A Study on Manufacturing Industry in India

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Abstract

In this paper an effort is made to measure the productive efficiency of aggregate manufacturing sector in Tamil Nadu in the liberalized regime for the reference period from 1991-1992 to 2011-2012. A stochastic frontier production function model was applied to analyze the data. The summation of the elasticities of factors of production, indicated return to scale of 1.287. Since the value of return to scale was greater than unity, one percent increase in inputs (labour and capital) resulted an increase 1.287 percent in output level for the stochastic frontier. In terms of technical efficiency, the manufacturing sector in Tamil Nadu recorded an average efficiency of 0.939 (93.0 percent). It was also revealed that the technical efficiency of industries in Tamil Nadu have not shown any decline but showed mixed trend. The average technical inefficiency was observed as 0.065, which was negligible. In order to reduce the inefficiency in future, and become more efficient the manufacturing sector can increase output using the existing resources or by reducing costs given the current level of production.

The Indian economy is the tenth-biggest on the planet by alleged Gross domestic product and the third-biggest by obtaining power equality (PPP). India was the nineteenth biggest stock and the sixth biggest administrations exporter on the planet in 2013; it imported a sum of $616.7 billion worth of stock and administrations in 2013, as the twelfth biggest stock and seventh biggest administrations merchant. India's financial development eased back to 4.7% for the 2013– 14 monetary years, as opposed to higher financial development rates in 2000s. IMF extends India's Gross domestic product to develop at 5.4% more than 2014-15. Assembling industry has held a consistent offer of its monetary commitment, while the quickest developing piece of the economy. The manufacturing sector is an important sector of the Indian economy comprising about 31 percent of the non-agricultural sector, which makes up 75 percent of the overall GDP in India (Kalirajan and Bhide 2005).

The post-independence time Indian economy (from 1947 to 1991) was a blended economy with an internal looking, midway arranged, interventionist approaches and import-substituting monetary model that neglected to exploit the post-war development of exchange and that nationalized numerous divisions of its economy. India's offer of worldwide exchange tumbled from 1.3% out of 1953 to 0.5% of every 1983. This model added to across the board wasteful aspects and debasement, and it was ineffectively actualized.

After a fiscal crisis in 1991, India has increasingly adopted free-market principles and liberalized its economy to international trade. These reforms were started by former Finance minister Manmohan Singh under the Prime Minister of P.V.Narasimha Rao. The country's economic growth progressed at a rapid pace, with relatively large increases in per-capita incomes. Since 1991, continuing economic liberalization has moved the country towards a market-based economy. By 2008, India had established itself as one of the world's faster-growing economies. Growth significantly slowed to 6.8% out of 2008– 09, yet along these lines recuperated to 7.4% out of 2009– 10, while the monetary shortage ascended from 5.9% to a high 6.5% amid a similar period. India's present record shortfall surged to 4.1% of Gross domestic product amid Q2 FY11 against 3.2% the past quarter.

Tamil Nadu is the second biggest supporter of India's Gross domestic product. Tamil Nadu's gross state residential item for the year 2011– 2012 was 4.28 trillion (short scale) or $145,868 Million. The state has demonstrated a development of 9.4 for each penny in the year 2011– 2012. Tamil Nadu is the second most industrialized state in India. It positions third in remote direct venture (FDI) endorsements (aggregate 1991– 2002) of 225,826 million ($5,000 million), next just to Maharashtra and Delhi constituting 9.12 for every penny of the aggregate FDI in the nation. The per capita wage in 2007– 2008 for the state was 72,993 positioning third among states with a populace more than 10 million and has relentlessly been over the national normal. As indicated by the 2011 Statistics, Tamil Nadu is the most urbanized state in India (49 for every penny), representing 9.6 for each penny of the urban populace while just containing 6 for each penny of India's aggregate populace. Administrations add to 45 for each penny of the financial movement in the state, trailed by assembling at 34 for every penny and horticulture at 21 for every penny. Government is the significant financial specialist in the state with 51 for every penny of aggregate speculations, trailed by private Indian speculators at 29.9 for each penny and remote private speculators at 14.9 for every penny. Tamil Nadu has a system of around 113 mechanical stops and domains offering created plots with supporting foundation.

As indicated by the distributions of the Tamil Nadu government the Gross State Household Item at Steady Costs (Base year 2004– 2005) for the year 2011– 2012 is 428,109 crores, an expansion of 9.39 for every penny over the earlier year. The per capita pay at current cost is 72,993.

