Sub-national competitiveness analysis and simulation studies for 35 states and union territories of India

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Abstract: This paper uses the Asia Competitiveness Institute (ACI) competitiveness index to rank the competitiveness of the 35 states and union territories of India and conducts simulation studies to recognise how each state or union territory can improve its competitiveness. The results highlight, in general, a distinct pattern of high competitiveness in the western and the southern states of the country. A similar geographic concentration emerges with the north-eastern states characterised by their low competitiveness. Paradoxically, the mineral-rich states in eastern India rank in the Bottom-10 though access to rich natural resources present several areas of opportunity for the development of these states.

Keywords: sub-national competitiveness; Indian states and union territories; competitiveness; simulations; India.


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1 Introduction

Post economic liberalisation and reforms in 1991, India has enjoyed strong growth and development and has been one of the fastest growing developing economies in the world. It experienced an average gross domestic product (GDP) growth rate of about 8% during the period 2000 to 2010. While India’s growth rate is still higher than many advanced economies and most emerging economies, it appears to have slowed down in the last few years after recovering from the global financial crisis. This is mainly on account of severe domestic stresses driven by supply-side bottlenecks which have resulted in worsening the internal and external competitiveness of the country, and needs to be dealt with adequate supply-side reforms that will help the economy achieve its full potential (see Park et al., 2013; Chakraborty and Mandal, 2014).

Implicit in this process is striking a fine balance between greater political unity and concrete economic reforms. Since independence, India has enriched its legacy of democratic political process and institutions. However, achieving its goals and ambitions of economic growth and development requires greater discipline as largely enforced by other workings in a market economy ranging from financial markets to environmental concerns where the country has fallen short of expectations.

In this light, given the particular importance of competitiveness to restore India’s full economic might, this paper provides a disaggregated state level analysis of competitiveness and associated development strategies in India for its 35 states and union territories using the so-called Asia Competitiveness Institute (ACI) competitiveness index. The remainder of the paper is organised as follows: Section 2 provides a review of literature of the notion of regional competitiveness in addition to discussing a few competitiveness rankings that have been conducted both in the international and regional context for India, Section 3 highlights the features of the ACI competitiveness index. One of the distinguishing features of the ACI index is that it goes beyond mere rankings of competitiveness by offering policy simulations on how each state or union territory can improve its competitiveness which facilitates the formulation of appropriate policies. Section 4 presents the empirical research findings by discussing the overall competitiveness rankings along with an identification of common patterns and gaps. Section 5 concludes.

2 Literature review

Several studies have explored the concept of competitiveness. The term ‘competitiveness’ was first popularised by the work of Porter (1980) in the 1980s who defined it at a micro-level with respect to individual firms in the business domain. This concept of competitiveness has been extended and applied to nations and regions (Porter, 1990; Begg, 1999) and has attracted several economists and experts.

The Competitiveness Policy Council based in the USA, the first governmental institution to develop recommendations for national strategies focussing on specific policies, intended to enhance international competitiveness of industries in the USA. The European Commission followed suit by creating the Competitiveness Council to produce competitiveness studies for the European Union. However, the focus on competitiveness has not just been at a micro-level (competitiveness of individual firms) and the
macro-level (competitiveness of nations), but has significantly increased at sub-national and city levels.

Others such as Krugman (1994) have argued strongly against using competitiveness for nations. He reasons that international trade, unlike competition between firms is not a zero-sum game and countries do not compete with each other as corporations do. He goes on to state that there is little evidence to suggest that formulation of strategic trade policies should be based on competitiveness, and if they were, the benefits would only be miniscule (Krugman, 1996). Importantly, Krugman’s contributions refer specifically to competitiveness for nations and not sub-national territories. However, subsequently studies have extrapolated the argument against national competitiveness to apply it to regions and cities (Urwin, 2006).

The other side of the sub-national competitiveness debate argues that regions play a crucial role in providing competitive environmental tools to individual companies, as well as in development of local cooperation (Camagni, 2002). Camagni’s counter-argument proposes that some laws governing the economics of international trade may not hold at the sub-national level. At the regional level adjustment mechanisms of price-wage flexibility and exchange rate movements ‘do not work properly or may not exist’, thus, he argues that at the regional level, the law of comparative advantage does not hold. Territories compete on the basis of absolute advantage principle and consequently there is a possibility that a competitively weak region can go out of business.

