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Decomposing productivity growth in the Indian sugar industry

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Abstract We measure the growth in the total factor productivity (TFP) of the Indian sugar industry from 2002–03 to 2017–18 using the stochastic frontier production approach. The TFP grew at –10% per annum on average during the study period. The growth was negative because the allocative change and scale effect declined. To arrest the negative growth, the technical change must be improved urgently, modern processing technology must be adopted on a large scale, and the pricing policy of inputs, especially production factors, must be rationalized.

Keywords Total factor productivity (TFP), growth, sugar, manufacturing industry

JEL codes L11, L25, L60, O13, O33

Sugarcane is a widely grown crop in India. The country produced 348.448 million metric tons of sugarcane in 2015–16; 67.87% of the produce was used to make white sugar, 11.62% for seed and feed, and 20.51% to make gur and khandsari, a local type of sugar (NFCS 2017).

India produced 33.8 million metric tonnes of sugar: 560,000 metric tons of khandsari and 33.3 million metric tonnes of raw sugar in 2017–18 (Aradhey 2018). India ranks second in sugar production in the world, after Brazil, though its share in the global market is only 20%. In 2016–17, India exported 2,542.676 thousand metric tonnes of sugar worth INR 8,639.83 crore (NFCS 2017).

Recent policy changes have affected the sugar industry's performance (Singh 2016). The Government of India (GoI) removed the export duty on sugar with effect from 20 March 2018; earlier, it was 20%. A transport subsidy to sugar millers raised their cash flow; and it raised the export revenue by more than 46% (ISMA 2019).

At the World Trade Organization (WTO), Brazil and Australia claimed that the Indian subsidy programme distorts world sugar trade. The WTO has been exerting pressure on the sugar industry to become efficient and meet the challenges of global competition.

The sugar industry induces economic development because of the high returns that are increasing at a high rate, the incidence of technological change and innovations, and the synergies and linkages arising from the division of labour (Reinert 2009).

The trends in gur and khandsari production are envisaged to decrease over the base year of 1976 and the demand for sugar to increase to 33 million metric tons by 2030 (IISR 2011). To meet the increased demand, the productivity of sugarcane needs to be improved (Suresh and Mathur 2016).

Most of the assessments of total factor productivity (TFP) use a non-parametric approach (Arora and Kumar 2013; Kumar et al. 2011; Singh 2006; Singh 2016). Aggregate analyses mask the variation in productivity growth, though the variation is greater at the lower levels of aggregation of spatial units.

This study uses panel data aggregated by state to measure the state-specific TFP growth of the Indian sugar industry. The study also computes the spatial and temporal variation in TFP growth. The study quantifies TFP and its components—technical progress, technical efficiency, and scale efficiency.

Data

The study is based on panel data pertaining to the period from 2002 to 2018. We accessed the data from the Microdata Archive, an offshoot of the Ministry of Statistics and Programme Implementation, Government of India. We extracted the unit-level data from the Annual Survey of Industries (ASI), compiled it, and aggregated it at the state level.

First, we extracted the firm-level data on sugar mills for the years 2002 to 2018 from the ASI database. We used the National Identification Code (NIC) at different time level mills specific identification; we used the five-digit industrial classifications used from the year 2002 to 2004 NIC 2004 (code 15421) and NIC 2008 (code 10721) for the years 2002 to 2018 from the ASI database. Second, we aggregated the data by state by applying the multiplier presented in the dataset. Last, to normalize the data, we used deflators to deflate the inputs and output at constant prices.

We deflated the gross total outputs of industries by their respective Wholesale Price Index (WPI) of sugar products manufacturing. Likewise, we deflated the costs of the material inputs by the weighted average WPI of raw materials, fuel, power, light, and lubricants. We considered wages—including provident funds and other employee benefits—labour input and deflated it by the Consumer Price Index (CPI) for industrial workers. We deflated the total fixed capital input by an implicit price deflator for the gross fixed capital formation (GFCF) obtained from the National Accounts Statistics, Government of India. We normalized all the output and input variables before the log transformation.

