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ORIGINAL RESEARCH

Developing a Framework of Regional Competitiveness Using Macro and Microeconomic Factors and Evaluating Sources of Change in Regional Competitiveness in India Using Malmquist Productivity Index

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Abstract
Many studies on measurement of regional competitiveness focus on outcome-based pyramidal and hat models of Lengyel (2004) and Martin (2003) respectively using revealed indicators like per capita income, labour productivity and employment rate. On the other hand, Porter's (1990) diamond model focuses on foundational microeconomic factors of competitiveness. This study comprises of two objectives; first, to develop a new framework of extended Diamond based Pyramid of regional competitiveness by integrating the two, and second, to assess sources of change in regional competitiveness for 32 states/union territories of India. For this, Malmquist productivity index (MPI) framework has been used, treating per capita net state domestic product as output and six factors of regional competitiveness developed from first part of the study as inputs. Results show that regional competitiveness is almost singularly driven by the frontier shift component of MPI, while there is negligible contribution of efficiency change. This is interpreted as states benefitting more from better collective knowhow and resources of competitiveness provided by the economic environment in general. However, the states are not able to correct the individual inefficiencies compared to their most efficient peers.

Keywords Regional competitiveness · Porter diamond model · Malmquist productivity index · Factors of competitiveness · State domestic product · India

JEL Classification O41 · O43 · O47

Introduction

Growth in prosperity of an economy is determined by its productivity growth, which in turn is said to be an outcome of its competitiveness among other economies. Competitiveness of an economy is defined by a set of institutions, policy and infrastructure that enhances and sustains the prosperity of a nation (World Economic Forum, Schwab and Sala-i-Martin 2014). However, the important question is how do we understand the disparity in competitiveness and productivity growth among nations or regions[1] or locals. As the role of sub-nations or regions is becoming important because of their unique characteristics and presence of industrial clusters, the study of determinants of regional productivity and regional competitiveness is becoming essential. Increased importance and capabilities

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[1] According to Behrens and Thisse (2007), since early days of regional economics, economists use different spatial units of analysis of location, regions, or places interchangeably without definite clarity. Nevertheless, Losch (1938) attempted to define region as bundle of places such that two places in the same region are, in a way or another, similar. This concept of similarity is also not without ambiguity. In another pioneer geographical history study (Paasi 2003; Gren 2002), region means ethno-nationalism in the operation of economic institution and administration and ad-hoc spatial units for governance. Most relevantly, Huggins et al. (2013) use the term region as sub-national regions for the study of regional competitiveness. Similarly, this study refers region to the sub-national units of Indian states and union territories for comparison and analysis of regional competitiveness among themselves.

of these sub-national economies and interaction among many regional determinants make assessment of competitiveness at regional level very critical at present (Bristow 2010; Akpinar et al. 2017). Some regions are able to attract domestic as well as foreign investments while others are not able to do so. The regional differences in policies, institutions, cultures, and priorities need to be consolidated using measures like competitiveness index to make direction for policy making. Anticipating the importance of roles of regions, European Commission (1996) defines regional competitiveness as the ability of the region to produce goods and services which meet the test of international competition, whilst maintaining high and sustainable income and employment level. Factors that influence economic productivity and job creation in an economy are main drivers of regional competitiveness. Some of main pillars (or drivers) of regional competitiveness are institutions, infrastructure, macroeconomic environment, public health, primary and higher education, market size, labour market efficiency, financial market efficiency, entrepreneurial activities and innovation capability (Annoni and Kozovska 2010).

The Porter Diamond Model (PDM) of competitiveness (Porter 1990) emphasizes strategy and specific conditions that drive competitiveness of a nation or region. This diamond is comprised of four microeconomic factors of business environment, namely factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry. According to Pena-Vinces (2009), competitiveness of a country should be understood as outcome of these four factors of PDM and not as single independent variable of productivity. However, the limitation of Porter's diamond is that it does not capture varying factors and business environment of different regions (Ketels and Solvell 2004). Subsequently, many have proposed different modification of basic Porter (1990) diamond to 'double diamond' (Rugman and Cruz 1993; Dunning 1993), 'nine-factor double diamond' (Cho 1994), and 'generalized double diamond' (Moon et al. 1998). Still, these models majorly discuss about physical factors or conditions but not important aspect of processes that drive competitiveness, for example, synergy, strategic management, management of technology, supply chain and operation management, HR development, etc. To resolve these limitations, Momaya (1996) introduced 'competitiveness assets-processes-performance (APP)' framework and discussed international competitiveness from APP framework (Momaya 2001) to incorporate respectively factors like innovation and human resources, complexities of multinational firms, and international cooperation. Other limitation of Porter's diamond model is that although it analyses factors of industrial competitiveness, it could not explain competitiveness of some specific industry, for example, construction industry (Momaya and Selby 1998) or emerging industry (e.g. nanotech, Momaya 2011).

On the other hand, regional competitiveness models like 'regional competitiveness hat' (Martin 2003), 'pyramid model of regional competitiveness' (Lengyel 2004) and 'regional competitiveness tree' (ECORYS-NEI 2001) have connected revealed indicators of regional competitiveness like productivity and employment with other numerous factors of competitiveness. Among these several approaches, we observe that there is no systematic synthesis of these numerous foundational-factors like Porter Diamond approach does.

However, the above input-based as well as output-based models do not answer some process related questions. This study attempts to address this gap in research and motivates us to ask some important research questions. Why are there significant differences among sub-national regions or states in achieving competitiveness under similar national macroeconomic umbrella? What are the sources of productivity change and efficiency change in the process of enhancing regional competitiveness? Consequently, assessing the productivity change of the process (APP, Momaya 1998, 2011) needs linking of both foundational input factors as well as revealed output(s) of regional competitiveness. This necessity motivates us to propose an integrated framework of foundational input factor-based Porter diamond (including macroeconomic environment) and revealed indicator or output based Lengyel's (2004) pyramid model. We name the framework as 'extended diamond based pyramid (DBP)'. The six input dimensions of extended diamond and output as revealed indicators of regional competitiveness are thoroughly discussed in the theoretical framework section. To confirm the exogeneity assumptions of these input factors we use Durbin–Wu–Hausman test.

Through this proposed DBP framework, we use the Malmquist productivity index (MPI) for analysing total change in regional competitiveness across the states and Union Territories (UT) of India. While the MPI is typically used to measure sources of productivity change of a production process using a set of inputs to produce one or more outputs, in this study we have used the underlying optimization process of MPI to measure change in competitiveness. Our analysis employs the revealed indicator of competitiveness as output and six determinants of competitiveness under proposed DBP as inputs in the MPI framework. This helps in exploring different sources of regional competitiveness change of the states/UTs in terms of "technical efficiency change" and "technology change" components of MPI. However, it needs to be remembered that technical efficiency or technology change in our application of MPI have interpretations slightly different from the usual sense in which they are employed during application of MPI in production processes. This analysis tries to compare the regions in terms of their responsiveness to competitiveness indicators.

