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Will GST Exacerbate Regional Divergence?

PRAVEEN CHAKRAVARTY, VIVEK DEHEJIA

This article analyses the extent of regional disparities in income per capita in India, considering both disparities amongst and within major states. For within-state inequality, this article is the first to use a “nightlights” luminosity data set as a proxy for gross domestic product per capita, whereas the choice of a crisper data set, comprising the 12 largest states, yields sharper results than in previous literature. It concludes with a cautionary note on the goods and services tax, which, contrary to the optimists, is likely to further exacerbate, rather than ameliorate, regional income disparities, marking the need for a turn to “place-based” economic policies.

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The advent of the goods and services tax (GST) has been heralded by its proponents as a game-changing economic reform which will help stitch the nation into a genuine single market and provide a boost to gross domestic product (GDP) and possibly its growth rate. Yet, we caution that India has adopted GST in a context of large and widening regional economic disparities, both across, and within, major states. While optimists believe that the GST may narrow those gaps, there are reasons for concern that these gaps may actually be widened further. It is entirely plausible that with reduced policy levers (in terms of tax policy) at the level of the states, together with the existence of agglomeration economies and network effects, could actually exacerbate regional inequality.

It is in this context that this article revisits the research on regional income convergence and divergence, deploying a novel methodology and new data. Our main findings, that disparity in income per person both across and within major states, is skyrocketing, gives us reason to be cautious in asserting that the GST will ameliorate, rather than exacerbate, these trends of dangerous divergence.

Framework and Literature

There is extensive literature on the economics of convergence, both theoretical theory and empirical. As a matter of economic theory, it is a well-established proposition that, in a world of diminishing marginal productivity of capital and other reproducible inputs, and in which preferences and technology are theoretically identical—or, empirically, similar—across economies, there is a strong tendency for convergence in income per capita between economies—whether these economies are thought of as national economies, or as subnational regions

within larger federal economic and political unions, such as the United States (US) or India. These forces of convergence are strongly reinforced when trade in goods or trade in factors of production (such as capital and labour) are allowed to occur. Intuitively, with diminishing returns, rates of return on capital are high in economies that are poorer rather than richer, other things being equal, creating a natural tendency for capital accumulation to be more rapid in the former than the latter, and additionally creating an incentive for capital to flow from richer to poor economies, thereby providing a strong force for convergence. That is the essence of the neoclassical theory.

Empirical tests of convergence typically fall into two approaches: “beta convergence,” which looks at convergence among different economic units over time, and “sigma convergence,” which tracks the behaviour over time of the coefficient of variation (the standard deviation normalised by the mean, a natural statistical measure of dispersion) across units at a point in time. The former tests, in effect, whether initially poorer economies grow more rapidly (sometimes called the “catch-up” hypothesis), as the theory predicts, while the latter tracks the dispersion in income measured at a point in time progressively over time. (There is a mathematical/statistical relationship between the two forms of convergence.) As it happens, evidence from across the advanced economies and within federal states such as the US strongly supports the convergence hypothesis. Thus, after World War II, there was rapid convergence in income per capita amongst the members of the Organization for Economic Cooperation and Development (OECD) economies, colloquially known as the “rich countries” club. Likewise, after the end of the civil war, there was rapid convergence in income per capita amongst the US states, with the poorer states of the south catching up with the richer states of the north. Similar trends have been observed amongst the provinces of Canada, the prefectures of Japan, and elsewhere. The standard textbook by Robert J Barro and Xavier Sala-i-Martin (2003) furnishes

details and copious references to earlier literature both on the theory and empirics of convergence.

In the case of India, there exists a body of work testing convergence amongst the states, but none, so far as we are aware, looked at convergence amongst the districts of the major states. On the former, the work closest to ours is a research paper published in this journal by economists Utsav Kumar and Arvind Subramanian (2012), which also contains extensive references to previous literature. These authors consider the 21 largest states and use a data set spanning the first decade of the current century. They document divergence among states, but the focus of their analysis is on the effects, if any, of the 2008 global financial crisis. Our data and methodology are somewhat different, which allow us to generate sharper results.