Output and inputs

The ASI provides information on the outputs of manufacturing firms, or the value of output[1] (Mukherjee 2008; Mukherjee 1 2004; Deb and Ray 2014; Ali, Singh, and Ekanem 2009; Abdulla and Ahmad 2017; Khan and Abdulla 2019; Kumar et al. 2020). The ASI also provides information on the net value added (the difference between the (1) total intermediate inputs and depreciation and (2) the total value of output (Dholakia and Pateria 2015; Kumar and Arora 2009).

We followed the ASI tabulation programme to calculate the input and output variables. We consider the value of output an appropriate outcome variable. To assess the productivity of the Indian sugar industry, we take as input variables the number of employees[2] (wages and salaries), fixed capital,[3] and fuel consumed.[4] Before the analysis, we divide all the input and output variables by the number of factories in the respective states to remove the heterogeneity in the data.

Decomposing the total factor productivity (TFP)

We use stochastic frontier analysis (SFA) to measure productivity and technical efficiency. We apply the SFA to obtain an estimator for the degree of technical efficiency. Technical change is captured (as usual) by a time trend and the interactions of the explanatory variable with time. Thus, we estimate technical efficiency and technical change.

Changes in TFP may occur due to technical change or changes in the efficiency of input use, scale of production, or input and output price. We can introduce in the production function a decomposition of TFP into these components. Aigner et al. (1977) and van den Broeck et al. (1994) independently proposed the stochastic frontier production function. A single-output production function, with panel data and output-oriented technical inefficiency, can be defined as

$$y_{it} = f(x_{it}, t)\, exp(-u_{it}) \quad (1)$$

where, y_{it} is the maximum possible output produced by i^{th} firm (i = 1, 2, … …, N) in the t^{th} time period (t = 1, … … …, T);

[1]The value of output, or the value of products and by-products, is the sum of the ex factory value of output, the variation in the stock of semi-finished goods, and the value of own construction.
[2]Wages and salaries provided to all workers.
[3]It is the sum of net value of closing (land, building, plant and machinery, transport equipment, computer equipment including software, others and capital work in progress).
[4]It is the sum of value of electricity purchased and consumed, petrol, diesel, oil, lubricants consumed, coal consumed, and other fuel consumed.

f (.) is a production function,

x_{it} is the input vector,

t is the time trend and serves as a proxy for technical change, and

$u_{it} \geq 0$ is the output-oriented technical inefficiency.

Following Coelli et al. (2005) and Kumbhakar et al. (2015), we take the logarithm of *y* and totally differentiate Equation 1 with respect to t:

$$\dot{y} = \frac{d\ ln\ f(x_{it},t)}{dt} - \frac{\partial u}{\partial t} = \frac{\partial\ ln\ f(x_{it},t)}{\partial t} + \frac{\partial\ ln\ f(x_{it},t)}{\partial x_j}\frac{\partial x_j}{\partial t} - \frac{\partial u}{\partial t} \tag{2}$$

In Equation 2, on the right-hand side, the first term provides the change in frontier output caused by technical progress and the second term provides the change in frontier output caused by input use.

Using the output elasticity of input j, $\varepsilon_j = \frac{\partial f(x_{it},t)}{\partial \ln X_j}$, the second term can be expressed as $\sum_j \varepsilon_j \dot{x}_j$.

The dot (.) indicates the rate of change. The overall productivity change is influenced not only by technical progress (TP) and change in input use but also by changes in technical efficiency. The exogenous technical change shifts the production frontier upward (downward) for a given level of input if the technical progress (TP) is positive (negative). If the technical efficiency improves (deteriorates), then $\frac{\partial u}{\partial t}$ is negative (positive). The rate at which inefficient producers catch up with production frontier is interpreted as $-\frac{\partial u}{\partial t}$.

Thus, Equation 2 can be rewritten as

$$\dot{y} = \frac{d\ ln\ f(x_{it},t)}{dt} - \frac{\partial u}{\partial t} = TP + \sum_j \varepsilon_j \dot{x}_j - \frac{\partial u}{\partial t} \tag{3}$$

The classical definition of TFP growth is defined as output growth unexplained by input growth:

$$T\dot{F}P = \dot{y} - \sum S_j \dot{x}_j \tag{4}$$

where, S_j is input j's share in production cost.