Other scholars argue that the concept of regional competitiveness does in fact have value however it is a much more complex concept and cannot be reasonably defined by the role of export-oriented performance of regional clusters as defined by Porter (Kitson, et al., 2004). They propose that regional competitiveness focuses more on the dynamics of a region’s long-term prosperity to ultimately develop into places where companies and people want to locate and invest in. It can be said that regions are neither simple aggregation of firms, nor scaled down versions of nations (Cellini and Soci, 2002) and competitiveness takes on a different meaning as per the scale being referenced. However, despite the complexities and imperfections in measuring regional competitiveness researchers have agreed that it is a key concept to better understand sources and dynamics of national and international competitiveness of a country (Čučković et al., 2013).

The World Competitiveness Yearbook (WCY) (IMD, 2012a) and the Global Competitiveness Report (GCR) (World Economic Forum, 2012) are two popular international studies on competitiveness. These indices are developed predominantly based on publicly available data sourced from international and national organisations, sometimes supplemented with primary data through surveys. The WCY defines competitiveness by four factors:
1 economic performance
2 government efficiency
3 business efficiency
4 infrastructure.

Each factor is further divided into five sub-factors, with 20 sub-factors in total. It uses equal weights such that each sub-factor contributes 5% weight, and each factor contributes 25% weight to the Overall Competitiveness Index (IMD, 2012b).
The GCR describes competitiveness as the set of institutions, policies and factors that define the level of productivity of a country. The Global Competitiveness Index is measured across 12 pillars which are divided into three sub-indices:

1. basic requirements
2. efficiency enhancers
3. innovation and sophistication factors.

The weights for each of the sub-indices vary depending on a particular country’s level of GDP per capita. Thus, the higher a country’s GDP per capita, more weight is assigned to the innovation and sophistication sub-index, and less weight is assigned to the basic requirements sub-index, and vice versa.

The GCR and WCY differ in their views of how they measure competitiveness. The GCR views the index as a measure of inputs in an attempt to explain a particular output, which is prosperity (GDP per capita). As such, the GCR does not include GDP, population, or GDP per capita into its calculation. On the other hand, the WCY, views the index as an aggregated snapshot of various factors that collectively shape competitiveness. The WCY thus uses all relevant criteria including those that may be seen as ‘outcome indicators’, such as GDP per capita. This difference highlights the ongoing theoretical debate about competitiveness: whether it is a determinant of prosperity or revealed through prosperity, whether it determines productivity or vice versa, and whether competitiveness is a means or an end, thereby necessitating complex measurements using one or more economic social indicators (Snieška and Bruneckienė, 2009).

Several recent studies have focussed on the subject of sub-national competitiveness. In the USA, for example, the Progressive Policy Institute compiles economic indices for US cities and regions. Likewise, the European Commission has developed the Regional Competitiveness Index – RCI which follows the GCR methodology closely to show the strengths and weaknesses for each of the EU NUTS2 regions. The World Knowledge Competitiveness Index (2008) developed by the Centre for International Competitiveness, Cardiff, UK goes a step further by comparing 145 regions across Europe, North America and Asia Pacific.

In India, there have been similar efforts to analyse the competitiveness of states. The State Competitiveness Report (Institute for Competitiveness, 2013) by the Institute of Competitiveness, India is one such report which presents a perspective on the impact of business environment on competitiveness of states. The same institute also carries out an India City Competitiveness Report with the broad conceptual framework closely following the Michael Porter’s Diamond model. More recently, the Raghuram Rajan Committee (Finance Ministry, India, 2013) established a composite development index for the 28 states in the country to identify backwardness of states to recommend criteria for future planning and devolution of funds from the central government to the states.

While the notion of competitiveness has been defined in various ways, ACI’s eclectic approach to competitiveness is a comprehensive one, taking into account different factors that collectively shape the ability of a nation or region to achieve substantial and inclusive economic development over a sustained period of time.
3 Methodology

The comprehensive methodology of the ACI used in this paper ranks the states and union territories of India with respect to several socioeconomic development indicators and provides a strategic dimension to the competitiveness of these sub-national entities. By collating data and performing analysis at the state and union territory level, ACI’s unique methodology draws conclusions and suggests development strategies to stimulate productive discussion between industry, administration and policy makers.

3.1 ACI’s competitiveness framework

In-line with the comprehensive approach, the overall competitiveness is defined through four different environments:

1. macroeconomic stability
2. government and institutional setting
3. financial, business and manpower condition
4. quality of life and infrastructure development.

These four environments can be effectively visualised as quadrants, each contributing the same weight (25%) to the Overall Competitiveness Index (see Figure 1).

