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON GSDP IN GUJARAT VERSUS THE REMAINDER OF INDIA, POST-2001

	(1)	(2)	(3)
	Log(GSDP)		
Post-2001	0.864***		
	(0.070)		
Gujarat	0.327**		
	(0.166)		
Gujarat* Post-2001	0.208	0.023	0.023
	(0.279)	(0.032)	(0.044)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.26	1.00	1.00
No. of observations	496	496	496

*$p < .01$, **$p < .05$; ***$p < .001$.

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before (coefficient on post-2001 dummy), while in the pre-2001 period, Gujarat was growing faster than the remainder of India (coefficient on the Gujarat dummy). Post-2001, the simple diff-in-diff suggests that Gujarat's output was growing at an additional 21 percent relative to the remainder of India (coefficient on the interaction term), but this effect is not statistically significant. Most importantly, this coefficient reduces drastically in magnitude to 0.02 when state and year fixed effects along with state linear trends are added in column 2, and it is remains statistically insignificant.[18] Hence, once state-specific differences are accounted for, Gujarat does not appear to be growing at a significantly faster rate compared to the remainder of India post-2001. Inclusion of heteroscedasticity-robust standard errors in column 3 does not change these results.[19] In other words, we find no evidence that Gujarat was experiencing differentially higher growth compared to remainder of India post-2001.

Next, we carry out similar exercises as in Table 3, but using sectoral decomposition. In other words, we examine whether post-2001, Gujarat may have experienced differential growth spurts in specific sectors, even though it may not show up as statistically significant in terms of overall GSDP.

Table 4 presents results from estimating equation (1) and (2) for agricultural GSDP. We find that the magnitude of the interaction term is large in all specifications and highly statistically significant once various fixed effects are included (column 2). In terms of magnitude, Gujarat's agricultural output increased by an additional 19 percent post-2001 compared to the remainder of India. In other words, Gujarat appears to have experienced a significantly higher rate of agricultural growth post-2001, compared to the remainder of India. Although statistical significance of the coefficient of interest disappears once robust standard errors are included in column 3 ($p = .13$), the magnitude, as expected, remain unchanged and large.

Moreover, as mentioned before, 2000–01 was the year of the Bhuj earthquake in Gujarat which seemed to have affected agriculture more than other sectors.[20] Hence, we testED the robustness of our results to the exclusion of the year 2000–01. Once

TABLE 4
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON AGRI. GSDP IN GUJARAT VERSUS REMAINDER OF INDIA, POST-2001

	(1)	(2)	(3)
	Log(Agri. GSDP)		
Post-2001	0.392***		
	(0.058)		
Gujarat	0.106		
	(0.139)		
Gujarat* Post-2001	0.131	0.189***	0.189
	(0.234)	(0.067)	(0.125)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.09	0.98	0.98
No. of observations	496	496	496

*$p < .01$, **$p < .05$; ***$p < .001$.

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we do that, the diff-in-diff coefficient falls to 0.11 and is no longer significant at conventional levels ($p = .35$). This suggests that the immediate recovery of the agricultural sector from its low base following the earthquake in 2000–01 might be partly driving the positive results for Gujarat's agricultural performance in 2000s.

Our findings are consistent with other studies that have pointed out that Gujarat's agricultural growth performance in the 2000s has been impressive.[21] There is some debate about to what degree there was a trend break in the agricultural growth rate of Gujarat relative to the remainder of the country.[22] Our study does offer limited evidence in support of a trend break. There is also debate regarding the relative importance of various factors that led to agricultural growth, with some candidate explanations emphasizing infrastructural investments such as irrigation and electrification.

In case of industrial production in Gujarat during the same period, the picture is somewhat different. Gujarat enjoyed a healthy lead over the remainder of India in terms of industrial growth prior to 2001, but post-2001, there is no significant evidence of any further acceleration (Table 5). In fact, once we control for various fixed effects, it appears that industrial GSDP was contracting in Gujarat post-2001 relative to elsewhere (the coefficient on the interaction term is −0.08 in columns 2 and 3), although this effect is not statistically significant in all specifications.

In case of service sector production in Gujarat during the same period, the simple diff-in-diff is positive and quite large at 0.16, although statistically insignificant (Table 6, < column 1) but reduces drastically in magnitude to 0.02 once various fixed effects are added (column 2), while remaining insignificant. This does not change once robust standard errors are introduced. Hence, there is no evidence of Gujarat growing differentially faster than the remainder of India in terms of service sector production post-2001.