Substituting Equation 3 in Equation 4, we get

$$T\dot{F}P = TP - \frac{\partial u}{\partial t} + \sum_j \varepsilon_j \dot{x}_j - \sum S_j \dot{x}_j = TP - \frac{\partial u}{\partial t} + \sum_j (\varepsilon_j - S_j)\, \dot{x}_j \tag{5}$$

$$= TP - \frac{\partial u}{\partial t} + (RTS - 1)\sum_j \lambda_j\, \dot{x}_j + \sum(\lambda_j - S_j)\dot{x}_j \tag{6}$$

where, $RTS = \{\sum_j \varepsilon_j\}$ denotes the returns to scale,

$\lambda_j = \frac{f_j x_j}{\sum_j f_i x_i} = \frac{\varepsilon_j}{\sum_i \varepsilon_i} = \frac{\varepsilon_j}{RTS}$ where f_j is the marginal product of input x_j, and

ε_j are input elasticities defined at the production frontier.

The decomposition formula in Equation 6 follows from Kumbhakar et al. (2015). The last component in Equation 6, $(\sum(\lambda_j - S_j)\dot{x}_j)$, measures the inefficiency in resource allocation resulting from the deviation of input prices from the value of their marginal product. Thus, in Equation 6, TFP growth can be decomposed into technical progress, the technical efficiency change (TEC)$\left\{-\frac{\partial u}{\partial t}\right\}$, scale change = (RTS – 1) $\sum_j \lambda_j \dot{x}_j$, and the allocative efficiency change denoted by $\sum(\lambda_j - S_j)\, \dot{x}_j$.

Model specification

To estimate the model and TFP decomposition, we used the book by Kumbhakar et al. (2015). We consider a single-output production function with panel data and output-oriented technical inefficiency

$$Y_{it} = \beta_0 + \beta_l\, ll_{it} + \beta_k\, lk_{it} + \beta_m lm_{it} + .5 * \beta_{ll}\, (ll_{it})^2 + .5 * \beta_{kk}\, (lk_{it})^2 + .5 * \beta_{mm}\, (lm_{it})^2 + \beta_{lk}\, (ll_{it} * lk_{it}) + \beta_{lm}\, (ll_{it} * lm_{it}) + \beta_{km}\, (lk_{it} * lm_{it}) + \beta_t\, t_{it} + .5 * \beta_{tt}\, (t_{it})^2 + \beta_{tl}\, (t*ll_{it}) + \beta_{tk}\, (t*lk_{it}) + \beta_{tm}\, (t*lm_{it}) + v_{it} - u_{it} \tag{7}$$

where,

Y_{it} is the output measure in rupees of i^th firm at t^th time,

t is the time variable of i^th firm at t^th time,

ll_{it} is the wage input measure in rupees of i^th firm at t^th time,

lk_{it} is the total fixed capital input measure in rupees of i^th firm at t^th time,

lm_{it} is the total fuel input measure in rupees of i[th] firm at t[th] time,

v_{it} is assumed to be independently and identically distributed as $N \sim (0, \sigma_v^2)$, and

u_{it} represents the production loss due to firm-specific technical inefficiency.

The technical efficiency i[th] of firm at t[th] time (TE_{it}) is computed as $TE_{it} = exp(-u_{it})$.

The technical efficiency change (TEC) over time is $TEC = -\frac{du}{dt}$

The technical progress or frontier shift is defined as $TC_{it} = \frac{\partial f(xt,\beta)}{\partial t} = \beta_t + \beta_{tt} + \beta_{tl}(ll_{it}) + \beta_{tk}(lk_{it}) + \beta_{tm}(lm_{it})$

The elasticity of output with respect to the j[th] input is defined by $\varepsilon_j = \frac{\partial lnf(x,t)}{\partial lnx_j}$, is calculated as the sum of labour elasticity

$$\varepsilon_l = \frac{\partial lf(x,t)}{\partial lx_l} = \beta_l + \beta_{tl}t + \beta_{ll}(ll_{it}) + \beta_{lk}(lk_{it}) + \beta_{lm}(lm_{it}),$$

The elasticity of capital is computed by

$$\varepsilon_k = \frac{\partial lf(x,t)}{\partial lx_k} = \beta_k + \beta_{tk}t + \beta_{kk}(lk_{it}) + \beta_{kl}(ll_{it}) + \beta_{km}(lm_{it})$$

and

The elasticity of fuel is computed by

$$\varepsilon_m = \frac{\partial lf(x,t)}{\partial lx_m} = \beta_m + \beta_{tm}t + \beta_{lm}(lm_{it}) + \beta_{lk}(ll_{it}) + \beta_{km}(lk_{it})$$

The returns to scale (RTS) is computed by

$RTS = \Sigma_j \varepsilon_j$ and $S = \varepsilon_l + \varepsilon_k + \varepsilon_m$.