Data and Methodology

In contrast to Kumar and Subramanian (2012) and other papers, our preferred methodology is to consider the 12 largest states of India—a narrower set of states—and a much longer time series—a wider time frame. On the former, it is our contention that using all or most of the states creates the possibility of outlier effects and noise in the data, with relatively small states potentially skewing the results and obscuring the larger message that the data tell. This possibility occurs because in a simple convergence test, with each state representing one data point, large and small states are, in effect, given identical weights. Yet, from a political and policy perspective, such an approach makes little sense, as most of the population and much of the economic activity is concentrated in a small number of large states. Our rule of thumb, both for India and our international comparisons, is to restrict attention to the largest states accounting for approximately 85% of the total population.

The reason that we consider the 12 largest (undivided) states is that they account for 87% of the population, 87% of seats in the Lok Sabha and 76% of GDP. The 13th state in this order, Assam, has 50% fewer seats in the Lok Sabha and 40% lower GDP than the 12th state of Kerala, marking a neat point to draw the line and demarcate our 85% cut-off. This cut-off gives us, as

our data set, the four large states in the Hindi heartland (Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan), the two big western states (Maharashtra, Gujarat), the two big eastern states (West Bengal, Odisha), and the four southern states (Karnataka, Kerala, Tamil Nadu, and Andhra Pradesh), which, as noted, account for a little over 85% of the total population of India. The data spans from 1960 to 2015, the longest series for which we have consistent data, and we report state net domestic product per capita, which is the norm in the literature on India. Note that in the case of states which have been bifurcated during this period (Uttar Pradesh, Bihar, Madhya Pradesh, and Andhra Pradesh), we consider the undivided state in each case for reasons of data consistency.

Likewise, our US data looks at the 26 largest states, accounting for about 85% of US population, spanning from 1963 to 2015, and our data for the European Union (EU) considers the 10 largest member states for the years 1970 to 2014, again accounting for approximately 85% of the EU population. Finally, our data for China uses decadal data (which is what is available) of the 20 largest provinces accounting for 85% of the population for the period 1978 to 2015.

As our convergence tests (beta and sigma convergence) are standard in the literature, any difference between our findings and that of other papers must rest on our crisper data set, which, as noted, we argue eliminates noise and outlier effects from smaller states which are given equal weight in the convergence analysis. Note that it would be possible, instead of our chosen method to restrict the data to the largest states, to adjust the standard convergence tests by weighting each state by its respective share of the total national population. It is evident that this would yield similar results to our approach, which takes 85% of the total population as a cut-off, but the precise demonstration of this equivalence is left for future research.

Departing from and enriching the existing literature, our research is the first, so far as we are aware, to use a novel “nightlights” luminosity data set to explore income convergence and divergence among states at the level of districts, using the same methodology of beta and sigma

convergence tests applied at the level of districts within the states in our data set. The reason for using a proxy for income to study sub-state inequality is the lack of reliable and consistent data on district level GDP. Only some states report this and the data series often has gaps, making it difficult or impossible to use the extant data to address our research question.

The US Air Force (USAF) Defence Meteorological Satellite Program (DMSF) operates a series of satellites which carry very sensitive light sensors that detect light emission from the earth surface at night. The digital data from DMSF since 1992 are archived and made available. This is the data set that we employ. There has been sufficient global research that demonstrates that nightlights luminosity readings are a good proxy for economic activity. A now classic reference is a research paper by J Vernon Henderson, Adam Storeygard, and David N Weil (2012). A more recent reference is a paper by Charlotta Mellander, Jose Lobo, Kevin Stolarick, and Zara Matheson (2015). Both contain extensive references to previous literature. For India, the most relevant research paper in this literature is by Laveesh Bhandari and Koel Roychowdhury (2011), which establishes the utility of nightlights luminosity as a proxy for economic activity in the Indian context.

Keeping in line with our methodology, discussed earlier, of using the 12 largest states that account for about 85% of population and nearly 80% of GDP, we measured economic convergence across 387 districts (of a total of 640 across India) in these 12 states using the USAF nightlights luminosity data set. (Note that we have also parsed the luminosity data into the 543 Lok Sabha constituencies, an analysis of which yields similar results to our district-wise analysis.)