Figure 1  ACI’s competitiveness framework

ACI’s competitiveness framework (Tan et al., 2013a, 2013b, 2013c) uses a nested approach, wherein each of the four environments is further divided into sub-environments (alternatively, we can say that each sub-environment is nested within a specific environment). There are 11 sub-environments altogether. In aggregating sub-environments into environments, and the latter into an overall ranking, ACI uses simple averaging mechanism (equal weights). While assigning weights for different levels of importance seems more appropriate, the practical difficulties are as controversial. Thus a balanced view towards the different factors that make up an overall notion of competitiveness means equal weights.
Sub-national competitiveness analysis and simulation studies for 35 states

The four quadrants of ACI’s competitiveness framework represent a holistic, integrated and systemic view of competitiveness. Two environments are specifically related to the economy.

1. **Macroeconomic stability** encompassing aggregated economic conditions
2. **Finance, business, and manpower conditions**, which represent conditions related to the micro-economy.

They include an analysis on the performance of firms as well as the challenges that they face.

Two other two environments are more political, institutional, and social in character.

3. **Government and institutional setting** cover efficacy of government institutions, and include analyses on expectations of progress
4. **Quality of life and infrastructure development** combines an analysis on infrastructure, basic services and an overall sense of ‘quality of life’.

In all, the analysis uses 77 indicators. Although the weights assigned to the four environments are equal (25% weights each), the weight of each indicator itself depends on the number of indicators present in each sub-environment. Depending on availability of data, some environments and sub-environments have more indicators than others. The 77 indicators used for the competitiveness study include both determinant and outcome indicators. A comprehensive view encompassing both determinant and outcome indicators, allows us to simply answer the question, what are the most and least competitive states and union territories in the country? Inclusion of both determinant and outcome indicators facilitates a sharper contrast between the high performing and the low performing states.

The analysis employs both size independent and size dependent indicators for the competitiveness study. The size independent indicators are measured as normalised for population or land area. The use of size dependent indicators raises the question of results being skewed in favour of larger states. However, using a comprehensive set of indicators to measure overall competitiveness ensures such specific size dependent indicators do not affect the rankings significantly and that the smaller states and union territories are not penalised. While performing the competitiveness analysis for the year 2011, three different sets of indicators were created to identify the impact of size on the rankings. The first dataset was the original list of indicators which included a mix of size dependent and size independent indicators. For the second dataset, all size dependent indicators were normalised by population or land area. The third dataset included the size dependent indicators and their corresponding normalised indicators in conjunction. The competitiveness ranking results for all the three sets on comparison revealed only minor differences in rankings, indicating that the original set of indicators did not skew the results in favour of the larger states.

### 3.2 Aggregating across components

The next question is how to aggregate the different types of data into one coherent way of analysis. ACI uses the statistical methodology of ‘standardised score’ to account for different units of measurement across the 77 indicators. The standardised score is a
relative score to compare the performance of a certain state or union territory with the national average. Therefore, the unit of measurement is no longer relevant. The standardised score has no unit of measurement because it simply measures relative performance among states and union territories, whatever the indicator may be. In statistical terms, it measures how many standard deviations away is each state and union territory from the average.

If a state or union territory has a standardised score of zero, it is an average performer for the particular indicator. Having a negative score means a performance below average, while a positive score, means above average performance. The further away the score is from zero, the further away is the performance of the state or union territory from the national average. The standardised scores for each indicator are then aggregated at the sub-environment level, then re-aggregated at the environment level, and finally aggregated at the overall level. This allows comparison of performance of the states and union territories at different levels, from the specific indicators to overall competitiveness (see Annex 2 for technical explanation).

3.3 What-if competitiveness simulations

A competitiveness ranking merely identifies the states that are doing well and the ones that are facing challenges, but stops short of giving more constructive advice on improving the rankings.

ACI takes one step further to tackle the ‘so what’ question. What is the policy implication of a competitiveness ranking result for a particular Indian state? The data allows us to do an in-depth analysis of the performance of each state and union territory for the indicators, sub-environments and environments. By analysing the said data, we are able to identify not just the overall competitiveness ranking, but also specific indicators for which the state is doing well or otherwise to come up with policy recommendations for each state and union territory.

ACI’s What-if competitiveness simulation is based on an improvement of each state and union territory’s 20% weakest indicators, and a re-calculation of the standardised score based on such improvement. The simulation is done one state/union territory ($i_1$) at a time, starting with state/union territory $i_1$ to state/union territory $i_{35}$ (see Annex 3 for technical explanation).