Using Equations 5 and 6, TFP is defined as

$$T\dot{F}P = TC - \frac{\partial u}{\partial t} + \sum_j \varepsilon_j \dot{x}_j - \sum S_j \dot{x}_j = TC - \frac{\partial u}{\partial t} + \sum_j (\varepsilon_j - S_j)\dot{x}_j$$

$$= TC - \frac{\partial u}{\partial t} + (RTS - 1)\sum_j \lambda_j \dot{x}_j + \sum (\lambda_j - S_j)\dot{x}_j$$

where,

S_j is the share of inputs, and

the dot (.) indicates the rate of change of the variable.

Results and discussion

The study is limited to sugar manufacturers producing homogenous products (manufacturing of sugar). The literature uses three inputs (labour, capital, and fuel) and output as the total production of sugar. The national output of the sugar industry averaged INR 3,740 crore per annum for the period from 2002 to 2018.

Wages and salaries average INR 186 crore, and the average fixed capital is INR 2,660 crore; on average, fixed capital exceeds labour (wages and salaries) (Table 1). The expenditure on fuel averages INR 933 crore. On average, the industry uses INR 4,420 crore of fixed capital and INR 2,690 crore of fuel.

We applied several alternative restrictions on the specification of the translog production function. We used likelihood ratio tests to check whether the restrictions are appropriate (Table 1 in the Appendix). The likelihood ratio statistics favour the translog functional form (Table 2). The first order parameters, labour and fuel, are insignificant; the capital elasticity of output is statistically significant at the 5% level. All other things being equal, an increment in capital of 1% would increase the sugar output by 88%.

The second-order parameter labour and fuel (β_{lm}) is negative, revealing the possibility of substitution between the factors of production. The parameter labour and capital (β_{lk}) is also negative and statistically insignificant, revealing the tendency towards the substitution of labour and capital. The parameter capital and fuel (β_{km}) is positive, revealing that there is no substitution between capital and fuel. The coefficients of time*labour (β_{tl}), time*capital (β_{tk}), and time*fuel

Table 1 Input and output variables (constant prices, 2002–18)

Variable	Mean	Std. Dev.	Min	Max
Sugar (INR in crore)	3,740.00	5,950.00	0.02	27,200.00
Labour (INR in crore)	186.00	346.00	0.43	2,060.00
Capital (INR in crore)	2,660.00	4,420.00	1.87	23,200.00
Fuel (INR in crore)	933.00	2,690.00	0.18	18,200.00

Source Authors' calculations

Table 2 Estimates of half-normal stochastic production frontier model

Variables	Parameters	Coefficients	t- statistics
Labour	β_l	0.117	(1.08)
Capital	β_k	0.879***	(10.84)
Fuel	β_m	–0.098	(–1.53)
Labour*Capital	β_{lk}	–0.064	(–0.61)
Labour*Fuel	β_{lm}	–0.275**	(–2.89)
Capital*Fuel	β_{km}	0.261**	(3.27)
time	β_t	0.031	(1.72)
Time*Labour	β_{tl}	–0.032	(–0.69)
Time*Capital	β_{tk}	0.038	(1.11)
Time*Fuel	β_{tm}	–0.036	(–1.84)
time*time	β_{tt}	–0.008	(–1.64)
Labour*Labour	β_{ll}	0.135	(1.86)
Capital*Capital	β_{kk}	–0.087	(–1.50)
Fuel*Fuel	β_{mm}	–0.019	(–0.34)
constant	β_0	0.641***	(6.93)
usigmas	σ_u		
time		0.054	(1.74)
constant		–0.760*	(–2.17)
vsigmas	σ_v		
constant		–2.639***	(–10.86)
N		273	

Source Authors' calculations

Note *** significantly different from zero at the 1% level. ** Significantly different from zero at the 5% level.* Significantly different from zero at the 10% level.