The study is attempting to compare the states in their differences in preparedness for competitiveness with heterogenous regional policies, initiatives, programs, resources and other factors under homogenous national macroeconomic umbrella. This responsiveness improves (or deteriorates) in comparison to the best responding peers and also over time for all regions. The improvement in relation to the most efficient peers is efficiency change and improvement caused by shift in the overall frontier over time is the technology change, i.e. all competitiveness indicators in general are able to improve competitiveness more over time as all regions in general adapt to them more.

The advantage of using Malmquist DEA is that it does not require information regarding functional forms or distribution function of inefficiencies and it provides insights on TFP (total factor productivity) change by decomposition of the change into efficiency and technical change (Chaudhary 2016). An additional advantage of non-parametric DEA is that it compares the unit with the most efficient peer or the frontier one, and not with the average unit as done in econometric approaches (Grosskopf 1986). In the light of current discussion and literature gap, the objectives of the present study include: (i) to develop a descriptive theoretical framework for linking output and foundational input factors of regional competitiveness and (ii) to assess sources of changes in TFP of regional competitiveness of the states/UTs of India and efficiency of its foundational driving factors using DEA-MPI approach. The remainder of paper has been divided into following sections: theoretical background of proposed framework followed by methodology applied, data and variables. Next, result and discussion from this empirical analysis, is followed by last section of the paper, conclusion.

Theoretical Framework

Existing regional competitiveness models particularly 'pyramid model' and 'hat model' have given emphasis on hierarchy or layer of process of measurement of revealed regional competitiveness. The present study proposes a framework to integrate the 'hat', 'diamond' and 'pyramid' of regional competitiveness.

Extended Diamond Based Pyramid Framework (DBP)

The Porter diamond, among business strategy and economic theories, makes the understanding of factors underlying the regional competitiveness simple, logical, and systematic. Incorporating PDM in the base layer of 'success factors' in the Lengyel (2004) pyramid model or among 'determinants of regional competitiveness' in 'hat' model of Martin (2003) enhances the explanatory power of the models from competitiveness process point of view. We propose, in our extended framework, to integrate only single diamond as majority of the FDIs and multinational firms are concentrated in few geographic zones making 'double diamond' model less suitable for regional analysis. The proposed conceptual framework which is formed by integrating 'hat', 'diamond', and 'pyramid' is shown in Fig. 1 and named as extended diamond based pyramid (DBP) framework. The ultimate goal of improving regional competitiveness and its drivers is to bring or achieve welfare of economy. And the welfare of the economy can be evaluated in different forms or methods. One of the most accepted and convenient method by the economists is to measure per capita income, for example, GDP per capita or NSDP per capita. So, the per capita income has been measured as revealed indicator of regional competitiveness (Martin 2003). Also, income per capita can be again broken down into the labor productivity and employment rate to measure regional competitiveness as shown in Fig. 1 as well as the Eq. (1) below:

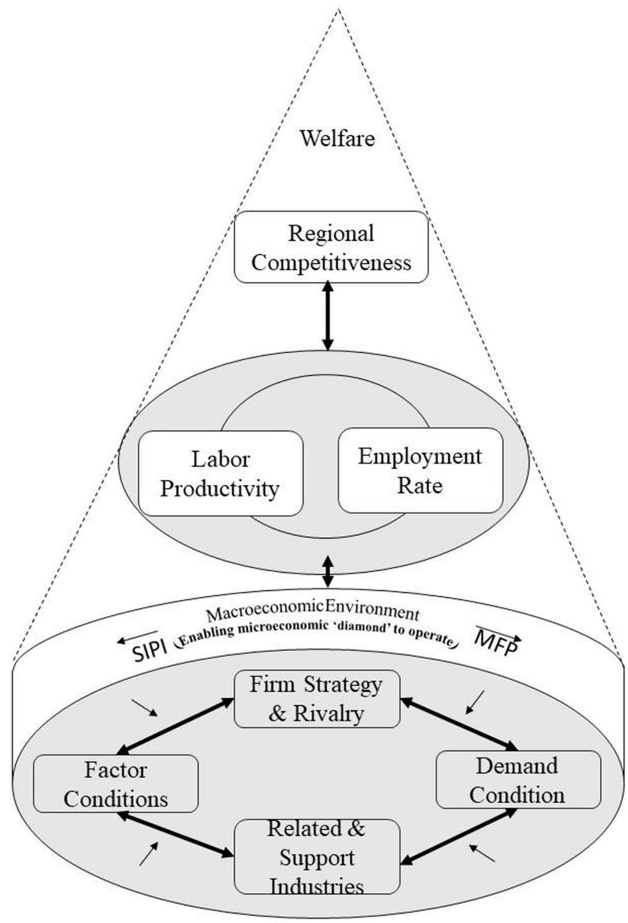

Fig. 1 Extended diamond based pyramid framework of regional competitiveness (Source: Framework Prepared by Authors)

$$\begin{aligned}\text{Per capita income} &= \frac{\text{GDP (or NSDP)}}{\text{Population}}\\ &= \frac{\text{GDP (or NSDP)}}{\text{Employment}} \times \frac{\text{Employment}}{\text{Working age population}} \times \frac{\text{Working age population}}{\text{Population}} \quad (1)\\ &= \text{Labour productivity} \times \text{Employment rate} \times \text{Labour force.}\end{aligned}$$

In our extended framework, the outcome of regional competitiveness is measured using net per capita income i.e. net state domestic product (NSDP) per capita[2] for the subnational regions. Porter (1990) emphasized strongly about the importance of microeconomic foundations seated on macroeconomic facilitations. For example, as per Porter's argument, government can 'create', 'support', 'enhance', 'lift', 'sanction', 'sponsor', 'organize', and 'act', any determinant under four elements of 'diamond'. So are the other macroeconomic factors like institutions, natural resources, and culture. Therefore, macroeconomic foundation has been presented graphically as a platform to the microeconomic diamond' as shown in the Fig. 1. Under macroeconomic environment, in this framework, we have grouped macroeconomic factors into two factors namely-Social Infrastructure and Political Institution (SIPI), and Monetary and Fiscal Policy (MFP) (Delgado et al. 2012). Basically, the two elements signify the non-financial and financial environment of the economy. Two inputs under macroeconomic environment will make the analysis simpler than numerous inputs. And the study is focussed on the process, and not on input itself. The input factors can be later segregated and studied for their individual significance. Integrated with these two major components of macroeconomic environment are four conditions/contexts of Porter's single diamond (Porter 1990) viz. factor condition (FC), demand condition (DC), context for firm strategy, structure and rivalry (FSR), and presence of related and supporting industries (RSI). These together constitute the six major factors of conceptual DBP framework. Relying on theory and existing competitiveness literature, indicators are grouped under each relevant pillar and similarly, relevant pillars are grouped to form one of six factors of DBP which is the input variable. The six factors of DBP framework along with their constituent competitiveness pillars, constituent indicators of a pillar, proxy of the indicator and supporting literature are listed in Annexure 1. The determinants of the regional competitiveness are predicated from economic theories like classical trade theory, investment theory, industrial organization theory and technology. As the proposed framework is based on these determinants and existing theories, the study assumes it to be true. The empirical testing of the econometric relationship between outcome and determinants is possible but beyond the scope of this study.

