

The Productivity Puzzle: An Evaluation of Entrepreneurial Efficiency in the MSME Sector

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Abstract: *This study evaluates entrepreneurial efficiency in the Micro, Small, and Medium Enterprise (MSME) sector by examining how effectively firms utilize financial, human, and operational resources to generate performance outcomes. Using a quantitative cross-sectional design, data were collected from 200 MSMEs through a structured survey, and Data Envelopment Analysis (DEA) was applied to estimate technical and scale efficiency. A second-stage Tobit regression was used to identify determinants of efficiency. The findings indicate considerable variation in efficiency performance, with many enterprises operating below optimal levels. Entrepreneur education, prior industry experience, digital adoption, formal business practices, and institutional support were positively associated with efficiency. The study highlights that improving managerial capability and strategic resource utilization may substantially enhance MSME performance. The findings offer practical implications for entrepreneurs and policymakers seeking targeted interventions to strengthen MSME competitiveness and sustainable growth.*

Keywords: Entrepreneurial Efficiency, MSMEs, Data Envelopment Analysis, Technical Efficiency, Digital Adoption, Resource-Based View, Small Business Performance

1. Introduction

The Micro, Small, and Medium Enterprise (MSME) sector is universally acknowledged as the backbone of most economies, both developed and developing. It is a prolific source of employment, a crucible for innovation, and a significant contributor to Gross Domestic Product (GDP). In emerging economies, MSMEs often represent over 90% of all businesses and account for a substantial proportion of employment, making them pivotal to poverty alleviation and inclusive growth (Ayyagari, Beck, & Demirgüç-Kunt, 2011). The sector's agility and ability to adapt to local market conditions provide it with a unique advantage over larger, more bureaucratic corporations.

However, despite its numerical dominance and economic significance, the MSME sector is perpetually plagued by what economists term the "productivity puzzle." While MSMEs are abundant, their individual productivity and growth rates are frequently underwhelming. A vast majority remain "micro" in scale throughout their lifecycle, unable to transition to "small" or "medium" categories. This stagnation is not primarily due to a lack of demand or entrepreneurial spirit but is often attributed to severe resource constraints and, more critically, profound inefficiencies in utilizing the limited resources at their disposal (Beck & Demirgüç-Kunt, 2006).

The core problem, therefore, shifts from mere resource scarcity to the inefficient deployment of these resources. Entrepreneurs in the MSME sector operate under conditions of extreme uncertainty and possess bounded rationality. Their decisions regarding the allocation of financial capital, human talent, and social networks are not always optimal, leading to a situation where firms operate far inside their production possibility frontier (Farrell, 1957). This inefficiency represents a significant loss of potential output, jobs, and economic dynamism.

The concept of "entrepreneurial efficiency" moves beyond simple financial metrics to encompass the holistic ability of an entrepreneur to transform a bundle of inputs (capital, labour, technology) into maximum feasible outputs (revenue, profit, growth, social impact). It is a measure of managerial prowess and strategic acumen in the face of constraints. Understanding the levels and drivers of this efficiency is paramount to unlocking the sector's latent potential.

This study seeks to investigate this productivity puzzle by conducting a rigorous evaluation of entrepreneurial efficiency within the MSME sector. The primary research question is: What are the levels of entrepreneurial efficiency in the MSME sector, and what key factors determine these efficiency levels?

To answer this question, this research employs Data Envelopment Analysis (DEA), a non-parametric linear programming technique well-suited for assessing the relative efficiency of decision-making units (DMUs) in this case, individual MSMEs that use multiple inputs to produce multiple outputs. By benchmarking firms against each other, DEA identifies "efficiency frontiers" and measures the distance of inefficient firms from this frontier.

The findings of this study hold significant implications. For policymakers, it provides an evidence-based guide for designing targeted interventions that move beyond blanket subsidies to focus on capability building. For entrepreneurs and practitioners, it highlights best practices and critical areas for operational improvement. For academia, it contributes to the literature on entrepreneurial productivity by applying a robust efficiency measurement framework to the often-informal MSME context.