(β_{tm}) are statistically insignificant or Hicks-neutral.[5] Thus, the Hicks-neutrality test of technical change in the sugar industry is fulfilled. The coefficients of time and labour (β_{tl}) and time and fuel (β_{tm}) are negative, showing labour- and fuel-saving technical change. The coefficient of time and capital (β_{tk}) is positive, showing the capital using technical change in the industry. One possible explanation is that most sugar firms invested more in plant and machinery, apparent from the calculation of capital input in monetary terms (in descriptive statistics, Table 1).

The Government of India and the state government of Maharashtra have exempted new sugar plants from the entry tax on sugar and the trade tax on molasses. They have undertaken to reimburse the administrative charge on molasses and the expenditure on the transfer of sugarcane. Sugar is exempt from purchase tax; it will be reimbursed. The industry is exempt from the society commission; it will be repaid. These incentives, to be offered for 5–10 years from the date of fulfilling the eligibility standards, would encourage entrepreneurs not merely to boost production capacity but also to increase economies of scale.

We compute the values of TFP growth and its components (Figures 1 and 2). The average scale change was –3%, technical change 3%, technical efficiency change 2%, price change was –12%, and the average TFP was –10%. Despite the technical progress (TC is positive), the TFP has been declining (TFP is negative)—driven primarily by a negative allocative and scale component. The scale change improved, and it is attributed mainly to the sugar policy in 2004 (Tuteja 2004). The change in scale has a positive contribution over the time span.

The sugar committee made certain recommendations in 2006, but these did not effect an increase in scale; it deteriorated, because the drought in 2008 reduced the availability of raw material for some states (ISMA 2016). The trade liberalization policies expose developing country farmers to the risks of price fluctuations in the global market (Shah 2010). The average growth in technical change improved over the period. The results confirm that Indian sugar mills improved technologically, due mainly to technical progress, and the TFP of the industry grew because of technical progress (innovations) rather than technical efficiency change. These results are in line with previous studies (Singh and Agarwal 2006; Kumar S et. al 2020).

The allocation of inputs in the industry was optimal, and so the average technical efficiency change (TEC) improved continually, in turn improving the TFP. The difference in allocative efficiency indicates that the market distortion among firms varied by state (Liu and Huang 2009; Kim 2010). The average allocative change (AEC) fluctuates because droughts, and changes in the regulatory and policy regimes, make the supply of sugarcane erratic. The rhythm of the growth in TFP matches the price change, indicating that price change drives the growth in TFP. The movement of scale

[5]Hicks neutrality occurs if the input coefficients of an industry fall in the same proportion (Batra 1970).

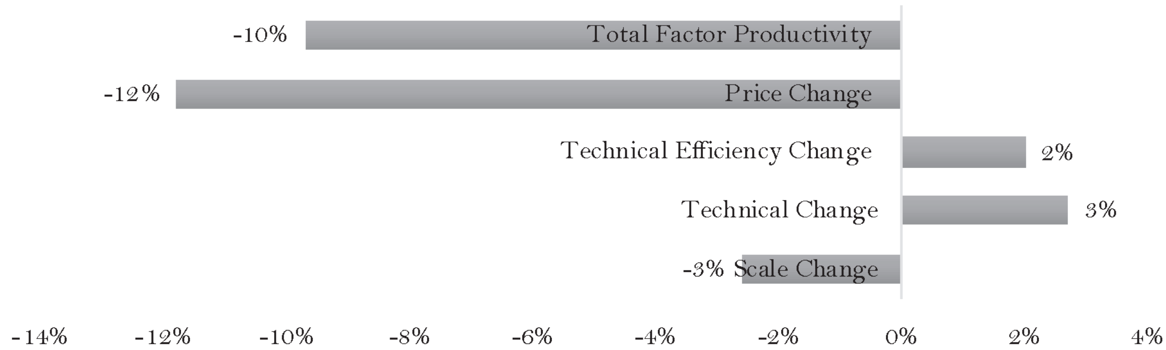

Figure 1 Temporal variations in technical change, technical efficiency change, scale change, allocative change, and TFP growth in the Indian sugar industry (2002–2018)