As Porter's (2004) concept of competitiveness focusses on prosperity 'created' from economic activity, not on 'inherited' prosperity from the exploitation of natural resources. There are evidences that this inherited prosperity, on contradiction, becomes negative spirit for competitiveness. That is how the study has omitted indicators like forest coverage, natural resources and natural endowments. The data is also static i.e. least variability across years which could not reflect in sync with the rapid changes in economic growth.

[2] By definition and existing literature, per capita net state domestic product (PCNSDP) will closely reflect the standard of living or per capita income. That is why our output variable is PCNSDP in the MPI study. However, to check the robustness of the result, we compared the result using 'percentage change in PCNSDP' as output variable.

Methodology

Data Envelopment Analysis-Malmquist Productivity Index

In a production process the production unit is given various resources like capital, labor, raw material and time as inputs and goods and services are generated through this transformation process as outputs. The efficiency or productivity is measured as weighted output divided by weighted input. And, data envelope analysis (DEA), coined by Charnes et al. (1978), is non-parametric method of evaluating efficiency of decision-making units (DMU) or simply units using a reference of 'efficient frontier or envelope' involving linear programing techniques (Farell 1957; Wu et al. 2006). To calculate TFP, one of the most commonly used methods is DEA based Malmquist productivity index (MPI). When efficiency or productivity is measured for panel data at different two time points 't' and '$t+1$', MPI is the suitable method (Wu et al. 2006). DEA-MPI is calculated using geometric mean of an efficient frontier shift over two points of time (Caves et al. 1982).

The MPI given by relative efficiency (or ratio of two output distance functions) of entity using same technology available at time 't' with reference to the same technology at 't' is given by M^t as shown given in Eq. (2):

$$M^t = \frac{D^t(x_{t+1}, y_{t+1})}{D^t(x_t, y_t)}. \quad (2)$$

Here, D^t is output-oriented production distance function, 'x_t' and 'y_t' are respectively input variables and output variables. Similarly, MPI at time '$t+1$' using technology at '$t+1$' is given as M^{t+1} in Eq. (3) below:

$$M^{t+1} = \frac{D^{t+1}(x_{t+1}, y_{t+1})}{D^{t+1}(x_t, y_t)}. \quad (3)$$

Subsequently, Fare and Grosskopf (1992) suggested that MPI for two reference points should be the geometric mean of these two indices mentioned above to avoid the arbitrary reference period. Thus, the functional definition of DEA-MPI is specified as below in Eq. (4):

$$M^{t+1}(x_{t+1}, y_{t+1}, x_t, y_t) = \left[\frac{D^t(x_{t+1}, y_{t+1})}{D^t(x_t, y_t)} \frac{D^{t+1}(x_{t+1}, y_{t+1})}{D^{t+1}(x_t, y_t)}\right]^{\frac{1}{2}}. \quad (4)$$

By rearranging the terms in the right-side of the above equation, Fare et al. (1994) demonstrated that Malmquist Productivity Index can be decomposed into technical efficiency change and technology change. The efficiency change is the change in relative distance of a particular state from its nearest peer on the efficiency frontier from t to $t+1$. And technology change is measure of average change in productivity due to change in technology (a shift in the frontier) during two points of time i.e. 't' and '$t+1$'. For each technology, we can have two combination of input and output i.e. one combination from time 't' and other combination from time '$t+1$' assuming the same technology. The geometric mean of such two productivity ratios is understood as technology change or frontier shift. The productivity due to technical efficiency change is the first term in right-side of the Eq. (5) and the second term is measure of productivity due to technology change:

$$M^{t+1}(x_{t+1}, y_{t+1}, x_t, y_t) = \left[\frac{D^{t+1}(x_{t+1}, y_{t+1})}{D^t(x_t, y_t)}\right]\left[\frac{D^t(x_{t+1}, y_{t+1})}{D^{t+1}(x_{t+1}, y_{t+1})} \frac{D^t(x_t, y_t)}{D^{t+1}(x_t, y_t)}\right]^{\frac{1}{2}}. \quad (5)$$

The technical efficiency change is also known as catch-up effect and technology change, as frontier shift. Therefore, MPI is the product of catch-up effect and frontier shift (Caves et al. 1982; Tone 2004):

$$\text{MPI} = [\text{Catch} - \text{Up effect or efficiency change}] \times [\text{Frontier or technology shift}].$$

An MPI value greater one indicates the positive TFP growth between these two reference periods, value equal to one means no change or effect, and MPI value less than one implies decrease in TFP growth between these two periods. This applies for the components of MPI like technical efficiency change and technology change; if MPI values of these parts are higher than 1, they show positive TFP growth and vise-versa (Fare and Grosskopf 1992; Agarwal et al. 2009).

The above methodology is used in this analysis to evaluate the comparative ability of the states to gain competitiveness with various competitiveness factors as inputs. The per capita net state domestic product (PCNSDP), which is revealed indicator of regional competitiveness, is used as output and the six factors of the proposed conceptual DBP framework of regional competitiveness as inputs. As mentioned earlier, the six factors of DBP are measured after aggregating the relevant competitiveness indicators from literature. The indicators, proxy used and supporting literature have been listed in Annexure 1.

Because of possibility of endogeneity issue between these input variables and technical efficiency, we have performed Durbin–Wu–Hausman specification test for endogeneity (Fu 2005). The estimate model specification for endogeneity test is given in Table 5.

Variables Definition

In calculating technical efficiency (TE), total factor productivity change (TFPCH), technical efficiency change (EFFCH) and technological frontier shift (TECHCH) of the process using MPI, the following variables are used.

Output Variable

The output variable in this study is measure of outcome of regional competitiveness inputs and process. The proxy taken is per capita net state domestic product (PCNSDP) at constant price with base year 2004–2005.