In the What-if competitiveness simulation, the scores of simulated states and union territories are raised (except for already competitive ones) while keeping the scores of other states and union territories constant (assuming others did not improve on their 20% weakest indicators). Therefore, a simulated state or union territory cannot be compared with other states and union territories vertically across the ranking table. The simulation is meant to identify the possibilities for a particular state or union territory to improve its competitiveness assuming a static condition for the other states and union territories.

4 Competitiveness in Indian states and union territories: findings

The Overall Competitiveness Index at the sub-national level for 2010 is ranked by sorting the standardised score for each state and union territory (Table 1). Since this overall competitiveness ranking is an aggregate of the scores of four specific competitiveness environments, they are also subsequently reviewed.
4.1 Relative competitive performances

In Table 1 for overall competitiveness, there are several items to take note in terms of standardised scores: the spread (maximum and minimum scores), the average score, and the median.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Economy</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maharashtra</td>
<td>1.316788</td>
</tr>
<tr>
<td>2</td>
<td>Delhi #</td>
<td>0.613884</td>
</tr>
<tr>
<td>3</td>
<td>Tamil Nadu</td>
<td>0.432705</td>
</tr>
<tr>
<td>4</td>
<td>Karnataka</td>
<td>0.339782</td>
</tr>
<tr>
<td>5</td>
<td>Gujarat</td>
<td>0.324118</td>
</tr>
<tr>
<td>6</td>
<td>Andhra Pradesh</td>
<td>0.292732</td>
</tr>
<tr>
<td>7</td>
<td>Uttar Pradesh</td>
<td>0.285282</td>
</tr>
<tr>
<td>8</td>
<td>Sikkim</td>
<td>0.183823</td>
</tr>
<tr>
<td>9</td>
<td>Chandigarh #</td>
<td>0.124562</td>
</tr>
<tr>
<td>10</td>
<td>Goa</td>
<td>0.085523</td>
</tr>
<tr>
<td>11</td>
<td>Arunachal Pradesh</td>
<td>0.081532</td>
</tr>
<tr>
<td>12</td>
<td>West Bengal</td>
<td>0.050786</td>
</tr>
<tr>
<td>13</td>
<td>Madhya Pradesh</td>
<td>0.039955</td>
</tr>
<tr>
<td>14</td>
<td>Puducherry #</td>
<td>–0.0405</td>
</tr>
<tr>
<td>15</td>
<td>Lakshadweep #</td>
<td>–0.0432</td>
</tr>
<tr>
<td>16</td>
<td>Rajasthan</td>
<td>–0.05646</td>
</tr>
<tr>
<td>17</td>
<td>Mizoram</td>
<td>–0.072</td>
</tr>
<tr>
<td>18</td>
<td>Jammu and Kashmir</td>
<td>–0.08618</td>
</tr>
<tr>
<td>19</td>
<td>Himachal Pradesh</td>
<td>–0.08983</td>
</tr>
<tr>
<td>20</td>
<td>Kerala</td>
<td>–0.09587</td>
</tr>
<tr>
<td>21</td>
<td>Haryana</td>
<td>–0.10105</td>
</tr>
<tr>
<td>22</td>
<td>Punjab</td>
<td>–0.13247</td>
</tr>
<tr>
<td>23</td>
<td>Andaman and Nicobar Islands #</td>
<td>–0.15182</td>
</tr>
<tr>
<td>24</td>
<td>Dadra and Nagar Haveli #</td>
<td>–0.15932</td>
</tr>
<tr>
<td>25</td>
<td>Uttarakhand</td>
<td>–0.16723</td>
</tr>
<tr>
<td>26</td>
<td>Odisha</td>
<td>–0.16845</td>
</tr>
<tr>
<td>27</td>
<td>Daman &amp; Diu #</td>
<td>–0.18509</td>
</tr>
<tr>
<td>28</td>
<td>Manipur</td>
<td>–0.22359</td>
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<tr>
<td>29</td>
<td>Bihar</td>
<td>–0.25641</td>
</tr>
<tr>
<td>30</td>
<td>Nagaland</td>
<td>–0.28647</td>
</tr>
<tr>
<td>31</td>
<td>Meghalaya</td>
<td>–0.29183</td>
</tr>
<tr>
<td>32</td>
<td>Assam</td>
<td>–0.32459</td>
</tr>
<tr>
<td>33</td>
<td>Chhattisgarh</td>
<td>–0.38512</td>
</tr>
<tr>
<td>34</td>
<td>Tripura</td>
<td>–0.41495</td>
</tr>
<tr>
<td>35</td>
<td>Jharkhand</td>
<td>–0.43905</td>
</tr>
</tbody>
</table>