Thus in summary, it appears that Gujarat's aggregate growth performance post-2001 was not significantly different from either its own past performance or that of the remainder of India, and the estimated impact is very small in magnitude as well. In

TABLE 5
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON IND. GSDP IN GUJARAT VERSUS THE REMAINDER OF INDIA, POST-2001

	(1)	(2)	(3)
	Log(Ind. GSDP)		
Post-2001	1.005***		
	(0.075)		
Gujarat	0.742***		
	(0.178)		
Gujarat* Post-2001	0.198	−0.082	−0.082*
	(0.299)	(0.052)	(0.042)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.31	0.99	0.99
No. of observations	496	496	496

*$p < .01$, **$p < .05$; ***$p < .001$.

TABLE 6
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON SERV. GSDP IN GUJARAT VERSUS THE REMAINDER OF INDIA, POST-2001

	(1)	(2)	(3)
	Log(Serv. GSDP)		
Post-2001	1.081***		
	(0.080)		
Gujarat	0.247		
	(0.192)		
Gujarat* Post-2001	0.164	0.020	0.020
	(0.322)	(0.031)	(0.019)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.29	1.00	1.00
No. of observations	496	496	496

*$p < .10$; **$p < .05$; ***$p < .01$.

agriculture, for some specifications, we find that Gujarat grew significantly faster than the remainder of India post-2001, with the estimated coefficient being sizeable in magnitude, while the opposite appears to hold for its industrial sector performance. Thus, taking all three sectoral results together appears to explain the overall small and insignificant results for Gujarat's relative GDSP performance post-2001: the effects for the industrial and the agricultural sectors cancel out, while the service sector experienced minimal significant change.

The natural question to ask at this point is what happened to real wages in Gujarat during this time? Did higher relative agricultural growth rates in Gujarat in the 2000s translated into higher wages for the state's rural population? Table 7 presents results from estimating equation (1), with real male agricultural wages as the outcome variable.

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TABLE 7
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON REAL AGRI. WAGES IN GUJARAT VERSUS THE REMAINDER OF INDIA, POST-2001

	(1)	(2)	(3)
	Log(Real Agri. Wage)		
Post-2001	0.099		
	(0.062)		
Gujarat	−0.222		
	(0.210)		
Gujarat* Post-2001	−0.038	−0.038	−0.038
	(0.239)	(0.049)	(0.040)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.03	0.96	0.96
No. of observations	195	195	195

*$p < .10$; **$p < .05$; ***$p < .01$.

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Unlike the income data we examined so far, real wages data is available for 1998–2010; hence, it is important to point out that we have far fewer pre-treatment years than post-treatment years in this case.

We find that the interaction term is small in magnitude, negative, and statistically insignificant in all specifications. Hence, the evidence suggests that there was no differential impact on Gujarat's real wages post-2001 relative to the remainder of India, thus providing no support for the trickle-down hypothesis. There could be several reasons for this; for example, out of state migration may have dampened the rise of real wages, or it could be that capital-intensive agricultural activities (for example, food processing) were driving the overall effect.

Bihar

Like Gujarat, Bihar's growth performance has also received a lot of attention in the recent past, primarily due to its dramatic turnaround from being one of the laggard states in the 1980s and 1990s to being one of the fastest growing ones in recent years. A lot of credit for such a turnaround is attributed to Nitish Kumar, who became the Chief Minister of Bihar in 2005. In the spirit of the aforementioned analysis of Gujarat's experience under Narendra Modi, it would be interesting look at Bihar as well, in order to test whether the data indeed supports the claim that relative growth performance of Bihar outstripped the remainder of India since mid-2000s.

We follow a similar empirical strategy as we did for the aforementioned Gujarat, except that we now estimate the diff-in-diff coefficient for Bihar relative to the remainder of India, before and after 2005. Here too, we do not lay any claims toward the identification of any causal impact of Kumar's leadership, and focus on examining whether Bihar's relative economic performance post-2005 was systematically different from its performance in previous years.

First, we look at Bihar's relative growth performance in terms of aggregate GSDP in Table 8. We find that the simple diff-in-diff coefficient for Bihar is negative and

TABLE 8
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON GSDP IN BIHAR VERSUS THE REMAINDER OF INDIA, POST-2005

	(1)	(2)	(3)
	Log(GSDP)		
Post-2005	0.943***		
	(0.082)		
Bihar	−0.367**		
	(0.155)		
Bihar* Post-2005	−0.174	0.094***	0.094**
	(0.327)	(0.030)	(0.044)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.23	1.00	1.00
No. of observations	496	496	496

*$p < .10$; **$p < .05$; ***$p < .01$.