Also, to check the robustness of the result, we measure the sources of change i.e. EFFCH, TECHCH and TFPCH once again using 'percentage change in PCNSDP'. To avoid dealing with negative values i.e. negative change, we adopt classical approach of data translation by adding a common positive number to make all input/output values positive (Bowlin 1998; Pastor 1996; Ali and Seiford 1990) rather than range directional model (RDM) of Malmquist index (Portela and Thanassoulis 2010) for mathematical complexity and tools.

Input Variable

The six factors of DBP framework are considered as six input variable (IV) to the MPI in this study. The six input variables along with relevant constituent pillars and indicators and literature are given in Annexure 1. And, the descriptions of the six input variables along with source of data for proxy-indicators which construct these IVs are given in Annexure 2. The definition of construct of IV is given below.

The measure of input variable is the equally weighted average of constituent pillars, $IV_i = \frac{\sum_1^j P_j}{J}$, where P_j is value of the jth pillar and J is number of constituent pillars.

Similarly, pillar value is the equally weighted average of constituent indicators, $P_j = \frac{\sum_1^k I_k}{K}$, where I_k is value of the kth indicator and K is number of constituent indicators of the pillar.

Data Source

This study has used only secondary data available in public domain especially Government of India websites of Reserve Bank of India, NITI Aayog, Ministry of Railways, National Crime Records Bureau, Airport Authority of India, Telecom Regulatory Authority of India, Ministry of Health and Family Welfare, MHRD, MCA, Ministry of MSME, etc. Some other supporting domains include Indiastat.com and CMIE. The source of data for basic indicators are given in Annexure 2. In this study, based on data availability, 32 Indian states/union territories have been considered and the panel data is of 10 years from 2007–2008 to 2016–2017.

Weights of Pillars and Indicators

As competitiveness index for Indian States is a composite index, equal weightages are given to all pillars assuming their equal impact on productivity (Source: OECD Handbook 2005). Under each pillar, indicators again are given equal weightage.

Standardization and Normalization of Indicators

Standardization for different sizes of states is taken care of appropriately; for example, indicators are measured as per million populations, etc. Those indicators which are negatively associated with productivity theoretically e.g. corruption level (Salinas-Jiménez and Salinas-Jiménez 2007; Olson et al. 2000; Mauro 1995) are reversed so that highest value becomes lowest. Standardization and normalization among different indicators are done using 'Max–Min transformation' in a new scale of 1–100 (McArthur and Sachs 2002) to enable aggregation of different nature of indicators as given below.

$$\text{Standardized value} = 1 + \frac{\text{State value} - \text{Minimum}}{\text{Maximum} - \text{Minimum}} \times 99.$$

Results and Discussion

In this study, Malmquist productivity change has been interpreted as the rate at which the regions have responded to the competitiveness pillars in comparison to each other. While the efficiency change component of Malmquist productivity growth is the "catching up" effect on the states with respect to their most efficient peers, technical change is interpreted as the ability of the states to better adapt and respond to the enablers of competitiveness. Many existing DEA works assume that endogeneity is not big issue and these studies do not address it because DEA technique is assumed to be merely placing an envelope around feasible production possibilities. However, endogeneity may create biases in the efficiency study (Orme and Smith 1996; Cordero et al. 2013). For this study too, the diagnostic test of endogeneity between technical efficiency and each input variable is performed to confirm exogeneity of input variables. Generally, endogeneity issue arises when there is correlation between independent variable and error term in parametric analyses, which is generally caused by omitted variable confounding with both independent variable and dependent variable. Here, one lagged dependent variable i.e. previous period technical efficiency (TE9) is used as proxy for omitted or control variable (Nair-Reichert and Weinhold 2001). The suspected variable is selected and others are used as instrument variable (Fu 2005). The result of Durbin-Wu-Hausman test of endogenous variables is given in Table 5. All six input variables are found to be insignificant at 5% significance level and they are not endogenous. It implies that these standardized values of input variable are not messed up with residuals of the model estimate of productivity. The EFFCH, TECHCH and TFPCH based on MPI for the 32 Indian states/union territories under the study is shown in Table 1. The major observation in the results is that regional competitiveness is almost singularly driven by technology change, least by efficiency change. Based on the result, there is overall progress of 5% in TFP of regional competitiveness in these 32 states during the 10 years and percentage change of TECHCH component is 5%. By observing values in Tables 3 and 4 it is found that the states/UTs have been changing in their input conditions i.e. the technological

Table 1 Efficiency change (EFFCH), technology change (TECHCH) and TFP change (TFPCH)—state-wise during 2007–2008 to 2016–2017

State/UT	EFFCH	TECHCH	TFPCH
Andaman and Nicobar Islands	1.00	0.96	0.96
Andhra Pradesh (incl. Telangana)	1.00	1.04	1.04
Arunachal Pradesh	1.00	1.09	1.09
Assam	0.99	1.07	1.06
Bihar	1.12	1.02	1.15
Chandigarh	1.00	1.06	1.06
Chhattisgarh	0.98	1.06	1.04
Delhi	0.99	1.06	1.04
Goa	1.00	1.06	1.06
Gujarat	1.01	1.06	1.07
Haryana	1.00	1.04	1.03
Himachal Pradesh	1.00	1.09	1.08
Jammu and Kashmir	1.01	1.09	1.10
Jharkhand	0.98	1.00	0.98
Karnataka	0.97	1.06	1.03
Kerala	0.99	1.06	1.05
Madhya Pradesh	1.01	1.03	1.04
Maharashtra	1.02	1.04	1.06
Manipur	1.00	1.07	1.07
Meghalaya	1.00	1.08	1.08
Mizoram	1.00	1.06	1.06
Nagaland	1.00	1.02	1.02
Odisha	0.97	1.04	1.02
Puducherry	1.00	1.07	1.07
Punjab	0.98	1.07	1.05
Rajasthan	0.99	1.03	1.03
Sikkim	1.00	1.07	1.07
Tamil Nadu	0.99	1.07	1.06
Tripura	1.00	1.08	1.08
Uttar Pradesh	1.01	1.01	1.02
Uttarakhand	0.99	1.08	1.07
West Bengal	1.00	1.06	1.07
All India mean	1.00	1.05	1.05

Table 2 Using output as percentage change in PCNSDP: efficiency change (EFFCH), technology change (TECHCH) and TFP change (TFPCH)—state-wise during 2007–2008 to 2016–2017