Note: # denotes union territories
From the spread, we see that scores range from a maximum of 1.3198 for top ranking Maharashtra, to a minimum of –0.4390 for Jharkhand at 35th. A closer examination of the range indicates 33 out of 35 states and union territories of India to fall within the range of positive 0.4 to negative 0.4. Maharashtra at the first position can be considered an ‘outlier’ as its score of 1.3167 is significantly higher from the rest of the states and union territories. By excluding Maharashtra, the spread of scores becomes more symmetrical, from +0.6138 (Delhi) to –0.4390 (Jharkhand).

Inclusive of Maharashtra, the average performing state (with a score of zero) lies between the 13th position (state of Madhya Pradesh, score: 0.0399) and the 14th position (union territory of Puducherry, score: −0.0405). The median state, which is the state or union territory holding the 18th position out of the 35 states and union territories, is Jammu and Kashmir with a score of −0.0861. We can see that the average score (0, between positions 13 and 14) is higher than the median score (−0.0861, at position 18), implying that the average score is skewed upwards as a result of Maharashtra’s high score.

A closer scrutiny of the spread reveals several ‘jumps’ in the standardised scores at several positions. Besides the large gap between the scores of Maharashtra at first position and Delhi at second, there is a wide gap between the second position (Delhi, score: 0.6138) and the third position (Tamil Nadu, score: 0.4327). Similarly, there is a significant gap in the standardised scores between the seventh position (Uttar Pradesh, score: 0.2852) and the eighth position (Sikkim, score: 0.1838). These gaps in the standardised scores are important to note because these states and union territories are only separated from each other by one position, but their competitiveness as indicated by the scores is quite far apart. Remainder of the states are quite closely packed together with the gap between the states ranked 25th (Uttarakhand, score: −0.1672) and ranked 26th (Odisha, score: −0.1684) being as low as 0.0012 standardised points.

4.2 Geographic spread

We also examine the geographic spread of the overall competitiveness ranking of the states and union territories for 2010 and we can identify the Top-10, the Bottom-10 and the Middle-15 positions. Such an analysis yields some interesting insights.

First, there is a noticeable geographic concentration of high-competitiveness and low-competitiveness states and union territories. The southern states of Tamil Nadu, Karnataka and Andhra Pradesh along with Goa, Maharashtra and Gujarat which lie on the western coast are among the Top-10 most competitive states. The union territories of Chandigarh, Delhi and the state of Uttar Pradesh from the north of the country make it to the Top-10 list. Sikkim is the only state from the eastern and the north-eastern region in the Top-10.

With respect to the Top 10 states, Western states of Gujarat and Maharashtra emerge as the most competitive states which have historically been the entrepreneurial and business hubs of the country. The southern states are also very competitive and have consistently performed strongly across social indicators of education and healthcare.
result, these states were in the best position to achieve faster economic growth and development.

As regards the Bottom-10 states and union territories, five of them – Tripura, Assam, Meghalaya, Nagaland and Manipur – are located in the northeast region of the country. The four eastern states of Bihar, Jharkhand, Chhattisgarh and Odisha are also in the Bottom-10, along with the union territory of Daman and Diu on the western coast.

The north-eastern states perform relatively poorly with five out of the seven states in the region among the Bottom-10 positions. Factors such as difficult topography, poor connectivity to rest of the country and political unrest are seen as the major roadblocks in the development of this region. Absence of policies to ensure inclusive growth and augment infrastructure development has resulted in a vicious cycle inhibiting the economic growth.

While the north-eastern region faces challenges with its geography, its proximity to Myanmar which is opening up (Choudhary, 2013) to the international community is being seen as a strong growth potential for the region. A multimodal transport project to connect Kolkata, Myanmar and the north-eastern states and an international highway connecting India-Myanmar-Thailand are being planned. These new infrastructure projects and the proximity to Myanmar are expected to boost cross-border trade for the north-eastern states.

Additionally, to account for the inherent challenges of location, topography, etc. and to create a level playing field, all seven north-eastern states have been assigned a ‘special category’ status. The special status entitles these states to prioritised financial assistance from the centre. Also, as much as 90% of the central assistance is classified as grants for the special states, compared to just 30% for the general states. Therefore, to benefit from these opportunities, an impetus to facilitate efficiency oriented development process is most required.