Source Authors' calculation

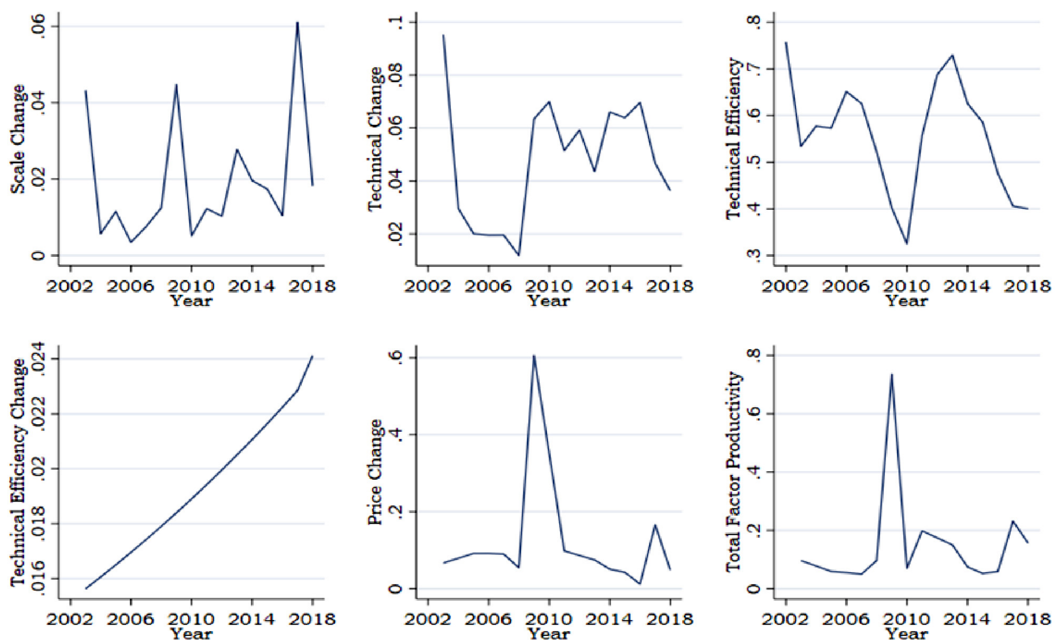

Figure 2 Trend of temporal scale change, technical change, technical efficiency, technical efficiency change, allocative change and TFP growth of sugar manufacturing industry (2002–2018)

Source Authors' calculation

efficiency shows that the global recession impacted the input prices and led the TFP growth to decline. The scale efficiency began improving after 2012 and supported the growth in TFP. These results are in line with Singh (2016) on the temporal variation in TFP growth.

The TC averaged 3.00%; it was highest in West Bengal (15.00%) and Chhattisgarh (14.90%) (Figure 3). The technical change was the least in Uttar Pradesh (–3.40%) and Maharashtra (3.00%). The scale change averaged –3.00%. The allocative change was negative for all states except Haryana and Telangana. The scale change was positive in Karnataka and Maharashtra, indicating that the sugar policy reform positively impacted the industry in the two states. Uttar Pradesh and Maharashtra produce the most sugarcane among the states in India. The pricing policy differs by state. Tamil Nadu and Uttar Pradesh have adopted the state advisory price (SAP). Karnataka and Maharashtra have adopted the fair and remunerative price (FRP) fixed by the central government (ISMA-Grant Thornton 2014). The SAP is substantially higher than the FRP.