2. Literature Review

This section reviews the theoretical and empirical foundations of the study, focusing on the role of MSMEs, the concept of entrepreneurial efficiency, the Resource-Based View (RBV) as a theoretical lens, and the identified determinants of efficiency.

1) The MSME Sector: Engine of Growth and Its Challenges:

The literature is replete with evidence affirming the critical role of MSMEs. They are celebrated for their flexibility, ability to foster entrepreneurship, and contribution to regional development (Audretsch & Thurik, 2001). Their role in job creation is particularly pronounced; they are often the primary source of new employment in developing economies, absorbing labour and reducing underemployment.

However, the sector's journey is fraught with challenges. The "liability of smallness" and "newness" make MSMEs vulnerable. Key challenges, as identified by a vast body of research, include:

- a) **Financial Constraints:** Limited access to formal credit is the most cited obstacle. MSMEs often rely on informal finance or personal savings, which constrains their ability to invest in technology, inventory, and market expansion (Beck, Demirgüç-Kunt, & Maksimovic, 2005).
- b) **Managerial Deficiencies:** Many entrepreneurs are technical experts or opportunity-seekers but lack formal training in management, finance, or marketing. This leads to poor strategic planning and operational inefficiencies (Mazzarol, 2014).
- c) **Technological Obsolescence:** The inability to adopt modern technologies, often due to cost and knowledge barriers, hinders productivity and competitiveness (Arendt, 2008).
- d) **Regulatory and Institutional Hurdles:** Cumbersome bureaucratic procedures, complex tax systems, and weak property rights protection disproportionately burden small firms (Djankov, McLiesh, & Ramalho, 2006).

These challenges do not operate in isolation; they create a vicious cycle where resource constraints lead to inefficiency, which in turn perpetuates resource scarcity.

2) Conceptualizing Entrepreneurial Efficiency

Efficiency, in economic theory, is broadly categorized into technical efficiency and allocative efficiency. Technical efficiency reflects the ability of a firm to obtain maximal output from a given set of inputs, while allocative efficiency reflects the ability to use inputs in optimal proportions, given their respective prices (Coelli et al., 2005). This study focuses primarily on technical efficiency, which is a direct measure of managerial performance in converting physical inputs into outputs.

"Entrepreneurial efficiency" integrates this economic concept with the entrepreneurial function. It is the efficacy with which an entrepreneur combines and deploys resources to create value. This aligns with Joseph Schumpeter's view

of the entrepreneur as an innovator who carries out "new combinations" of resources. An efficient entrepreneur is one who performs this combinatorial function optimally, minimizing waste and maximizing output. The DEA methodology is perfectly suited to measure this multi-faceted efficiency.

3) Theoretical Framework: The Resource-Based View (RBV)

The RBV of the firm provides a powerful theoretical lens for this study (Barney, 1991). It posits that firms gain competitive advantage by possessing valuable, rare, inimitable, and non-substitutable (VRIN) resources. For MSMEs, which typically lack massive physical or financial assets, the critical resources are often intangible. This study operationalizes RBV by categorizing key entrepreneurial resources as:

- a) **Financial Capital:** The lifeblood of the business, determining its ability to invest and weather shocks.
- b) **Human Capital:** The entrepreneur's own knowledge, skills, education, and experience (Becker, 1964).
- c) **Social Capital:** The networks of relationships and trust that the entrepreneur can leverage for resources, information, and support (Nahapiet & Ghoshal, 1998).
- d) **Technological Capital:** The access to and use of digital tools and platforms that can enhance productivity.

The RBV suggests that it is not merely the possession, but the efficient orchestration of these resources that drives performance. This study's DEA model directly tests this proposition by evaluating how efficiently these resource inputs are converted into performance outputs.