State/UT	EFFCH	TECHCH	TFPCH
Andaman and Nicobar Islands	0.99	0.99	0.97
Andhra Pradesh (incl. Telangana)	0.99	1.02	1.01
Arunachal Pradesh	0.97	1.04	1.01
Assam	1.06	0.97	1.02
Bihar	1.04	1.01	1.05
Chandigarh	1.05	1.02	1.07
Chhattisgarh	1.03	0.96	0.99
Delhi	0.95	1.01	0.96
Goa	1.04	1.02	1.06
Gujarat	0.98	1.02	1.00
Haryana	0.97	1.03	1.00
Himachal Pradesh	1.00	1.02	1.03
Jammu and Kashmir	1.05	1.05	1.11
Jharkhand	1.00	0.90	0.90
Karnataka	0.95	1.00	0.95
Kerala	0.99	0.98	0.98
Madhya Pradesh	1.05	1.01	1.06
Maharashtra	0.98	1.03	1.00
Manipur	1.00	0.97	0.97
Meghalaya	1.05	1.00	1.05
Mizoram	1.01	1.02	1.02
Nagaland	1.04	1.00	1.03
Odisha	1.01	1.01	1.02
Puducherry	0.99	1.01	0.99
Punjab	0.96	1.02	0.98
Rajasthan	1.02	1.00	1.02
Sikkim	0.91	1.00	0.92
Tamil Nadu	0.98	1.02	1.00
Tripura	1.01	1.02	1.03
Uttar Pradesh	1.01	1.03	1.04
Uttarakhand	0.95	1.01	0.96
West Bengal	1.02	0.95	0.97
All India mean	1.00	1.00	1.00

change-TECHCH is contributing to TFP more than what the efficiency improvement-EFFCH is contributing. Values in TECHCH column are greater than 1 in most states along the 10 years of study. So, states can focus now more on improvement of efficiency of implementation of input conditions. It would be very expensive for the government and institutions to keep on changing the conditions of innovations or policies. It should improve efficiency of implementation, which would be more cost saving than keep on changing frontiers or conditions or policies or technology. Comparing the changes using 'percentage change in PCNSDP' as output of MPI function the results seem to be consistent except for some states as shown in Table 2.

Nevertheless, all discussion and illustrations will focus on the sources of change impacting per capita income i.e. PCNSDP for clarity. As mentioned above the result using PCNSDP as output also shows that the state of Bihar and Uttar Pradesh were doing very well in EFFCH efficiency change, for example, in year 2009 Bihar's EFFCH is 1.42, and 1.24 in 2011, 1.34 in 2013, 1.26 in 2014 as well as1.27 in 2015 and 1.11 till 2016 as seen in Table 3. One of the weakest states considered. Yet their responsiveness to competitiveness conditions is much higher than average at around 14%. Also, contrary to most other states, this has been contributed mostly by efficiency improvement

Table 3 EFFCH during the study years 2008 to 2017

State/UT	Year								
	2008 to 2009	2009 to 2010	2010 to 2011	2011 to 2012	2012 to 2013	2013 to 2014	2014 to 2015	2015 to 2016	2016 to 2017
Andaman and Nicobar Is	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Andhra Pr. (incl. Telangana)	1.11	1.00	0.90	0.88	1.12	0.92	1.21	1.04	0.87
Arunachal Pradesh	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.04	1.00
Assam	1.02	1.02	0.94	0.96	1.00	0.99	0.96	1.00	0.96
Bihar	1.42	0.81	1.24	0.82	1.34	1.26	1.27	1.11	1.00
Chandigarh	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Chhattisgarh	0.95	0.91	1.01	0.94	1.04	1.01	0.97	0.99	0.97
Delhi	1.00	1.00	1.00	0.93	1.00	1.02	0.97	1.06	0.94
Goa	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gujarat	1.13	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Haryana	1.00	1.00	1.00	0.92	1.01	1.08	0.96	1.05	0.96
Himachal Pradesh	1.03	0.98	1.00	0.94	1.04	0.99	1.00	0.99	1.01
Jammu and Kashmir	1.00	1.04	0.95	0.98	1.03	1.04	0.97	0.98	1.12
Jharkhand	0.89	1.06	1.13	0.85	1.18	1.00	1.00	1.00	0.80
Karnataka	0.99	1.05	0.93	0.93	1.02	1.08	0.94	1.03	0.82
Kerala	1.14	1.02	0.94	0.92	1.01	1.16	0.91	0.97	0.91
Madhya Pradesh	1.17	0.93	1.16	0.74	1.17	1.21	0.95	0.95	0.90
Maharashtra	1.04	1.11	0.95	0.96	1.09	1.09	1.00	1.00	0.95
Manipur	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Meghalaya	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mizoram	1.00	0.98	1.02	1.00	1.00	1.00	1.00	1.00	1.00
Nagaland	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Odisha	1.18	0.86	0.86	0.92	1.03	1.06	0.90	1.00	1.00
Puducherry	1.00	1.00	1.00	1.00	0.98	1.02	0.97	1.03	1.01
Punjab	1.03	1.01	0.92	0.93	1.04	1.01	0.97	1.01	0.95
Rajasthan	1.36	0.91	0.93	1.01	1.02	1.06	0.89	1.03	0.83
Sikkim	0.99	1.01	1.00	0.97	1.03	1.00	1.00	1.00	0.99
Tamil Nadu	1.08	1.03	0.97	0.87	1.06	1.03	0.93	1.02	0.95
Tripura	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uttar Pradesh	1.19	1.03	1.34	0.57	1.03	1.13	0.90	1.11	1.05
Uttarakhand	1.02	0.99	1.03	0.96	1.02	1.00	0.98	1.01	0.92
West Bengal	1.16	0.95	1.08	0.89	1.01	1.18	1.09	0.94	0.82
All India mean	1.05	0.99	1.00	0.93	1.03	1.03	0.99	1.01	0.95

