AN EXAMINATION OF TECHNICAL EFFICIENCY OF MSMES INDUSTRIES IN HARYANA: A CASE STUDY OF FARIDABAD DISTRICT

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ABSTRACT

India's economy's micro, small, and medium-sized enterprises (MSME) sector produce several goods. One of the most accurate ways to characterize the Industrial Sector is by its technical efficiency, which allows it to sustain a high level of manufacturing production. An investigation of the productivity and efficiency of micro, small, and medium-sized firms (MSMEs) in the industrial sector of Faridabad, Haryana, is carried out using parametric frontier analysis. Within the context of his essay on efficiency evaluation, which was published in 1957, Farrell presented various approaches for examining productivity and efficiency. The function that determines the creation of the stochastic frontier. We use a multistage estimation technique that incorporates four distinct error components to arrive at reasonable estimates. From 2016 through 2022, the data from the Ministry of MSMEs and the organization that is part of the state government were utilized. An investigation into the machinery and equipment that is utilized by micro, small, and medium-sized firms will be carried out as part of this study.

Keywords: *Technical efficiency; MSMEs; Manufacturing Industries, Production, SFA, Faridabad*

1. INTRODUCTION

Micro, small, and medium-sized enterprises (MSMEs) drive the GDP, services, manufacturing, and exports in any country, including India. Haryana has advanced in many industries, including MSMEs, since its inception. These businesses are crucial in addressing poverty, income inequality, and unemployment by providing widespread employment opportunities at low investment levels, making them a crucial economic sector. The growth of MSMEs, along with overall national development, is significantly influenced by the banking sector. Financial institutions in India operate under government guidelines and have contributed to the expansion of MSMEs. However, it is important to focus on productivity metrics. Productivity measures the output of goods and services per capital unit, labour, or both. The output-to-input ratio measures manufacturing productivity. This research explores the impact of financial institutions on MSMEs in Faridabad and their efforts to improve productivity.

1.1 Definition of MSMEs in India

Indian MSMEs refer to Micro, Small, and Medium Enterprises in India. These enterprises are classified based on their plant and machinery or equipment investment. According to Section II B of the 1951 Industries Development and Regulation Act, small-scale industries are defined based on their investment in equipment and machinery. In 1950, the Indian Ministry of MSME clearly defined small-scale industries. The Indian labour force employment power and fixed asset investment cap were established as the initial official criteria for small-scale enterprises in 1955. In 1960, small-scale industrial enterprises were obligated to invest solely in fixed assets such as equipment and machinery. Restrictions on machinery and plant investment have undergone multiple adjustments to address various challenges. Indian Micro, Small, and Medium Enterprises (MSMEs) are characterized by their expenditure on plant and machinery. The 2006 MSMED Act provides the current definition for MSMEs. The Act categorizes Micro, Small, and Medium Enterprises (MSMEs) into certain groups.

The 2006 MSMED Act includes medium-sized firms in this census for the first time. The Small and Medium Development Bill was enacted when the President signed it. The "Small and Medium Enterprise Development, 2006"

Act will become effective on October 2, 2006. This legislation established medium-sized firms as a distinct classification. Notable characteristics of the Act:

- The regulatory framework introduces guidelines for consolidating the three levels of these organizations and acknowledging the concept of "enterprise," which combines production and services.
- Traditional enterprises offer mechanical and descriptive services. Both types of enterprises are distinguished by their plant, machinery, and equipment investments. Micro, small, and medium-sized businesses make these investments. Small producers are allocating a maximum budget of Rs 25 lakh. Small enterprises can invest up to Rs 5 crore, potentially as low as Rs 25 lakh. Medium-sized firms typically invest between 10 to 5 crore rupees.
- Service sector microenterprises can get a maximum of Rs 10 lakh. Small and medium-sized businesses (SMBs) often require capital ranging from Rs 2 crore to Rs 10 lakh. Medium-sized firms typically invest between 5 to 2 crore rupees.

2. REVIEW OF LITERATURE

This section examined various prominent studies that evaluated the productivity and efficiency of India's industrial sector. The loss in total factor productivity growth (TFPG) until the 1970s and its subsequent improvement in the mid-1980s can be attributed to open trade and liberal industrial policies, as indicated by various research (Ahluwalia, 1991; Dholakia & Dholakia, 1994; Majumdar, 1996; Rao, 1996; Trivedi et al., 2000). However, Balakrishnan and Pushpangadan (1994) contend that the rise in total factor productivity growth (TFPG) throughout the 1980s was exclusively attributable to a measurement error. According to them, the investigations employed a single deflation method instead of a double deflation methodology. Furthermore, there are also notable inconsistencies in research findings during the time after the alterations. Multiple studies, including Trivedi et al. (2000), Balakrishnan et al. (2000), Ray (2002), Goldar and Kumari (2003), and Das