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statistically insignificant (column 1), but once two-way fixed effects and state trends are included, the coefficient becomes positive and highly significant (column 2). In terms of magnitude, Bihar's aggregate GSDP increased by approximately 9 percent relative to the remainder of India post-2005. This implies that once we account for the general trends in Bihar (and the remainder of the Indian states) over our sample period, its relative growth performance post-2005 appears to have been differentially higher compared to the remainder of India. Inclusion of robust standard errors does not change these results (column 3).

Turning our attention to the sectoral decomposition of Bihar's aggregate growth performance, we find that the improvements in aggregate output in Bihar was, at least in part, being driven by the agricultural sector, which saw an increase of almost 13 percent relative to the remainder of India post-2005, significant at 5 percent. (Table 9, column 2). However, once robust standard errors are added, this interaction coefficient becomes only marginally significant at 10 percent (column 3).

However, the main driving factor behind Bihar's dramatic turnaround appears to be the industrial sector. Bihar's industrial output increased by an average of 36 percent post-2005 compared to the remainder of India (Table 10, column 2 and 3). This coefficient is highly significant and remains so even when robust standard errors are included.

In contrast, no significant improvement is observed in Bihar's relative service sector performance post-2005 (Table 11, column 2 and 3).

We also examine the relative impact on real agricultural wages in Bihar post-2005 (see Table 12 below).There appears to be no differential impact on agricultural wages in Bihar post-2005. Thus, we find no significant evidence of trickle down in the agricultural sector in Bihar during our sample period.

Conclusion

In summary, Gujarat was and remains an economically prosperous and dynamic state. It has been steadily on top of the state rankings in terms of both the level of per capita

TABLE 9
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON AGRI. GSDP IN BIHAR VERSUS THE REMAINDER OF INDIA, POST-2005

	(1)	(2)	(3)
	Log(Agri. GSDP)		
Post-2005	0.437***		
	(0.067)		
Bihar	−0.072		
	(0.128)		
Bihar* Post-2005	−0.095	0.129**	0.129*
	(0.269)	(0.062)	(0.078)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.08	0.98	0.98
No. of observations	496	496	496

*$p < .10$; **$p < .05$; ***$p < .01$.

TABLE 10
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON IND. GSDP IN BIHAR VERSUS THE REMAINDER OF INDIA, POST-2005

	(1)	(2)	(3)
	Log(Ind. GSDP)		
Pos- 2005	1.073***		
	(0.085)		
Bihar	−1.143***		
	(0.162)		
Bihar* Post-2005	0.115	0.361***	0.361***
	(0.342)	(0.045)	(0.092)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.32	0.99	0.99
No. of observations	496	496	496

*$p < .10$; **$p < .05$; ***$p < .01$.

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income and its growth rate (along with Maharashtra and Haryana). However, we find no evidence of any *significant* acceleration in aggregate growth in Gujarat in the 2000s, and the magnitude of the estimated effect is also quite small in most specifications. Even though the rank of Gujarat in terms of per capita income did improve from 4 to 3 from the 1990s to the 2000s, that partly reflects the sharp fall in Punjab's rank from 1 to 5. Decomposing Gujarat's growth by sector, we find that the state experienced a significantly higher rate of agricultural growth post-2001 relative to the remainder of India, although this finding is not robust across all specifications. Interestingly, such higher relative agricultural growth rates in Gujarat in the 2000s did not translate into higher wages for the state's rural population.

TABLE 11
DIFF-IN-DIFF ESTIMATE OF THE IMPACT ON SERV. GSDP IN BIHAR VERSUS THE REMAINDER OF INDIA, POST-2005

	(1)	(2)	(3)
	Log(Serv. GSDP)		
Post-2005	1.153***		
	(0.095)		
Bihar	−0.262		
	(0.181)		
Bihar* Post-2005	−0.189	0.016	0.016
	(0.380)	(0.029)	(0.025)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
State linear trends	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.24	1.00	1.00
No. of observations	496	496	496

*$p < .10$; **$p < .05$; ***$p < .01$.

TABLE 12
DIFF-IN-DIFF IMPACT ON LOG(REAL AGRI. WAGE) IN BIHAR VERSUS THE REMAINDER OF INDIA, POST-2005

	(1)	(2)	(3)
	Log(Real Agri. Wage)		
Post-2005	0.052		
	(0.052)		
Bihar	−0.281**		
	(0.137)		
Bihar* Post-2005	0.014	0.014	0.014
	(0.202)	(0.042)	(0.028)
State fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
Robust standard errors	No	No	Yes
Adj. R-sq	0.03	0.96	0.96
No. of observations	195	195	195

*$p < .10$; **$p < .05$; ***$p < .01$.