Table 4 TECHCH during the study years 2008 to 2017

State/UT	Year								
	2008 to 2009	2009 to 2010	2010 to 2011	2011 to 2012	2012 to 2013	2013 to 2014	2014 to 2015	2015 to 2016	2016 to 2017
Andaman and Nicobar Is	0.97	1.18	0.64	1.86	0.73	0.61	1.42	0.69	1.23
Andhra Pr. (incl. Telangana)	0.91	1.02	0.99	1.09	1.10	1.05	1.02	1.07	1.14
Arunachal Pradesh	1.09	1.09	1.07	1.32	1.09	1.00	1.01	1.05	1.11
Assam	1.05	1.08	1.06	1.18	1.01	1.01	1.06	1.09	1.13
Bihar	0.95	1.08	1.01	1.31	1.00	0.46	1.88	0.91	1.18
Chandigarh	0.88	1.21	1.00	1.06	1.07	1.07	1.13	1.01	1.15
Chhattisgarh	0.92	1.08	1.11	1.19	1.01	0.90	1.17	1.11	1.12
Delhi	1.04	1.10	0.97	1.10	1.06	1.08	1.01	1.06	1.10
Goa	0.99	1.27	0.91	1.14	1.34	0.60	1.51	1.01	1.03
Gujarat	0.91	1.14	0.91	1.13	1.11	1.05	1.10	1.14	1.09
Haryana	0.89	1.03	1.00	1.10	1.09	1.00	1.07	1.05	1.11
Himachal Pradesh	1.07	1.08	1.10	1.19	1.01	1.05	1.06	1.09	1.12
Jammu and Kashmir	1.06	1.07	1.14	1.18	1.04	1.05	1.03	1.10	1.12
Jharkhand	0.98	1.12	1.08	1.26	0.91	0.51	1.16	1.02	1.19
Karnataka	0.97	1.05	1.00	1.11	1.09	1.02	1.07	1.11	1.16
Kerala	1.04	1.05	0.97	1.13	1.10	0.98	1.05	1.07	1.16
Madhya Pradesh	0.87	1.06	0.91	1.13	1.16	0.97	1.07	1.09	1.06
Maharashtra	0.93	1.06	0.96	1.10	1.11	1.09	1.06	1.04	1.01
Manipur	1.04	1.09	1.21	0.98	1.04	1.00	1.07	1.01	1.20
Meghalaya	1.06	1.06	1.17	1.14	1.04	0.99	1.04	1.11	1.10
Mizoram	1.05	1.05	1.19	1.07	1.13	0.94	1.21	0.90	1.05
Nagaland	0.88	1.02	0.94	1.17	1.19	0.86	1.18	0.92	1.08
Odisha	0.88	1.03	1.05	1.14	1.05	0.99	1.08	1.09	1.11
Puducherry	1.07	1.11	1.02	1.08	1.04	1.05	1.06	1.09	1.13
Punjab	1.02	1.03	1.04	1.18	1.01	1.06	1.06	1.09	1.12
Rajasthan	0.86	1.07	0.99	1.09	1.11	1.00	1.07	1.06	1.09
Sikkim	1.02	1.33	0.88	1.15	1.18	0.92	1.02	1.09	1.10
Tamil Nadu	1.01	1.10	0.98	1.11	1.10	1.03	1.08	1.07	1.14
Tripura	1.12	1.00	1.14	1.15	1.03	1.00	1.02	1.07	1.19
Uttar Pradesh	0.89	1.06	0.86	1.26	1.13	0.70	1.31	0.98	1.03
Uttarakhand	1.06	1.10	1.08	1.17	1.01	1.05	1.06	1.09	1.13
West Bengal	0.87	1.14	0.91	1.11	1.19	0.86	1.36	1.00	1.20
All India mean	1.05	1.08	1.00	1.16	1.06	0.91	1.12	1.03	1.11

Table 5 Result of Durbin–Wu–Hausman test for endogenous variable

Null hypothesis	Difference in J statistic	*df*	*p* value
Null hypothesis: FC are exogenous Instrument specification: C TE9 DC FSR RSI SIPI MFP Endogenous variables to treat as exogenous: FC	0.367	1	**0.544**
Null hypothesis: DC are exogenous Instrument specification: C TE9 FC FSR RSI SIPI MFP Endogenous variables to treat as exogenous: DC	0.304	1	**0.581**
Null hypothesis: FSR are exogenous Instrument specification: C TE9 FC DC RSI SIPI MFP Endogenous variables to treat as exogenous: FSR	3.617	1	**0.057**
Null hypothesis: RSI are exogenous Instrument specification: C TE9 FC DC FSR SIPI MFP Endogenous variables to treat as exogenous: RSI	3.560	1	**0.059**
Null hypothesis: SIPI are exogenous Instrument specification: C TE9 FC DC FSR RSI MFP Endogenous variables to treat as exogenous: SIPI	2.953	1	**0.085**
Null hypothesis: MFP are exogenous Instrument specification: C TE9 FC DC FSR RSI SIPI Endogenous variables to treat as exogenous: MFP	0.710	1	**0.399**
Restricted test equation: dependent variable: TE[a] Specification: TE FC DC FSR RSI SIPI MFP Method: two-stage least squares Sample: 132			

[a]Average of 10 years; TE9 = TE from year 2015–2016 as instrument variable

of Bihar by around 12%, i.e. this state is catching up more with its most efficient peers.

Similarly, the EFFCH for Uttar Pradesh in 2009 is 1.19 and 1.05 till 2017. The reason for Bihar's high efficiency change may be due to its high growth rate of NSDP per capita during this period, highest since 2005 to 2011 (Dutta and Kar 2018), acceleration in industrial growth post 2005 (Ghatak and Roy 2015), structural change in district level (Santra et al. 2014), fast growth rate in service, agriculture and industrial sector with major changes in policy, administration and governance post 2005 (Singh 2018) and reduced amount of input conditions. This may be the case of cooperation for competitiveness among all stakeholders particularly human resources like politicians, bureaucrats, and entrepreneurs, and institution (Momaya 2011) resulting in industrial growth post 2005 in Bihar.

We feel the same pattern of turnaround for the state of Uttar Pradesh as the two states bear similar demographic and socio-economic structure, though there is no event-based evidence. Also, it needs to be kept in mind that MPI measures the dynamic improvement of the regions with respect to the most efficient peers. Hence an improvement in efficiency of a state implies better "catching up" of the state.

In overall study except Andaman and Nicobar Island and Jharkhand, the states or UTs are able to improve TFP during these 10 years. With Uttar Pradesh having least TFP average growth of 2%, the maximum TFP growth is that of Bihar with 15% as seen in Table 1. The plausible reason for the lack of improvement in efficiency change indicates that some states are unable to "catch up" with the more efficient peer states in utilization of the pillars of competitiveness. This implies that some states are better at achieving competitiveness with similar input of competitiveness factors. A possible explanation could be lack of efficient combinations of input conditions, productivity environment and policies as found by Krishnasamy et al. (2003).