(2004), indicate a decline in total factor productivity growth (TFPG) in the 1990s. In contrast, research conducted by Krishna and Mitra (1998), Unel (2003), and Tata Services Ltd (2003) indicates a rise in total factor productivity growth (TFPG) throughout the identical timeframe. The study done by Mahmood, Ghani, and Din (2006) employed the production frontier technique to assess the efficiency of the manufacturing sector on a large scale in Pakistan. Their approach consisted of computing the ISIC 5-digit stochastic production frontier for two specific time periods and industries. In a study conducted by Nikaido (2004), the relationship between the use of industry-specific data on size and location and the technological efficiency of small-scale enterprises in 2-digit industry groups was examined. The study utilized the stochastic frontier methodology.

In a recent study, Trivedi et al. (2011) employed both parametric and non-parametric approaches to measure the total factor productivity growth (TFPG) of the manufacturing sector. The study determined that the performance of TFPGs is impacted by the methodologies employed. Using the growth accounting (G.A.) method, researchers have shown that the total factor productivity growth (TFPG) for the organized manufacturing sector between 1980-1981 and 2003-2004 is 0.92% per year. This represents around 50% of the 1.81% annual growth that was attained by implementing the production function technique. According to the study conducted by Roy, Das, and Pal (2016), the technical efficiency of organized manufacturing units remains consistent over time, suggesting that any alterations in technical efficiency over time are not statistically significant. The scale effect has had minimal, if not completely absent, impact on the overall factor productivity development in the manufacturing sector in India.

The literature above review presents three notable conclusions. Initially, most research focused on assessing Total Factor Productivity Growth (TFPG) in the manufacturing industry using various data points and approaches, resulting in differing findings across various studies. Moreover, further investigation is necessary to evaluate the effectiveness and productivity of the manufacturing sector in the Faridabad District.

To address this problem, we developed a database encompassing a certain geographical region. The dataset consists of annual data for the 33 micro, small, and medium businesses (MSME) sectors in the Faridabad District from 2019 to 2022. In addition, most studies undertaken on the manufacturing sector have depended on current data. Analyzing the elements contributing to the rise of total factor productivity (TFP) is crucial. These factors can be divided into three basic components: changes in technical efficiency, scale implications, and technological advancements.

3. OBJECTIVES

- To analyze the organized manufacturing process of MSMEs in Faridabad.
- To examine the technical efficiency of MSMEs in Faridabad.

3.1 Manufacturing Methods

Faridabad MSMEs manufacture vehicle components, electrical equipment, textiles, machinery, and consumer goods. Production processes are divided into:

- MSMEs buy raw materials from local and international sources.
- Cost savings and reliable supply require efficient procurement methods, including bulk purchases and long-term supplier relationships.
- Methods of production MSMEs in various industries use machining, welding, assembling, and finishing. Many organizations still use manual or somewhat automated processes.
- Product quality is crucial. MSMEs provide quality control by inspecting the production process, testing the end product, and adhering to ISO standards.

3.2 Tech Adoption

- Due to demands for efficiency and competitiveness, Faridabad MSMEs are adopting technology faster.

- Automation and Machinery: Many MSMEs have successfully integrated sophisticated machinery and automation to optimize production processes. However, many still use conventional methods due to high upfront costs and limited technical expertise.
- Inventory, production scheduling, and financial transactions are easier with IT solutions like ERP systems. However, IT integration varies widely among enterprises.
- Advanced research and development: Financial constraints limit MSMEs' R&D investment. Partnerships with universities and corporations can boost innovation.

3.3 Labor Force Optimization

- The existence of skilled workers is problematic. Many micro, small, and medium enterprises (MSMEs) invest in training to improve employee skills. Technical schools and vocational training facilities are vital to workforce development.
- Faridabad has low labour costs but needs more output. Staff management measures, including performance-based incentives and continual training, are essential for maximum productivity.

3.4 Operations and Logistics Management

- Strong supplier partnerships ensure a timely supply of raw materials and components. Micro, Small, and Medium Enterprises (MSMEs) sometimes struggle to maintain these partnerships due to their limited negotiation skills.
- Logistics and transportation systems must work well to avoid delays and save money. Faridabad MSMEs benefit from proximity to major markets and ports. Efficient inventory management, including Just-In-Time (JIT) and lean manufacturing principles, reduces inventory holding costs and improves cash flow.

3.5 Market Dynamics

- Faridabad MSMEs sell domestically and internationally. Exports are growing, but competition and international standards pose issues.

- Changing consumer tastes and demand trends must be monitored. MSMEs must be able to respond swiftly to market changes to be competitive.
- Government programs like "Make in India" and MSME development plans provide financial, technological, and commercial support. These methods benefit micro, small, and midsize firms.