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Bihar, on the other hand, appears to have experienced differentially higher aggregate growth relative to the remainder of India post-2005, primarily driven by growth in the industrial sector. It is true that this growth spurt has not helped it improve its rank from the bottom of the state rankings in terms of per capita income, nor has it had a significant effect on real wages.

Now, one may argue that it is easier to turn around a state that was at the bottom of the league like Bihar than to maintain, or to marginally improve, the performance of a state already at the top, like Gujarat. After all, there is greater scope for improvement in the former case. Conversely, one could also argue that it is more challenging to turn around a backward state, because if it were easy, someone would have done it already. This is reinforced by the argument that Bihar is the third largest state, whereas Gujarat is ranked tenth in terms of population[23] and it is difficult to achieve sharp

improvements in a larger than a smaller state. All said and done, this is not a question that has an easy answer. Achieving high growth starting with a low base and below (national) average growth or maintaining high growth starting with a high base and above (national) average growth both are praiseworthy performances and in the absence of counterfactuals, it is difficult to say which task is more impressive.

The growth experience of both states, however, raises the question as to what extent the benefits of growth has trickled down to the poorer sections of society. It has been argued that agricultural growth in Gujarat was an example of inclusive growth, by raising rural incomes.[24] Although a more complete investigation of this view would require looking at household incomes and rural employment, the evidence we find on real wages does not confirm it. Moreover, despite having the highest growth rate for more than two decades, and currently being third in terms of per capita income, Gujarat is ranked seventh in terms of the Human Development Index, eighth in terms of having the lowest percentage of people below the poverty line, and eleventh in terms of equality.[25]

However, this is not necessarily a Gujarat (or Bihar) specific problem. At the all-India level, with several decades of relatively high growth rates, poverty has gone down, but still, according to latest numbers, 30 percent of the population—more than 350 million Indians—still lives below the poverty line.[26] Despite a slew of anti-poverty programs under the UPA, real GDP increased at the rate of 7.6 percent per year, whereas the rate of decrease in poverty was only 2.2 percent per year and improvements in many of the development indicators were miniscule during 2004–2013.[27] This is not to say that growth is not important for poverty alleviation. Rather, the question is the size of the task and the transmission mechanism from growth to poverty alleviation. Cross country evidence suggests that India's growth elasticity of poverty (to what extent decline is poverty responds to growth) has been lower compared to China and other developing countries.[28]

We started the essay with the recently concluded elections in India. We can all agree that it is a good thing that development was one of the main issues in the election campaign, whatever may be our ideal model of development. Also, we should wait for some time for the newly elected PM to implement new policies and for these to translate into results. However, whether from the point of view of overall welfare or from the point of view of future electoral success of a government elected on a development agenda, the growth process will have to be inclusive and must lead to sustained and substantive improvements in the standard of living of the poorer sections of society. The experience of Gujarat or Bihar, or that of India's overall growth process in the recent past suggests that this will not happen automatically through a trickle-down process.