While overall technical change has mostly been positive, some of the states witnessed negative technical change in some of the years of analysis (e.g. Bihar, U.P and two smaller states namely Andaman and Goa in the year 2013–2014, etc.). Bihar has 54% decline in technical shift and U.P. has 30% decline in technical shift. It indicates that both states are relatively lagging in effectiveness of the drivers of competitiveness in those years. This can be intuitively explained as change in the competitiveness environment which might have impacted the overall responsiveness of the state to the drivers of competitiveness. For example, it is observed that Bihar reduced per capita expenditure on primary education during the year 2013 to 2014 from Rs. 83,206 to Rs. 74,406 approximately when rest of the states increased the same relatively. This in turn not only pulled down social infrastructure (SIPI) sub-index score but may have adversely impacted the overall effectiveness of all the other indicators of competitiveness. Similarly, U.P. saw decline in primary education expenditure as well as enrolment ratio from 105 to 96 when other states increased both, from the year 2013 to 2014. Also, West Bengal had lower company registration in that year impacting entrepreneurship pillar under FSR factor of diamond framework. While, in case of physical production processes technical change cannot be negative, in this analysis, negative technical change implies that for changes in inputs of competitiveness conditions becoming less effective in improving competitiveness (Table 4). The results indicating decline in responsiveness to all competitiveness indicators on the periods where there was decline in components of one of the pillars, imply the possibility that the competitiveness conditions are complementary. In other words, a decrease in one or more of the determinants adversely affect the overall competitiveness of any region. It is also possible that for these states other unobserved competitiveness conditions, for example, implementation, government expenditure, schedule, other economic drivers, etc., have deteriorated so much that they are weakening the contributions of competitiveness inputs in improving the overall outcome. However, both these possibilities need further investigation which is beyond the scope of this study.

From 2014 to 2015, there are high positive growth in technical shift for Bihar with 88%, Goa with 51%, U.P with 31% and West Bengal with 36%. There are two major reasons for this—first, high positive change from previous year and second, relatively high input conditions in 2015 for these states. For example, when we study the contributing conditions and associated competitiveness indicators, Bihar has increased both primary and higher education per capita expenditure in year 2015 from 2014. In the same period, U.P. has relative higher ranks among states in entrepreneurship activities. Similarly, West Bengal has improved macroeconomic pillar in that year, particularly in controlling and reducing state inflation (Table 5). For Goa, we find that SIPI conditions has improved in 2015, resulting out of increased number of police strength and reduction in number of anti-corruption cases filed along with increased health pillar resulting from relatively increased number of doctors in that year. Again, the increase in one of the input conditions leading to overall improvement in relative competitiveness possibly indicates complementarity between the competitiveness determinants.

As discussed above, inefficient processes are sometimes indicative of factors like presence of corruption, inefficient institution, biased incentives and market, and the regions can improve efficiency by reforms of policies and programs (Fare et al. 2006). Therefore, regional policy makers and planners should identify local or state specific innovation mix or pattern to match regional characteristics of competitiveness (Camagni and Capello 2013). In other words, the state level improvement in responsiveness to competitiveness factors is resulting from overall frontier shift for all states than individual "catching-up" effect of individual states. This indicates that although the states are benefitting from better knowhow in general of the entire national economy, in application and usage of resources, but individual inefficiencies of the states compared to their peers are not corrected sufficiently to raise their productivity more.

As policy implication, the individual Malmquist scores and their decomposition for each of the states are able to identify the states which need to work harder in improving their efficiencies. One of the major advantages of this study is that it enables us to understand conditions or sources of regional competitiveness in addition to understanding the role of individual indicators meaning competitiveness drivers. When we study the individual indicators of regional competitiveness, we learn about its role in competitiveness and how the states are doing in investing or adding or reducing this indicator resource. However, we miss the information about conditions or consolidated sources as in PDM. This study under extended diamond framework allows one to focus on broad sources or conditions rather than numerous narrower drivers.

Conclusion

In this paper, the numerous drivers or indicators of competitiveness have been consolidated into specific macro and microeconomic sources based on models of Delgado et al. (2012), and of European Union regional competitiveness (Martin 2003). This provides scope for broader direction of actions or improvement as microeconomic determinants are seen in the context of macroeconomic indicators of the economy. This paper is based on the premise that revealed indicators of regional competitiveness like per capita income can be linked to structured and grouped driving forces of competitiveness through an extended porter diamond framework of regional competitiveness rather than simply linked to numerous individual factors, for example, Martin (2003) and Lengyel (2004). First, it proposes a linking framework in the form of extended porter diamond framework. Second, the paper evaluates competitiveness in a productivity measurement framework using the Malmquist productivity index treating state domestic product (the revealed indicator of competitiveness) as output and factors influencing competitiveness under the proposed DBP framework as inputs. The result of MPI analysis reveals that the main source of productivity of the states and UT of India is technical change-TECHCH and less of efficiency change. Interpretation of Technical change and Efficiency change components is different in this study from standard productivity. Technical change implies shift of utilization frontier i.e. the states are benefitting from better knowhow in utilization of DBP factors in general, in application and usage of resources, of the entire national economy but individual inefficiencies of the states compared to their peers are not corrected sufficiently to raise their competitiveness.

The implication of the study for policymaking is that the individual Malmquist scores and their decomposition of source of TFP into technical efficiency change and technology frontier change for each of the states are able to identify the states which need to work harder in improving their efficiencies or in raising their resources. The states with lesser productivity improvement are the ones where the elements of competitiveness are unable to achieve the extent of competitiveness that the more competitive states are able to achieve. The use of MPI in analyzing the competitiveness position allows understanding relative progress or regress between two different points of time. This MPI analysis provides insight on how efficiently states combine the resources and how states position themselves compared to frontier state. This approach highlights different perspective of states, for example, some high-income states like Delhi and Punjab are regressing in their efficiency change or technical change while some low-income states like Bihar exhibit progress in either efficiency change or technical change.

This study has attempted to measure how successfully the states have been able to convert their competitiveness indicators into improving their relative competitiveness by a novel application of the MPI index which is generally used to look at productivity improvement in an input output framework. When the components for individual states are studied closely along with observation on their competitiveness pillars, it is possible to get insights on policy direction for the states to be able to better utilize the combinations of micro and macro pillars of competitiveness. Unintended inclusion of irrelevant variable and omission of relevant variable due to data constraints are limitations of this study. For example, our study misses to incorporate important indicators like quality of institution because there is no state wise yearly data to measure it. The rule of law index, transparency, adaptability and other institution related measurements are subjective as well as not available in regional level to include in regional competitiveness input factors.

Key Questions

1. What are the sources of change of regional competitiveness in terms of frontier shift and efficiency change to explain it?
2. Identify the indicators under competitiveness pillars that influence frontier shift and/or efficiency change in the regional competitiveness process which are important for policy implications.
3. What can be factors of competitiveness framework that can capture overall aspects like input, process, and output aspects of regional competitiveness suitably?
4. What are the causes of regional economic disparity? How can regional competitiveness explain regional economic disparity?

Annexure 1

See Table 6.