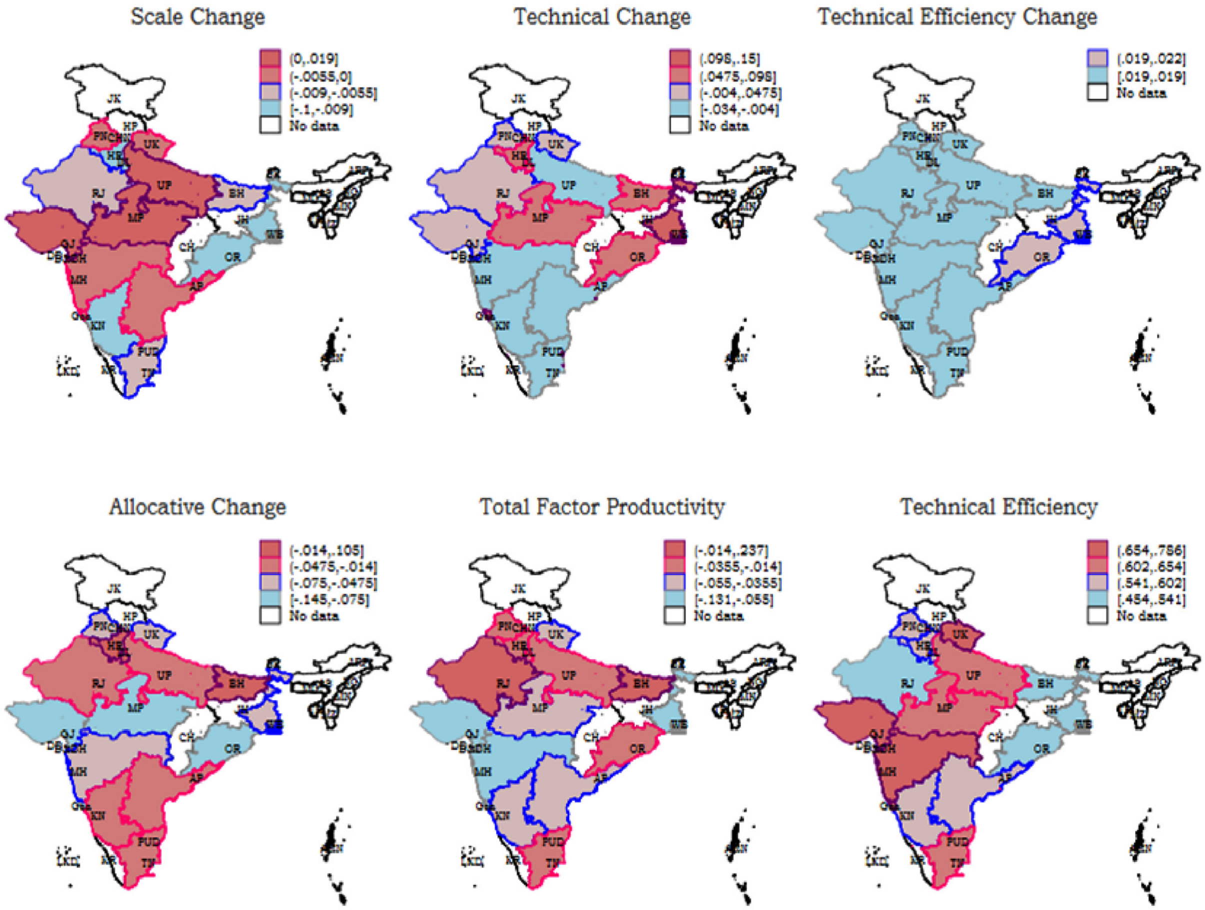

Figure 3 Spatial variation of the TFP (and components) of the Indian sugar industry (2002–2018)
Source Authors' calculations

Tamil Nadu and Uttar Pradesh are the least impacted by the price change compared to Karnataka and Maharashtra. The average price change in Uttar Pradesh has the least effect on the price change in the states. The TFP was highest in Chhattisgarh and lowest in Maharashtra, probably because Maharashtra has more sugar mills.

Conclusion and policy implications

The Indian sugar industry competes directly with the global sugar industry. The average value of capital use was higher than the other inputs. To stay competitive, the industry needs capital to adopt modern technology and adjust to the dynamic business environment. To help it do so, the government has liberalized policies and set up institutions.

The findings of the stochastic frontier approach explain the dynamic behaviour of the components of the industry's TFP. The economic shocks from the domestic economy and global markets impact the factors of production and TFP growth. The TFP grew at –10% on average during the study period. The growth varied widely by state. The average TFP growth regressed in all the states except Rajasthan, Bihar, Chhattisgarh, and Telangana.

The rhythm of the country-level TFP growth matched the rhythmic change in allocative efficiency (price effect). The fluctuations in allocative efficiency reduced technical efficiency. The industry's technical efficiency is poor—its technical inefficiency increased over time and it was around 42% during the study period. The industry did not use input resources efficiently and its technical efficiency fell as the business scenario changed.