Acknowledgments
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NOTES

1. For a discussion of the economic record of the UPA, see M. Ghatak, P. Ghosh, and A. Kotwal, "Growth in the Time of UPA: Myths and Reality," *Economic & Political Weekly* 49, no. 16 (2014, April 19): 34–43.
2. Nitish Kumar stepped down as the CM of Bihar after the national elections in 2014, after serving as Chief Minister from 2005, owning moral responsibility for the poor performance of his party, the Janata Dal (United), i.e., JD(U) in the national elections. The JD(U) had broken off its longstanding alliance with the BJP over the choice of Mr. Modi as the candidate for PM.
3. R. Nagaraj and S. Pandey, "Have Gujarat and Bihar Outperformed the Rest of India? A Statistical Note," *Economic & Political Weekly* 48, no. 39 (2013, September 28): 39–41.
4. M. Ghatak and S. Roy, "Mirror, Mirror on the Wall, Which is the Most Dynamic State of Them All?" *Ideas for India,* March 23, 2014; also published in *The Outlook*, March 31.
5. M. Ghatak and S. Roy, "Did Gujarat's Growth Rate Accelerate under Modi?" *Economic & Political Weekly* 49, no. 15 (2014, April 12): 12–15; M. Ghatak and S. Roy, "Did Gujarat Switch to a Higher Growth Trajectory Relative to India under Modi? A Rejoinder," *Economic & Political Weekly* 49, no. 18 (2014, May 3): 79–81; Ghatak and Roy, "Mirror, Mirror on the Wall."
6. See Ghatak and Roy, "Did Gujarat's Growth Rate"; and Ghatak and Roy, "Did Gujarat Switch."
7. Some debates about Gujarat's growth under Modi seem to stem from confusion about the difference-in-difference method. For example, a critique of our earlier work (see R. Dholakia, "Relative Growth Performance of Gujarat: A Comment on the Recent Debate," *Economic & Political Weekly* 49, no. 18 (2014, May 3): 75–77) carries out a trend-break analysis but looks at Gujarat's growth rate only, even though the entire point of difference-in-difference analysis is to ask whether there was a *differential* trend break in Gujarat relative to national growth rates. Interestingly, this study finds that the endogenously identified trend break points in Gujarat's absolute growth are 1971–72, 1984–85, and 1999–2000, which are all periods before Modi came to power. See Ghatak and Roy, "Did Gujarat Switch" for a detailed discussion.
8. See Ghatak and Roy, "Mirror, Mirror on the Wall."
9. State income is also the focus in Ghatak and Roy, "Did Gujarat's Growth Rate"; and Ghatak and Roy, "Did Gujarat Switch."
10. S.Shastri, "The Leadership Factor in the 2014 Polls," *The Hindu*, May 2014, 28; P. Chhibber and R. Verma, "It is Modi, Not BJP that Won this Election," *The Hindu*, Junne 2014, 1.
11. This is also true given the standard economic assumption of diminishing returns, which leads to a slowdown in the growth rates as an economy becomes more prosperous.
12. See Ghatak and Roy, "Did Gujarat's Growth Rate"; Ghatak and Roy, "Did Gujarat Switch"; Ghatak and Roy, "Mirror, Mirror on the Wall."
13. In our analysis, Bihar in 1980s and 1990s is undivided Bihar, i.e., includes Jharkhand. In 2000s, Bihar is modern-day Bihar.
14. The original source of this data is the Central Statistical Organization (CSO).
15. Yoshifumi Usami, "A Note on Recent Trends in Wage Rates in Rural India," *Review of Agrarian Studies* 1, no. 1 (2011): 149–82; Yoshifumi Usami, "Recent Trends in Wage Rates in Rural India: An Update," *Review of Agrarian Studies* 2, no. 1 (2012): 171–81. The original source of these data is Labor Bureau, Government of India, *Wage Rates in Rural India* (New Delhi: Author, 2010).
16. "Rest of India" includes Bihar in Figure 1 and includes Gujarat in Figure 2. The figures look very similar even if we drop Bihar from the first figure and Gujarat from the second, i.e., compare both Gujarat and Bihar to a common set of states comprising "Rest of India."
17. Olken, B. and B. Jones, "Do Leaders Matter? National Leadership and Growth Since World War II," *Quarterly Journal of Economics* 120, no. 3 (2005, August): 835–64.
18. In this table as well as in all the subsequent tables, the state fixed effects as well as the year fixed effects are all jointly statistically significant.
19. Heteroscedasticity-robust standard errors adjust for the fact that error variances might be different for different states.
20. A. Lahiri, P. R. Jena, R. K. Rao, and T. K. Sen, "Economic Consequences of Gujarat Earthquake," *Economic & Political Weekly* 36, no. 16 (2001, April): 21.
21. T. Shah, A. Gulati, P. Hemant, G. Shreedhar, and R. C. Jain, "Secret of Gujarat's Agrarian Miracle after 2000," *Economic & Political Weekly* 44, no. 52 (2009, December): 26.
22. S. Mukherjee, S. "Seeds of doubt in Gujarat's Agriculture Story," *Business Standard* (2014, May): 17.
23. These rankings were calculated prior to the recent split of Andhra Pradesh, which moved Gujarat to ninth position.
24. A. Gulati, "If One Takes Agriculture as Index of Inclusive Development, Gujarat's Agrarian Miracle Stands Out," *The Economic Times* April 24, 2014.
25. See Ghatak and Roy, "Mirror, Mirror on the Wall."

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26. These are 2011 figures, reported by the Planning Commission of India, *Report of the Expert Group to Review the Methodology for Measurement of Poverty (Chaired by C. Rangarajan)*, Government of India, (2014, June).
27. See Ghatak et al.,"Growth in the Time of UPA."
28. C. Lenagala and R. Ram, "Growth Elasticity of Poverty: Estimates from New Data," *International Journal of Social Economics* 37, no. 12 (2010): 923–32.
29. In Figure 1, Panels A–D, the red vertical line indicates the year of Modi's election in Gujarat in 2001.
30. In Figure 2, Panels A–D, the red vertical line indicates the year of Kumar's election in Bihar in 2005.

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