Table 6 Extended diamond based pyramid (DBP) factors as input and their constituent pillars of regional competitiveness

Extended diamond based pyramid (DBP) as six input variables (IV)	Competitiveness pillars (P)	Indicators (I)	Proxy for indicators	Literature
Factor condition (FC)	Infrastructure	Road density	Road density or total length per sq km area	Kapoor and Sharma (2016); Ketels 2006; Porter (1990)
		Railroad density	Railroad density	
		Air traffic density	Passenger traffic	
		Power consumption per capita	Per capita electricity consumption	
		Teledensity	Teledensity	
	Higher education and lifelong learning	Undergraduate enrolment	Undergraduate GER	Afzal et al. (2019); Moon et al. (1998); Porter (1990)
		Govt exp on education per capita	Budgeted Expenditure on education to GSDP ratio	
	Financial market sophistication	Number bank branches	No. of bank branches	Kapoor and Sharma (2016); Delgado et al. (2012); Ketels 2006
		Bank credit	Credits in amount	
		Bank deposit	Deposits in amount	
Demand conditions (DC)	Market size	Disposable income per capita	Per capita NSDP	Chung (2016); Brooksbank and Pickernell (1999); Porter (1990)
		Potential market size expressed in population	projected population	
Firm strategy structure and rivalry (FSR)	Entrepreneurship	Firm entry	No. of company registration	Chung (2016); Brooksbank and Pickernell (1999); Rugman and Cruz (1993); Porter (1990)
		Entrepreneurship memorandum/ Udyog Adhaar filing	No. of Entrepreneurship Memorandum or Udhyog Aadhar	
		Output/wealth creation of entrepreneurial activity	Manufacturing to GSDP share (%)	Audretsch and Keilbach (2005); Acs and Audretsch (1990)
Related and supporting industries (RSI)	Technology readiness	Government spending on R & D	Expenditure on Science, Technology & Environment	Castro-Gonzales et al. (2016); Delgado et al. (2012); Postelnicu and Ban (2010); Banwet et al. (2003); Momaya (2001); Moon et al. (1998)
		Human resource input	No. of PhD enrolment	
		Internet users	Total internet or broadband subscribers	
Social Infrastructure and Political Institution (SIPI)	Institution	Corruption	No. of Cases under Prevention of Corruption Act	Chung (2016); Ketels (2006); Amin and Thrift (1994)
		Government effectiveness	No. of Government Project Completion	
		Reliability of police service	No. of police personnel	
	Health	Infant mortality	Infant mortality rate	Delgado et al. (2012)
		Medical assistant	No. of allopathy doctors	
		Health expenditure per capita	Health expenditure per capita	
	Primary education	Primary enrolment	Gross enrolment ratio	Delgado et al. (2012)
		Govt expenditure on primary education per capita	Budgeted expenditure on primary education	

Table 6 (continued)

Extended diamond based pyramid (DBP) as six input variables (IV)	Competitiveness pillars (P)	Indicators (I)	Proxy for indicators	Literature
Monetary and Fiscal Policy (MFP)	Macroeconomic stability	General Govt surplus/deficit	Gross fiscal deficit to GSDP ratio	Delgado et al. (2012)
		Inflation	Consumer price index	
		Govt debt to GSDP	Govt Debt to GSDP ratio	

Annexure 2

See Table 7.

Table 7 Extended diamond based pyramid (DBP) input variable descriptions and source of data

Extended diamond based pyramid (DBP) as six input variables (IV)	Description of input variable terms (definition of the construct is given under methodology)	Proxy for indicators	Source of data
Factor condition (FC)	These are factors of production in an economy which are input to productivity process, such as infrastructure, skilled work force, etc	Road density or total length per sq km area	Basic Road Statistics of India, Ministry of Road Transport and Highways, GOI
		Railroad density	Year Book, Ministry of Railways
		Passenger Traffic	Airport Authority of India
		Per capita electricity consumption	Indiastat (Rajya Sabha and Lok Sabha Questions, Power and Energy Division, Planning Commission, GOI)
		Tele-density	Telecom Regulatory Authority of India, North-East Council Secretariat
		Undergraduate GER	Statistics of Higher and Technical Education, MHRD
		Budgeted Expenditure on education to GSDP ratio	Analysis of Budgeted Expenditure on Education, MHRD
		No. of bank branches	Reserve Bank of India
		Credits in amount	Basic Statistics Return, Reserve Bank of India
		Deposits in amount	Basic Statistics Return, Reserve Bank of India
Demand conditions (DC)	These are conditions and factors that enhances home demand of products and services, for example, income, domestic market size, etc	Per capita NSDP	Reserve Bank of India
		projected population	Registrar General and Census of India
Firm strategy structure and rivalry (FSR)	These are context and condition in which firms are created and grown and domestic rivalry is present	No. of company registration	Ministry of Corporate Affairs
		No. of Entrepreneurship Memorandum or Udhyog Aadhar	Ministry of MSME
		Manufacturing to GSDP share (%)	MOSPI and Reserve Bank of India
Related and supporting industries (RSI)	It indicates the presence or absence of related industries like suppliers, supporting environment, etc	Expenditure on Science, Technology and Environment	State Finances, Reserve Bank of India
		No. of PhD enrolment	Statistics of Higher and Technical Education, MHRD
		Total Internet or broadband Subscribers	Telecom Regulatory Authority of India and Rajya Sabha, Lok Sabha Q and A, Indiastat

Table 7 (continued)

Extended diamond based pyramid (DBP) as six input variables (IV)	Description of input variable terms (definition of the construct is given under methodology)	Proxy for indicators	Source of data
Social infrastructure and political institution (SIPI)	It includes social infrastructure like health and education and institutions like government and its effectiveness to create a productive economy	No. of Cases under Prevention of Corruption Act	Crime in India Statistics, National Crime Records Bureau, Ministry of Home Affairs
		No. of Government Project Completion	States of India, CMIE
		No. of Police Personnel	Crime in India Statistics, National Crime Records Bureau, Ministry of Home Affairs
		Infant Mortality Rate	NITI Aayog
		No. of allopathy doctors	National Health Profile, Central Bureau of Health Intelligence, Ministry of Health and Family Welfare
		Health Expenditure per capita	National Health Account Cell, Ministry of Health and Family Welfare
		Gross Enrolment Ratio	School Education in India, National University of Educational Planning and Administration
		Budgeted Expenditure on primary education	Analysis of Budgeted Expenditure on Education, MHRD
Monetary and Fiscal Policy (MFP)	These are the short and medium term measures for fiscal sustainability and for managing debt and inflation	Gross Fiscal Deficit to GSDP ratio	Reserve Bank of India
		Consumer Price Index	Annual Report, Ministry of Labour and Employment
		Govt Debt to GSDP ratio	NITI Aayog

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