The effectiveness term depicts the greatest yields feasible from using the accessible information sources. A creation is proficient in the event that it can't enhance any of its data sources or yields without exacerbating some of its different information sources or yields. Effectiveness can be expanded by limiting information sources while holding yield steady or by augmenting yield while holding inputs consistent or a blend of both may build proficiency (Assumed name Radam et al, 2010). Gainful productivity (otherwise called specialized effectiveness) is characterized as a circumstance in which the most generation is accomplished from the assets accessible to the maker It happens when the economy is using the greater part of its assets proficiently, delivering most yield from slightest info.

Productive efficiency occurs when the economy is utilizing the majority of its assets skillful. The concept is illustrated on a production possibility frontier (PPF)) where all focuses on the bend are purposes of greatest gainful effectiveness (i.e., no more yield can be accomplished from the given sources of info). Balance might be profitably productive without being allocatively capable—i.e. it might bring about a dispersion of merchandise where social welfare isn't boosted.

- Productive proficiency happens when creation of one great is accomplished at the most reduced asset (input) cost conceivable, given the level of generation of alternate good(s). Comparably, it happens when the most noteworthy conceivable yield of one great is created, given the generation level of alternate good(s). In long-run balance for flawlessly focused markets, this is at the base of the normal aggregate cost bend—i.e. where minimal cost parallels normal aggregate cost.
- Productive effectiveness requires that all organizations work utilizing best-rehearse mechanical and administrative procedures. By enhancing these procedures, an economy or business can broaden its generation probability boondocks outward, with the goal that effective creation yields more yield.
- Because of the idea of monopolistic organizations, they may not be profitably productive, as a result of X-wastefulness, whereby organizations working in an imposing business model have less of a motivating force to augment yield because of absence of rivalry. Nonetheless, because of economies of scale it can be feasible for the benefit boosting level of yield of monopolistic organizations to happen with a lower cost to the purchaser than impeccably focused organizations.
- The assurance of wilderness innovation and learning of profitable productivity and its association with firm size can give critical bits of knowledge into future Indian ventures. Advance more, the connection between productivity levels and different industry-particular elements can give helpful approach – applicable data. An examination of industry's wilderness or "best practice" capacity and its normal practice capacity will create valuable data about conceivable future auxiliary modifications for the ventures.

Methodology

The basic data source of the study was Annual Survey of Industries (ASI) published by Central Statistical Organization (CSO), Government of India covering the period from1991-92 to 2011-12. All the referred variables were normalized by taking log values. Gross output was taken as dependent variable. Number of. labourers(L) consisted of both workers directly involved in production and persons other than workers like supervisors, technicians, managers, clerks and similar type of employees. The fixed capital (K) was taken into account as capital.

Tool of analysis- Stochastic frontier production function

A stochastic frontier production function as proposed by Battese and coelli (1992) is defined as:

$$Y_i = f(X_i, \beta)\, \varepsilon^{ei}$$

Where Yi, is the output vector for the i^{th} firm, X_i is a vector of inputs, β is a vector of parameter and ε_i is an error term. In this model, a production frontier defines output as a function of a given set of inputs, together with technical inefficiency effects. Furthermore, this model specifies that these inefficiency effects are modeled by other observable explanatory variables and all parameters are estimated simultaneously. The stochastic element of this model allows some observations to lie above the production function, which makes the model less vulnerable to the influence of outliers than with deterministic frontier models.

The stochastic frontier is also called composed error model, because it postulates the error term ε_i as two independent error components:

$\varepsilon_i = v_i + u_i$

When a symmetric component is normally distributed, $v_i \sim (N, \sigma_v^2)$, represents any stochastic factors that is beyond the firm's control affecting the ability to produce on the frontier such as luck or weather. It can also account for measurement error in Y or minoromitted variables. The asymmetric component, in this case distributed as a half- normal $u_i \sim (N, \sigma_v^2)$, $u_i > 0$ can be interpreted as pure technical inefficiency. This component has also been interpreted as an unobservable or latent variable; usually representing managerial ability.