The growth in TFP was driven temporarily by technical change and technical efficiency change and it was adversely affected by allocative efficiency. The government must institute a mechanism to improve technical efficiency and the industry needs to learn to use inputs optimally. To improve allocative efficiency, the government must implement price policy reforms.

The industry's technical progress increased continually during the study period but it declined in the last two years. To boost technical progress, old and obsolete technology needs to be replaced with modern processing and preservation technology and the labour force needs to learn to use the machinery.

A few states have not adopted the fair remunerative price for cane. Nevertheless, the government must rationalize the pricing policy of the factors of production to make the industry more sustainable.

This paper quantifies TFP and its components—technical progress, technical efficiency, and scale efficiency—and adds to the literature. The in-depth analysis would provide feedback to researchers, industry management, and policymakers and help them to design and refine policy and target their investment.

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Appendix

Table 1 Likelihood ratio test

Null Hypothesis	Degree of freedom	Statistic test	Critical Value at 5%	Decision
Cobb-Douglas vs Translog 1	4	407.60	8.76	Reject H0
Translog 1 vs Translog 2	3	107.14	7.04	Reject H0
Translog 2 vs Translog 3	4	1,050.18	8.76	Reject H0
Time invariant vs Time varying	1	346.02	2.70	Reject H0

Source Table 1, Econometrica, Kodde and Palm (1986)

Table 2 Share of labour, capital, and fuel (2002–2018)

Year	Labour Share	Capital Share	Fuel Share	RTS
2002	0.14	0.83	0.04	1.19
2003	0.14	0.83	0.03	1.17
2004	0.07	0.47	0.47	1.01
2005	0.09	0.47	0.44	1.02
2006	0.08	0.46	0.46	1.00
2007	0.08	0.45	0.47	0.97
2008	0.07	0.43	0.50	0.94
2009	0.19	0.76	0.05	1.04
2010	0.15	0.80	0.06	1.10
2011	0.16	0.79	0.06	1.05
2012	0.07	0.87	0.06	1.28
2013	0.05	0.89	0.07	1.27
2014	0.05	0.89	0.07	1.26
2015	0.04	0.91	0.05	1.24
2016	0.03	0.91	0.06	1.27
2017	0.06	0.83	0.11	1.01
2018	0.05	0.83	0.12	0.97

Table 3 Spatial variation in technical change, technical efficiency change, scale change, allocative change, and TFP growth (2002–2018)

State	SC	TC	TEC	AEC	TFP	TE	No. of Mills
Punjab	–0.10%	–0.10%	1.90%	–5.20%	–3.40%	59.80%	301
Uttaranchal	0.00%	3.30%	1.90%	–4.90%	–4.80%	66.00%	175
Haryana	–1.10%	6.20%	1.90%	2.10%	–1.90%	56.90%	147
Rajasthan	–0.70%	2.50%	1.90%	–4.60%	0.80%	47.90%	25
Uttar Pradesh	0.50%	–3.40%	1.90%	–1.40%	–1.40%	64.60%	2035
Bihar	–0.70%	6.60%	1.90%	–1.00%	4.60%	50.80%	187
West Bengal	–10.00%	15.00%	2.10%	–5.30%	–5.70%	45.40%	13
Orissa	–4.40%	9.10%	2.00%	–10.80%	–2.20%	49.70%	62
Chhattisgarh	–0.60%	14.90%	2.10%	10.50%	23.70%	63.90%	15
Madhya Pradesh	1.90%	9.80%	1.90%	–7.50%	–4.80%	62.20%	159
Gujarat	0.40%	1.90%	1.90%	–9.30%	–6.30%	78.60%	278
Maharashtra	0.00%	–3.10%	1.90%	–5.20%	–13.10%	68.80%	2,563
Andhra Pradesh	–0.30%	–0.40%	1.90%	–2.00%	–3.70%	58.10%	517
Karnataka	–0.90%	–1.40%	1.90%	–1.50%	–4.30%	56.50%	780
Goa	–0.50%	11.60%	1.90%	–14.50%	–11.70%	65.70%	18
Tamil Nadu	–0.80%	–2.60%	1.90%	–2.70%	–3.10%	65.40%	679
Pondicherry	–3.70%	11.10%	1.90%	–13.30%	–5.50%	60.60%	25
Telangana	0.00%	6.40%	2.20%	7.00%	14.30%	54.10%	50