Luminosity data as a proxy for GDP poses one particular challenge, which is that luminosity values are capped at a certain maximum value which means that big cities such as Mumbai, New York, Tokyo, etc, that are very luminous, do not see their luminosity increase beyond a certain maximum value. This runs contrary to the fact that per capita GDP can grow infinitely without a ceiling. In other words, at the upper end, luminosity levels

Figure 1: Sigma Convergence

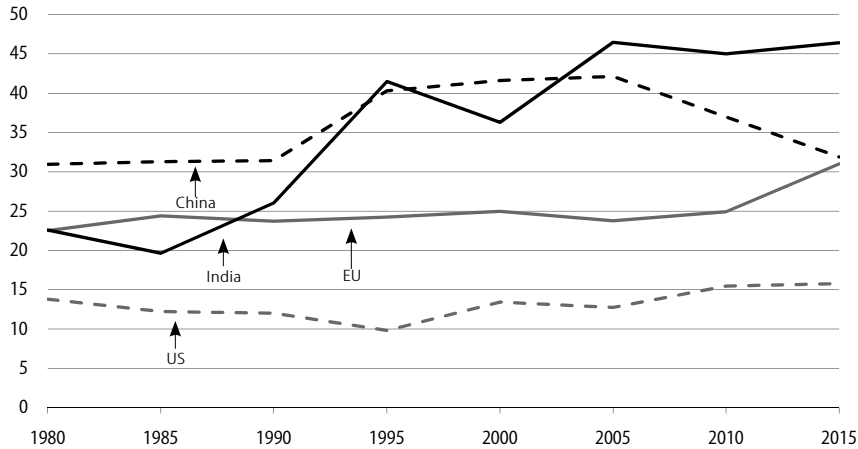


Figure 2: Beta Convergence – US, EU and China

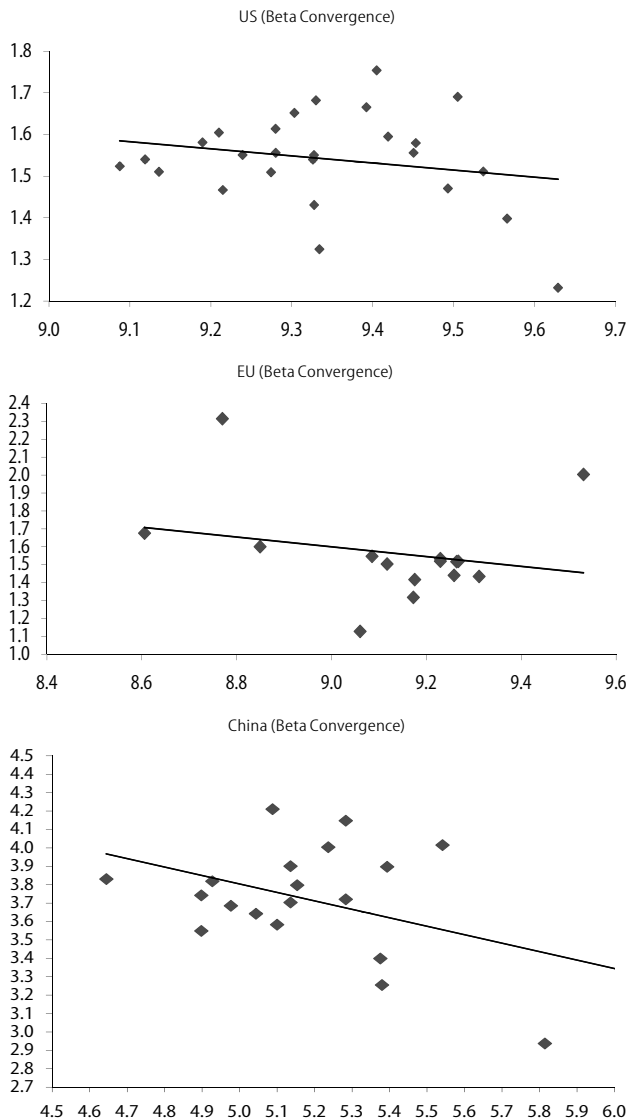
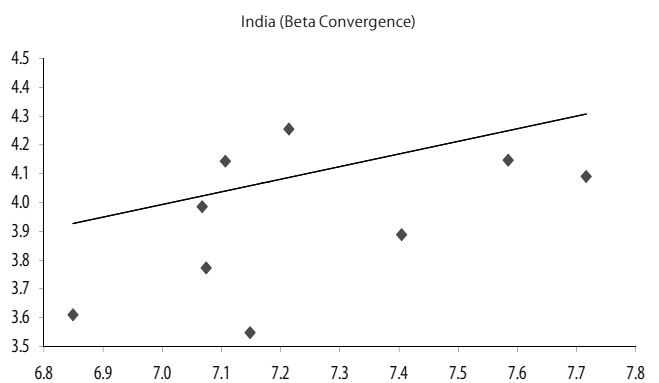