The parameters of v and u can estimated by maximizing the following log-likelihood function:

$$\ln (Y \sim \beta, \lambda, \sigma^2 = \frac{N}{2} \text{In} [\ \frac{2}{\pi}\ ] - \text{Nin}\ \sigma + \sum_{i-1}^{N} \text{In}\ [\ 1 - F(\varepsilon_i \lambda \sigma^{-1})] + \frac{1}{2\sigma^2} \sum_{i=1}^{N} \varepsilon_1^2$$

Where,

$\varepsilon_I = Y_1 - f(X_i, \beta)$

$\sigma^2 = \sigma_u^2 + \sigma_v^2$

$\lambda = \sigma_u / \sigma_v$

F = the standard normal distribution function

N = Number of observation

Given the assumptions on the distribution of v and u, Jondrow et al. (982) showed that the conditional mean of u given ε is equal to

$$E\ (u_i \setminus \varepsilon_i) = \frac{\sigma_u \sigma_v}{\sigma} [\ \frac{f\ (\varepsilon i\ \lambda\sigma)}{1 - f\ (\varepsilon i\ \lambda\sigma)} - \frac{\varepsilon i\ \lambda}{\sigma}$$

Where f and F are the standard normal density and distribution functions evaluated at $\varepsilon_i\ \lambda/\sigma$. Measures of technical efficiency (TE) for each firm can be calculated

$TE_i = \exp\ (\ -E[u_i / \ \varepsilon\ ]\ )$ so that $0 \leq TE \leq\ 1$

The Cobb- douglas stochastic frontier production function in logarithm form is as follows:

$$\ln VAi = \ln \beta_0 + \beta_1 \ln C + \beta_2 \ln L_i + \beta_3 \ln E_i + \varepsilon_I$$

Where VA represents Net value added per year. Independent variables are C (capital) and L (number of labourers). Parameters $\beta_0$denotes the technical efficiency level and β_I is elasticity of the various inputs with respect to output level.

Table-1 Summary statistics of Tamil Nadu Manufacturing Industries

Variable	Mean	Std .Dev	Mini mum	Maxi mum	C.V
Gross output	0.939	0.044	0.87	1	4.7436
Invested Capital (K)	2.137	0.114	2	2.39	5.35407
Number of workers (L)	2.553	0.300	2	3.1	11.7698

Source: calculations are based on ASI Data

Foot Note: C.V - co –efficient of variation

Mean values of input variables indicate that the industry's main factors of production were both capital and labour since there were not much differences in their mean values. The magnitude of variability (C.V) also substantiated this point since the co-efficient are less for both the inputs.

Table-2 show the maximum likelihood estimates of TamilNadu industries in the context of its productive efficiency.

Table-2 Maximum Likelihood estimated of stochastic frontier production function – Tamil Nadu Manufacturing Industries

Variable	Co-efficient	Std-error	t – ratio
Intercept	-0.549	0.408	-1.348
Ln K	0.187	0.316	0.592
LnL	1.100	0.112	9.864***
σ^2	50.769	19.847	2.558**
Γ	0.999	0.00002	31836.064***

Source: Calculations are based on ASI Data

Foot Note: ** - Significant at 5 % level *** - Significant at 10 % level

The maximum likelihood estimates for productive efficiency of manufacturing industries show that in single output case, parameters of capital input was positive and statistically significant. Hence capital is main input factor for these industries as its value was higher than labour. The co-efficient of σ^2 and γ were statistically significant though the sign of them differs. It reveals that estimated levels of output considerably differ from their potential levels due to factors, which are within the control of the industries. The summation of the elasticity's of factors of production, indicated return to scale of 1.287.The value of return to scale greater than unity suggested that increasing returns to scale prevails. One percent increase in inputs (labour and capital) resulted in an increase 1.287 percent in output level for the stochastic frontier.

Table-3 presents the 7 years group wise technical efficiency of Tamil Nadu industries during the period 1991-92 to 2011-12.

Table -3 Technical efficiency- Tamil Nadu Manufacturing Industries

Year	Efficiency score
1991-98	6.414
1998-05	6.607
2005-12	6.701
Mean	0.939
Average inefficiency score	0.065

Source: calculations are based on ASI data

Average technical inefficiency score is derived from the formula [1-average efficiency/ average efficiency]

In terms of technical efficiency, the manufacturing sector in Tamil Nadu recorded an average efficiency of 0.939 (93.0 percent). The table also reveals that the technical efficiency of Tamil Nadu industries have not shown any decline but showed mixed trend. The average technical inefficiency was observed as 0.065, which was negligible.

Conclusion

The Tamil Nadu manufacturing Industries were enjoying increasing returns to scale. This had no doubt made the aggregate industries also work under increasing returns to scale. The technical efficiency of industries has not shown any decline but showed mixed trend. The inefficiency present in aggregate industries was zero. But in as indicated earlier about their inefficiency in future, these industries can become more efficient by increasing output using the existing resources or by reducing costs given the current level of production. Labour was the main factor without much variation in its contribution to the growth of net value added in Tamil Nadu manufacturing industries. Whereas capital was the main input factor for aggregate industries. The main factors of production were both capital and labour in Tamil Nadu manufacturing industries.

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