Eastern states of Jharkhand, Chhattisgarh and Odisha form the mineral-rich region in the country, yet are also a part of the Bottom-10 states. These three states account for over 60% of the coal and iron ore production in the country. However, these resources have failed to spur industrial development in these states. One reason attributed to this lost opportunity is the heavy tribal population in these states affected by inequitable socio-economic development in the region. The discontent within the indigenous population has resulted in several insurgencies in the region further inhibiting development activities.

These results are broadly compatible and consistent with the rankings of competitiveness based on the sub-components. For instance, when examined on the basis of macroeconomic stability, we find that the state competitiveness ranking are broadly consistent with the overall competitiveness ranking with the southern and the western states emerging relatively more competitive with encouraged industrial development and emphasis on export-oriented growth strategies. However, rankings based on government and institutional setting, shows a slightly different pattern and they are less consistent with the overall competitiveness ranking; barring the exception of rankings based on government and institutional setting, other indicators such as financial, business and
manpower conditions are rather similar to the rankings based on macroeconomic stability especially for the Top-10 most competitive states. Again, we see the strong performance of southern and western states. The union territories of Delhi, Chandigarh are also within the Top-10 performers for this environment. Similar results hold for rankings based on Quality of Life and Infrastructure Development as well.

4.3 What-if competitiveness simulation results

We now examine the results of the What-if competitiveness simulation for the 35 states and union territories of India for 2010. Table 2 shows the ranking for each state and union territory with their standardised scores, before and after simulation. The results which have been presented previously are ‘as-is’, or before simulation was conducted.

The simulation results (Table 2) show that different states and union territories have different potential to improve their rankings and scores. With the simulation that improves their weakest 20% indicators (assuming other states and union territories remain unchanged), some states and union territories show an improvement of many positions while others could perhaps only improve by fewer positions.

States and union territories which improve by several positions include Chhattisgarh (11 positions), Jharkhand (11 positions), Kerala (11 positions), Bihar (15 positions), Daman and Diu (15 positions) and Manipur (18 positions). Most middle ranked states such as Jammu and Kashmir (4 positions), and Himachal Pradesh (6 positions) move up only a few positions. These states display significant potential with respect to policy simulation, but a strong political will and commitment will be the key to follow through and stay the course. The Top-10 ranked states and union territories which have good scores even before the simulation show modest jumps of two-three places after simulation, while the top three ranked states remain unchanged.

All states which ranked 20 and below before the simulation move up by at least eight positions after simulation with the state of Manipur moving up by 18 positions. It is also interesting to note that Manipur is the only Bottom-10 ranked state which is able to convert its overall negative score to positive post simulation. This is primarily driven by its exceptional scores across the Top-20% strongest indicators which highlight efficient government institutions as well as good quality of life and infrastructure development.

The potential to move up the competitiveness rankings depends on two factors:

1. the spread of scores among the different indicators for each state and union territory
2. the spread of aggregated scores among that particular state to the state at one position higher.

If two consecutive states or union territories (with difference of one rank) have a wide gap in their scores, then the one with lower score will have difficulty to leapfrog over the one with the higher score.

ACI’s What-if competitiveness simulation assists states to direct their limited resources into areas which increase their competitiveness significantly. The Top-20% weakest indicators are simulated by policy to show how the states and union territories can target some low-hanging fruits to spur growth and development. This will allow the states to optimise their resources and gain confidence in turn, leading these policy measures in loosening some other tight screws.
Table 2  What-if competitiveness simulation on overall competitiveness ranking, year 2010

<table>
<thead>
<tr>
<th>Economy</th>
<th>Rank Before</th>
<th>Rank After</th>
<th>Score Before</th>
<th>Score After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andaman and Nicobar Islands #</td>
<td>23</td>
<td>13</td>
<td>−0.1518</td>
<td>0.0389</td>
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<tr>
<td>Andhra Pradesh</td>
<td>6</td>
<td>4</td>
<td>0.2927</td>
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<td>Arunachal Pradesh</td>
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<td>8</td>
<td>0.0815</td>
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<td>22</td>
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<td>29</td>
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Note: # denotes union territories
5 Concluding remarks

The ACI Competitiveness index provides a valuable policy framework for assessing the current competitiveness of each of the 35 Indian states and union territories. Specifically, considering the decentralised federal structure with considerable implementation that happens at the state level, particularly in areas such as law and order, water, public health, land rights and agriculture, it is important for the states and union territories to remain competitive. To this end, ACI’s unique methodology to rank the states and union territories provides a valuable tool to analyse the progress of states as independent entities.