Figure 3: Beta Convergence – India



may be understating GDP. As a simple way to correct for this, our analysis excluded the five major metros of these

our data sources and methodology may be found in the two briefing papers (Chakravarty and Dehejia, 2016a and

(%) 2017b), upon which this research paper is based.

Findings

We begin by documenting the extent of inter-state income divergence in India, comparing it to other large federal economic and political unions, using our preferred dataset and the standard methodology. Figure 1 shows the sigma convergence for the US, EU, China and India which established India as an outlier in its divergent trend.

Figures 2 and 3 show beta convergence results for each of these federal economies. It is evident how the US, EU

and China have all experienced convergence while India displays the exact opposite trend as shown in Figure 3. A more sophisticated methodology could attempt to generate a mapping or “calibration” between luminosity and GDP to correct for the “top coding” of the data, or to use a different data set from a different satellite which does not cap luminosity values, but such analysis is left for future research as both of these alternative approaches pose their own methodological challenges.

12 states—Mumbai, Kolkata, Chennai, Bengaluru and Hyderabad. The results are striking. While the years pre-1991 show a modest trend towards convergence, the years since 1991 see a skyrocketing of income divergence.

We can gain more insight into the Indian data by breaking the Indian time series at a natural point, 1991, the year of economic reforms and arguably the most important structural break in terms of economic policy in the post-independence years. The results are striking. While the years pre-1991 show a modest trend towards convergence, the years since 1991 see a skyrocketing of income divergence.

It would be very tempting to conclude that there is a causal relationship between the 1991 economic reforms and the evident structural break in what the data are telling us about widening economic divergence after 1991, but we wish to stress that our convergence tests do not entitle us to make any causal claims, statistically speaking. A simple and striking way to illustrate the extent of economic divergence is what we call the “3–3–3” paradox: by 2014, the average

Figure 4: Sigma Convergence–India (1965–2014)

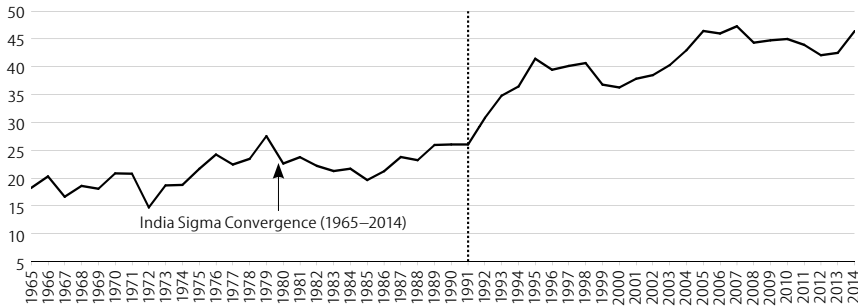
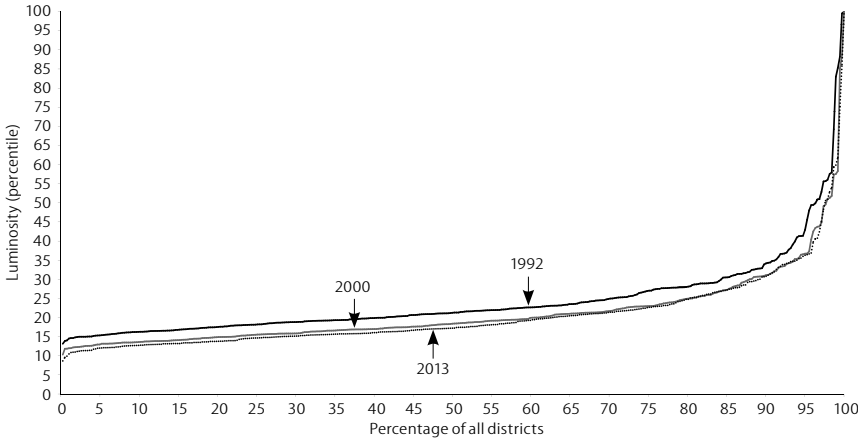