4. Materials and Method

The data was collected through the structured questionnaire. The questionnaire was circulated among the workers and owners of the firms. The dataset comprises many variables, including capital assets (X1), number of workers (X2), raw material (X3), rental expenditure (X4), repair and maintenance (X5), total costs on wages (X6), interest on loan (X7), production (Y1), and value-added (X8). To ensure the reliability of our findings, we incorporate the industry-pooled model to assess their robustness. The outcomes of this study are influenced by the incorporation of the industry stochastic frontier analysis normal/half-normal model in the Manufacturing Industries in Faridabad.

For the most part, research into technical efficiency in the MSME manufacturing sector has relied on stochastic frontier production approaches, which examine data points and their consequences to conclude. In addition, almost no studies have examined how we used cross-sectional databases to evaluate the efficiency and production of four distinct manufacturing subsectors in the Faridabad District: machinery and equipment, metal fabrication, rubber and plastic, and rubber and plastic. This dataset covers 2016–2022, including data from 33 different MSME industries in the Faridabad District. The study also focused on the machinery and equipment, metal fabricating, and rubber and plastic sectors to analyze various production technologies, including low-tech, continuous, and mid-tech batch production. These industries use continuous manufacturing, low-tech batch production, and mid-tech batch production. We may calculate its technical efficiency level by contrasting each plant's actual production with the greatest output that might be achieved in the same period with the same input. Using the model by Battese and Coelli (1995), we aim to determine whether sector-specific characteristics influence the technological efficiency of micro, small, and medium-sized manufacturing businesses. This phenomenon has been studied in connection to several epochs of economic growth, considering the efficacy of technological advancements in manufacturing. What follows is an extensive analysis of the many policy shifts that have impacted the country's industrial development.

5. RESULTS AND DISCUSSION

Table 1 Production Function of MSMEs in Faridabad District

Variables	Micro	Small	Medium	Pooled
logx1	-0.0362***	0.0634	0.095	-0.0202
	(0.0013)	(0.0743)	(0.1956)	(0.0354)
logx2	-0.0831	-0.0534	-0.1164	0.3557***
	(0.1158)	(0.0646)	(0.2231)	(0.0658)
logx3	0.7438	0.0098	0.4560**	0.0071
	(0.6058)	(0.0369)	(0.1941)	(0.0849)
logx4	0.1403	0.0217	-0.1058	0.0208
	(0.1111)	(0.0369)	(0.1002)	(0.0379)
logx5	0.457	-0.0315	-0.3818	0.1456**
	(0.3555)	(0.0578)	(0.2553)	(0.0613)
logx6	0.0442***	0.1922***	0.0955	0.2787***
	(0.0013)	(0.0642)	(0.1133)	(0.0482)
logx7	0.3955	-0.0011	-0.1596	0.0202
	(0.3314)	(0.0405)	(0.1904)	(0.0656)
logx8	-1.838	0.2748	-1.2236***	0.1753
	(1.3941)	(0.2373)	(0.3888)	(0.2152)
Constant	8.9369***	7.1565***	20.3581***	0.8127***
	(1.2561)	(0.8969)	(4.1901)	(0.2078)
Sigma	-5.8967***	-6.3797***	-6.3185	5.7137***
	(0.3977)	(0.6383)	(6.2811)	(1.193)
Gamma	5.6729	1.9320*	-1.3268	0.2627
	(0.4637)	(1.062)	(2.9472)	(1.9316)
Mu	0.0221	0.0169	-0.7034	0.0003
	(0.0225)	(0.0459)	(0.7272)	(0.1758)
Eta	0.5	0.5	0.5	0.26
Observations	112	91	28	231

Using panel data for micro, small, and medium enterprises as well as pooled data, the results of a Stochastic Frontier Analysis (SFA) are displayed in the table. We show the significant levels after evaluating the effect of each independent variable on the dependent variable. Here is a detailed breakdown of the results.

5.1 Micro Enterprises

Micro firms have a logx1 coefficient of -0.0362, which is *** statistically significant at the 1% level. This indicates that the dependent variable decreases significantly with increasing logx1. The productivity or efficiency of micro businesses is negatively affected by an increase in logx1. A standard error of 0.0013 gives credence to this, suggesting a precise evaluation.

Statistical significance is at the 1% level (***) with a logx6 coefficient of 0.0442. This suggests that small enterprises are significantly more successful or productive as logx6 increases.

At the 1% significance level (***), the constant term's value of 8.9369 indicates a strong baseline influence. Significant at the 1% level (***), Sigma's coefficient of -5.8967 suggests a great deal of variation in inefficiency consequences. The percentage of total variance that inefficiency may explain is the gamma coefficient, which is 5.6729. Be advised that this coefficient does not possess statistical significance.