The results of our competitiveness analysis of the 35 states and union territories of India as well as the subsequent policy simulations highlight high regional variability with a distinct pattern of high competitiveness in the western and the southern states of the country. A similar geographic concentration emerges with the north-eastern states characterised by their low competitiveness. While paradoxically, the mineral-rich states in eastern India rank in the Bottom-10, the access to rich natural resources present several areas of opportunity for the development of these states.

The suggested development strategies for the states and union territories emphasise the focus areas keeping in mind their strengths, opportunities and challenges faced at the ground level. It is the intention of the competitiveness rankings to induce a sense of competition within the states and provide them with policy options which will benefit their overall competitiveness vis-à-vis the other states. Ultimately, stronger competition between the states and the union territories will put India in the path to becoming a globally competitive nation.

References

IMD (2012a) World Competitiveness [online]
IMD (2012b) Factors and Criteria: Structure of the WCY [online]
Sub-national competitiveness analysis and simulation studies for 35 states

Institute for Competitiveness (2013) State Competitiveness Report [online]


Notes

1 There is a parallel literature dealing global competitiveness by examining the total factor productivity in Indian manufacturing. For an overview of this literature, see Kiran and Kaur (2008).
Annex 1

Environments and sub-environments

The four environments and their corresponding sub-environments are:

1. Macroeconomic stability
   - regional economic vibrancy
   - openness to trade and services
   - attractiveness to foreign investors

2. Government and institutional setting
   - government policies and fiscal sustainability
   - institutions, governance and leadership

3. Financial, businesses and manpower conditions
   - financial deepening and business efficiency
   - labour market flexibility
   - productivity performance

4. Quality of life and infrastructure development
   - physical infrastructure
   - technological Infrastructure
   - standard of living, education and social stability

Annex 2

Computation of rankings: the algorithm

Algorithm: ranking methodology

1. Compute the mean value of practical indicator \( j \) \((j = 1, \ldots, M)\),

\[
\bar{X}_j = \frac{1}{N} \sum_{i=1}^{N} X_{ij}
\]

where \( X_{ij} \) represents the value that state or union territory \( i \) \((i = 1, \ldots, N)\) takes for practical indicator \( j \).

2. For each practical indicator \( j \) \((j = 1, \ldots, M)\), calculate its standard deviation (SD),

\[
SD_j = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (X_{ij} - \bar{X}_j)^2}
\]

3. Compute the standardised value of indicator (SVI) that each state or union territory \( i \) \((i = 1, \ldots, N)\) takes under each of the practical indicators \( j \) \((j =1, \ldots, M)\),
Sub-national competitiveness analysis and simulation studies for 35 states

4. Compute the ‘ranked’ standardised value of indicator (RSVI) that each state or union territory \( i (i = 1, \ldots, N) \) takes under each of the practical indicators \( j (j = 1, \ldots, M) \):

\[
RSVI_{ij} = \begin{cases} 
-\frac{SVI_{ij} - X_j}{SD_j} , & \text{if a lower value is better} \\
\frac{SVI_{ij}}{SD_j} , & \text{if a higher value is better} 
\end{cases}
\]

5. For each of the practical indicators \( j (j = 1, \ldots, M) \), a ranking can be obtained for states and union territories: states and union territories with a higher value of RSVI for indicator \( j \) are ranked ahead of those with a lower value.

6. For each state or union territory \( i (i = 1, \ldots, N) \), calculate the RSVI for each sub-environment \( k (k = 1, \ldots, S) \) belonging to environment \( l (l = 1, \ldots, C) \),

\[
RSVI_{i,lk} = \frac{1}{y_{i,k}} \sum_{p=1}^{y_{i,k}} RSVI_{i,jlk,p}
\]

where \( y_{i,k} \) is the total number of practical indicators under sub-environment \( k \) of environment \( l \) and \( (RSVI_{i,jlk,1}, \ldots, RSVI_{i,jlk,y_{i,k}}) \) are the RSVIs for state or union territory \( i \) that make up sub-environment \( k \) of environment \( l \).

7. For each state or union territory \( i (i = 1, \ldots, N) \), calculate the RSVI for each environment \( l (l = 1, \ldots, C) \),

\[
RSVI_{i,l} = \frac{1}{S_l} \sum_{k=1}^{S_l} RSVI_{i,lk}
\]

where \( (RSVI_{i,l1}, \ldots, RSVI_{i,lS}) \) are the RSVIs for the \( S \) sub-environments under each environment \( l \).