Figure 5: India: District Luminosity Distribution



person in the three richest states (Kerala, Tamil Nadu, and Maharashtra) was three times as rich as the average person in the three poorest states (Bihar, Uttar Pradesh, and Madhya Pradesh). This is a level of regional inequality unprecedented in large federal states in contemporary world economic history.

Moving now to the data on within-state inequality, we first establish that there is a robust statistical relationship between state-level luminosity and state-level GDP per capita, thereby legitimating our use of the former as a proxy for the latter. Indeed, the data show a 75%–80% correlation between the two time series from 1992 to 2013 (the years for which the luminosity data are available), which exhibit, as we would expect, an upward sloping relationship: higher state-level luminosity is associated, other things being equal, with higher state-level GDP per capita (Chakravarty and Dehejia 2017b: Figure 1).

Not so surprisingly, there is massive variation in luminosity levels across these districts, in line with income disparity, which may be interpreted as modified “Lorenz Curves” (Figure 5). Thus, 380 of the 387 districts in these 12 states are on average just one-fifth as bright as the

metro cities of Mumbai and Bengaluru at night. Even excluding the metros, 90% of all districts are just one-third as bright in the night as the top 10% of all districts. What is more striking is that this ratio is only worsening between 1992 and 2013 as the figure shows. (It is important to note that this is different from income inequality posited by Gini calculation of a Lorenz curve, which measures cumulative share of income distribution. Luminosity cannot similarly be interpreted as cumulative.)

Further, using the standard beta convergence tests, as discussed earlier, we find that states exhibit similar divergence patterns on luminosity as they do with incomes (data available upon request). Since this conforms broadly to our observations of divergence across states using income data, it is then possible with confidence to test for intra-state trends across districts using luminosity. Our data analysis shows that intra-state divergence across districts is as significant as was the observed inter-state economic divergence. In particular, 10 of the 12 large states exhibit widening disparity among their districts, mimicking the pattern of widening disparity among states.

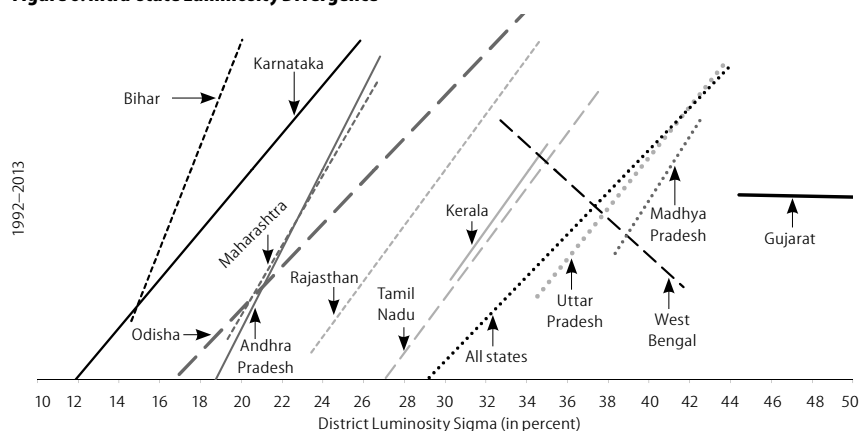
Figure 6 (p 101) shows the divergence pattern (which may be interpreted as a “Luminosity Sigma”) from 1992 to 2013 of all the districts within each state, excluding the metros. For reference, the divergence trendline of per capita GDP of all the 12 states is also shown. If the trendlines fall to the right, then it signifies a divergent trend as the variation increases from 1992 to 2013. Curiously, West Bengal is the only state to experience a convergence among its districts while Gujarat shows neither divergence nor convergence. All other states show strong divergence trends, in-line with the trend observed on an inter-state basis using per capita GDP.