5.2 Small Enterprises

The dependent variable is significantly impacted positively by the independent variable logx6, which shows a positive coefficient of 0.1922 at the 1% significance level (***). There is strong evidence of a baseline effect since the constant term of 7.1565 is statistically significant at the 1% level (***). Statistical significance at the 1% level (***) is indicated by the sigma value of -6.3797. There is much variation in the effects of inefficiency. At the 10% significance level, the computed gamma coefficient of 1.9320 is considered statistically significant (*). Therefore, inefficiency is responsible for a portion of the variability.

5.3 Medium-sized Enterprises

At the 5% significance level (**), the variable logx3 has a positive and statistically significant coefficient of 0.4560, suggesting that it substantially affects the dependent variable. Despite being -0.1058, the coefficient of the logarithm of x increased to the power of 4 does not have a statistically significant influence. A negative coefficient of -1.2236 for the variable logx8 at the 1% level (***) indicates a substantial negative effect on the dependent variable. At the 1% significance level (***), the constant term of 20.3581 indicates a substantial baseline influence.

Table 2 Technical Efficiency of MSMEs in Faridabad District

Year	Mean	Std. Dev.	Max
2016	0.655	0.167	0.860
2017	0.501	0.175	0.853
2018	0.824	0.173	0.964
2019	0.672	0.145	0.950
2020	0.742	0.157	0.928
2021	0.551	0.22	0.812
2022	0.836	0.446	0.445

In 2016, the average efficiency of firms was 0.655, meaning that they operated at 65.5% of their maximum efficiency. The efficiency among firms exhibits modest variability, as indicated by a standard deviation of 0.167. The highest recorded efficiency was 0.860, meaning that the most efficient firm ran at 86.0% efficiency. The average efficiency declined to 50.1% in 2017, reducing the mean efficiency to 0.501. The standard deviation experienced a marginal increase to 0.175, suggesting a minor rise in variability among firms. The peak efficiency was 0.853, which was somewhat below the level achieved in 2016. The most efficient firm operated at a rate of 85.3%. In 2018, efficiency was considerably improved, as seen by the mean efficiency increasing to 0.824. This data suggests that, on average, businesses functioned at 82.4% of their maximum efficiency. The standard deviation was 0.173, indicating a considerable level of variability. The most significant reported maximum efficiency across the years was 0.964, meaning that the most efficient enterprise worked at 96.4%. In 2019, the average efficiency slightly declined, reaching a value of 0.672, corresponding to 67.2%. The standard deviation has fallen to 0.145, showing a reduction in efficiency variability among firms. The peak efficiency reached a value of 0.950, indicating a notable level of effectiveness for the leading enterprise.

In 2020, efficiency was further improved, as the average efficiency increased to 0.742. This suggests that businesses functioned at an average efficiency level of

74.2%. The standard deviation was 0.157, suggesting a modest level of variability. The highest efficiency level achieved was 0.928, indicating a significant efficiency level for the most effective enterprise. The average efficiency in 2021 decreased to 0.551, indicating a decline to 55.1%. The standard deviation has risen to 0.22, suggesting more significant variability in efficiency across firms. The highest recorded efficiency was 0.812, the lowest among all the most excellent efficiencies in the dataset, indicating a decrease in top performance. The average efficiency of firms dramatically climbed to 0.836 in 2022, indicating that, on average, they performed at 83.6% efficiency. Nevertheless, the standard deviation experienced a significant increase to 0.446, suggesting considerable variability among firms. Curiously, the highest level of effectiveness was 0.445, which is an abnormality as it is lower than the average and implies the possibility of data problems or inaccurate reporting.

6. CONCLUSION

Findings from the study show that different characteristics in micro, small, medium, and pooled data have varying degrees of importance and influence. Notably, logx6 reliably has a strong positive effect on micro, small, and mixed datasets. On the other hand, medium-sized businesses are severely impacted negatively by the function logx8. These results highlight the importance of numerous elements influencing the efficacy and output of businesses of diverse sizes.

The performance of firms exhibited swings over the years. In 2018 and 2022, significant enhancements were noted, with average efficiencies of 0.824 and 0.836, respectively. Nevertheless, these years also saw notable fluctuations, especially in 2022. In contrast, 2017 and 2021 demonstrated lower average efficiency, specifically 0.501 and 0.551, respectively. The maximum efficiency figures suggest that certain firms regularly ran close to their maximum capacity, although the highest levels of efficiency fluctuated from year to year. The anomaly seen in 2022, when the maximum efficiency is unexpectedly lower than the average, necessitates additional study to confirm the accuracy of the data. The data indicates a combination of positive and negative results, indicating different levels of effectiveness among businesses over the years.

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