8. Overall rank score of state or union territory \( i (i = 1, \ldots, N) \),

\[
R_i = \frac{1}{C} \sum_{l=1}^{C} RSVI_{i,l}
\]

States and union territories with a higher \( R_i \) are ranked ahead of those with a lower value of \( R_i \), and the one with the highest \( R_i \) is the most competitive.

Step 5 of algorithm provides the ranking of each state and union territory for each individual practical indicator. To achieve this ranking, Step 4 of algorithm adjusts the value of the SVIs so that a higher value will lead to a better ranking in terms of ‘competitiveness’. Depending on the nature of the indicator in question, a higher or lower value may reflect a more ‘competitive’ state or union territory. Take for instance the practical indicators ‘GSDP’ and ‘unemployment rate’. A higher GSDP but a lower ‘unemployment rate’ suggest better economic performance which makes a state or union territory more ‘competitive’. In most cases where a higher value is better (e.g., GSDP), the SVI itself is compared between states and union territories and a higher SVI value will lead to a better ranking. However, for indicators where a lower value is better (e.g.,
unemployment rate), the negative of the SVIs are considered, and those with a lower 'negative SVI' will have a better ranking. Step 4 of Algorithm 1, thus, seeks to make all standardises values of all practical indicators consistent for ranking purposes.

Step 6 of algorithm determines the sub-environment rankings of each state and union territory. The average RSVI of all the indicators in the sub-environment are calculated and compared to other states and union territories. States and union territories with a higher average RSVI rank better in the sub-environment.

To arrive at the ranking for each environment, the average RSVIs of the sub-environments are calculated as detailed by Step 7 of algorithm. Finally, Step 8 of algorithm calculates the average RSVI values of all the environments to determine the overall ranking of the states and union territories. States and union territories with a higher RSVI are ranked ahead of those with a lower RSVI.

Although the number of sub-environments and indicators vary for each main environment, the aggregate score for each main environment is given an equivalent weighting: 25% of the total Competitiveness Index. Identical weights are assigned to each environment as they represent equivalent significance to the computation of the Index. This method is repeated and applied consistently across all the states and union territories to ensure precision of the rankings. Mathematically, this can be illustrated as follows:

Indian state’s and union territory’s competitiveness index:

\[
= 25\% \times \text{(Macroeconomic stability)}
+ 25\% \times \text{(Government and institutional setting)}
+ 25\% \times \text{(Financial, business and manpower condition)}
+ 25\% \times \text{(Quality of life and infrastructure development)}
\]

Annex 3

Algorithm of 'What-if' competitiveness analysis

1. Sort the 77 indicators \((j)\) for state/union territory \(i_t\) from the highest to the lowest (from \(RSVI_{j_{i_{min}}}^{RSVI_{i_{max}}}\) to \(RSVI_{j_{i_{min}}}^{RSVI_{i_{max}}}\)). This allows us to identify the bottom 20% of indicators \(j\) (15 weakest indicators out of 77 indicators used) for state/union territory \(i_t\). Let us call these indicators \(j_{i_{min15}}\).

2. Identify which of state/union territory \(i_t\)'s 15 weakest indicators \(j_{i_{min15}}\) have a negative RSVI (RSVI is below zero). This means that for these specific indicators, state/union territory \(i_t\) is performing 'below average'. Let’s call these indicators \(j_{i_{min15}neg}\) and their respective RSVIs as \(RSVI_{j_{i_{min15}neg}}\).

If state/union territory \(i_t\) has no indicators in \(j_{i_{min15}neg}\), then skip Step 3 below and go directly to Step 4. The logic is that some states/union territories may already be very competitive such that all of their indicators are performing above average.

3. Raise \(RSVI_{j_{i_{min15}neg}}\) to 0 (zero). This assumes a policy simulation where state/union territory \(i_t\) has improved the performance of its \(j_{i_{min15}neg}\) indicators from 'below average’ (RSVI below zero) to ‘average’ (\(RSVI_{j_{i_{min15}neg}}\) is now zero).
4 Repeat Steps 5 to 8 of Algorithm 1 described in Section 3.2. Thus, with the re-calculation, we get the updated competitiveness ranking and score for state/union territory $i_1$.

5 The simulation for state/union territory $i_1$ is done. Repeat steps (1) to (4) of Algorithm 2 for the remaining 34 states and union territories, from $i_2$ to $i_{35}$. Each time Algorithm 2 is repeated for a new state/union territory, $RSVI_{h, j, sat, reg}$ for previously simulated states and union territories are returned to their original (i.e., negative) scores.