Further data analysis broken down at the level of each of the 12 states confirms the pattern of widening income disparity not only across large states but within the large states as well. In particular, the data show a positive relationship between district-level luminosity sigma ratios and the level of GDP per capita in each of the states, implying that higher income levels in a given state were associated with a higher level of intra-state inequality, in almost all of the states (Chakravarty and Dehejia 2017b). Again, this sharp correlation is striking, and new in the literature so far as we are aware, but again we caution that this data analysis does not entitle us to impute a causal relationship between higher income and higher within-state inequality, although such a relationship may well exist and remains to be established by a more sophisticated statistical analysis than we have undertaken here.

Conclusions and Recommendations

To sum up, our research documents large and widening inequality in income per person, both amongst the largest states of India, and also within almost all of the largest states. The first finding is not new, but comes out more sharply than elsewhere with our crisper data set. The second finding is new to the literature. What is more, our data analysis reveals that within-state income dispersion is correlated with a state’s level of GDP per capita, mimicking the finding of widening gaps at the level of states as national GDP per capita rises. In short, the problem of regional inequality shows no signs of disappearing.

Figure 6: Intra-state Luminosity Divergence



We do not intend this to be a critique of the economic reforms of 1991 and beyond per se. Rather, the pinpointing of 1991 as the breakout year for regional inequality points to the strong likelihood that increased opportunities for economic enrichment in the brave new world of the market economy have been unequally grasped, with those states already doing well being better able to benefit than those already struggling. Thus, we would argue it is very plausible that there is a causal relationship, and not merely a sharp correlation, between economic liberalisation and widening economic disparity after 1991. Again, this does not impugn economic reform, but warns us that we must be mindful of its unintended consequences.

The policy relevance of these findings in the context of the current roll-out of the GST gives us cause for concern. While proponents of the GST contend that it is likely to be a force for economic convergence—Chief Economic Adviser Arvind Subramanian is one such proponent—we are not convinced of this optimistic scenario. As data presented by the *Economic Survey 2016–17*, authored by Subramanian and his team, clearly show, inter-state trade and labour mobility are already much higher than conventionally believed. If that is the case, it is hard to see how even greater economic integration among states is likely to reverse the ongoing pattern of widening economic divergence, especially given the context that the GST involves the states ceding their autonomy in setting excise taxes (and the reverse, in giving tax breaks) to the union government, albeit in exchange

for a portion of the total pot of revenue earned. If anything, tighter economic integration, with fiscal tools stripped away from the states, is, in our judgment, likely to worsen, rather than improve, widening disparity across and within states.

The conventional channel of economic convergence is diminishing returns to capital, but we would argue that this is offset by the opposite phenomenon, of agglomeration economies in capital accumulation and network externalities which increase, rather than decrease, the marginal productivity of capital as its stock increases. In simpler terms, capital benefits from being close to other capital, and from being close to markets and transportation and communication networks. That is why Apple has chosen to locate its new manufacturing unit in India in wealthy and expensive Karnataka rather than (say) poor and cheaper Bihar, and why, by extension, it has chosen to locate in wealthy and expensive Bengaluru rather than (say) poor and cheaper Shimoga. If low labour costs and a putatively higher return to capital were drivers, as conventional theory suggests, we ought to have seen Apple locate in Bihar rather than Karnataka or at least within Shimoga rather than Bengaluru. Now, with the advent of the GST, it is even more likely that the economics of agglomeration will drive more mobile investments to locate in already wealthy states and already wealthy regions within wealthy states, creating the spectre of ever-widening income disparity at an ever more granular level.

One could also posit that the laws of convergence will eventually start to work,

and India will get past the hump at the top of the Kuznets curve. The difficulty with this narrative is that it assumes that citizens within the polity, and states within the union, will continue to tolerate ever widening income disparities until the benign forces of convergence eventually kick in. At present, the life experiences of the average Tamilian and the average Bihari are such as to suggest they almost live in two different countries—not forgetting that income disparities are tightly correlated with disparities in other social indicators, such as health and education, as also documented in the *Economic Survey 2016–17*.

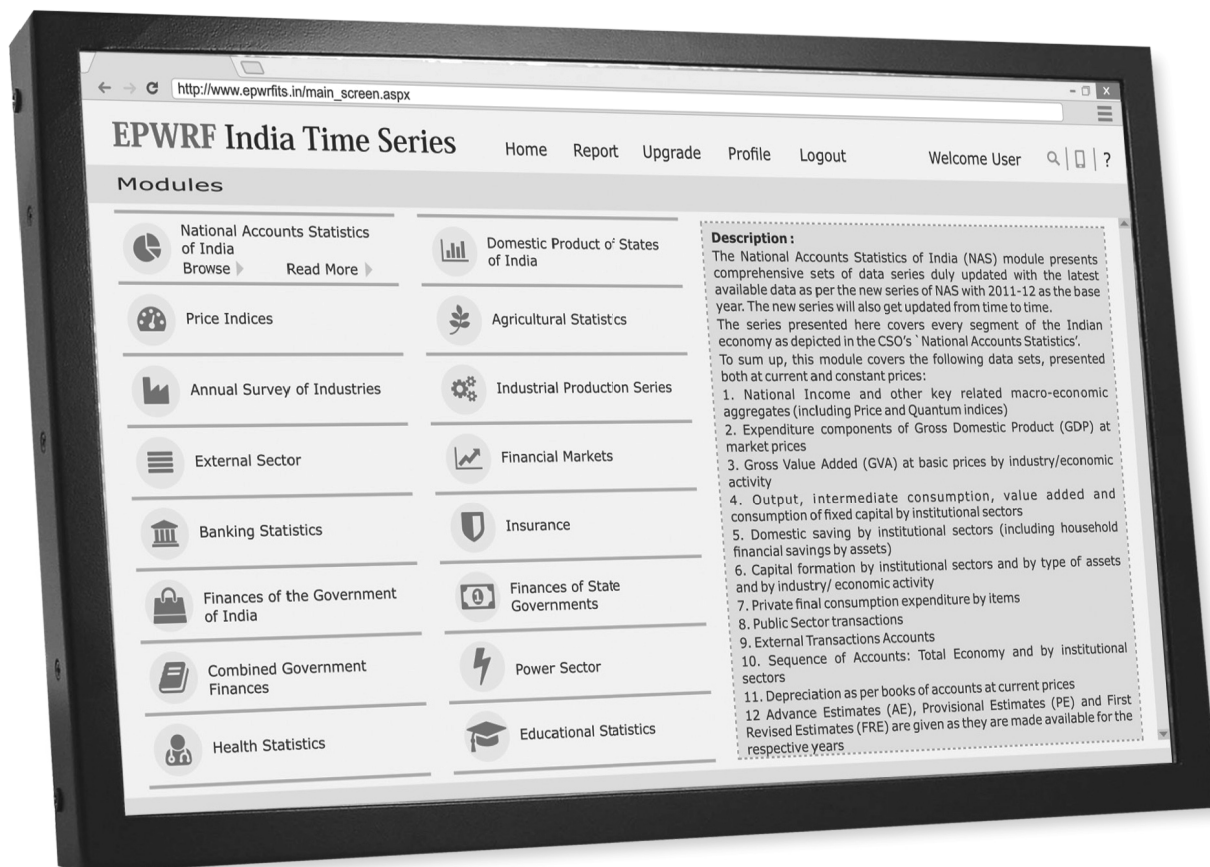
It is almost as if there is a race between the forces of divergence, at play since 1991, and the forces of convergence, which are yet to decisively manifest themselves in India, as against other federal economic and political unions. In this context, with the advent of the GST, policymakers must think creatively about what economists call “place-based policies,” with the aim of ameliorating these fissiparous tendencies. Else, the consequences for social and political harmony within the union could be dire.

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