2.4 Determinants of Entrepreneurial Efficiency

Empirical Evidence Previous empirical studies have identified several factors that correlate with higher efficiency in small firms.

Entrepreneur's Human Capital: Education level and prior industry experience are consistently linked to better firm performance and survival rates (Bates, 1990; Unger et al., 2011). Educated and experienced entrepreneurs are better at processing information, anticipating market shifts, and making sound strategic decisions.

- a) **Access to Finance:** Studies using DEA have shown that firms with better access to formal credit tend to be more efficient, as they can invest in productivity-enhancing assets (Lukacs, 2005).
- b) **Technology Adoption:** The adoption of Information and Communication Technologies (ICTs), such as accounting software, digital marketing, and e-commerce platforms, has been shown to significantly boost the efficiency of MSMEs by streamlining operations and expanding market reach (Brynjolfsson & Hitt, 2000).
- c) **Formal Business Practices:** The use of formal practices like written business plans, separate business bank accounts, and regular financial record-keeping is a hallmark of efficient firms. It introduces discipline, enables monitoring, and facilitates access to formal institutions (McKenzie & Woodruff, 2017).
- d) **Institutional Support:** The quality of support from government agencies, business development services, and industry associations can provide crucial knowledge,

networks, and resources that enhance entrepreneurial efficiency (Cooke & Wills, 1999).

This study builds upon this existing literature by integrating these diverse determinants into a unified DEA framework to provide a holistic assessment of their collective impact on entrepreneurial efficiency.

3. Research Objectives and Hypotheses

Based on the problem statement and literature review, this study has the following primary and secondary objectives:

3.1 Primary Objective

To measure and evaluate the level of entrepreneurial efficiency in a sample of MSMEs using Data Envelopment Analysis (DEA).

3.2 Secondary Objectives:

- 1) To classify the sampled MSMEs into efficiency categories (high, medium, low) and identify benchmark firms.
- 2) To analyze the influence of specific entrepreneurial and firm-level factors on the computed efficiency scores.
- 3) To provide recommendations for entrepreneurs and policymakers based on the empirical findings.

3.3 Research Hypotheses

To achieve the secondary objectives, the following hypotheses are tested:

- H1: The entrepreneur's level of education has a significant positive influence on entrepreneurial efficiency.
- H2: The entrepreneur's prior industry experience has a significant positive influence on entrepreneurial efficiency.
- H3: Access to and use of digital technologies has a significant positive influence on entrepreneurial efficiency.
- H4: The adoption of formal business practices has a significant positive influence on entrepreneurial efficiency.
- H5: The perceived quality of institutional support has a significant positive influence on entrepreneurial efficiency.

4. Methodology

1) Research Design

This study employs a quantitative, cross-sectional research design. The positivist paradigm is adopted, seeking to objectively measure efficiency and test hypotheses about its determinants. The core analytical technique is Data Envelopment Analysis (DEA), followed by a second-stage Tobit regression to identify determinants.

2) Data Envelopment Analysis (DEA) Model

DEA is a non-parametric method that uses linear programming to construct a piece-wise frontier over the data

points. Efficient DMUs (the best-performing MSMEs) lie on this frontier, while inefficient ones lie in the interior. The distance from the frontier measures the degree of inefficiency.

For this study, an input-oriented DEA model under Variable Returns to Scale (VRS) is chosen. The input-orientation is appropriate because MSME entrepreneurs have more control over their input usage (e.g., how much capital to borrow, how many employees to hire) than over their output levels in the short run. The VRS assumption is more realistic than Constant Returns to Scale (CRS) as it acknowledges that MSMEs of different sizes may not be able to scale their operations proportionally.

The model calculates two primary efficiency scores:

- 1) Technical Efficiency (TE) under VRS: Pure technical efficiency, isolated from scale effects. Scores range from 0 to 1, with 1 representing full efficiency.
- 2) Scale Efficiency (SE): The ratio of CRS TE to VRS TE, indicating whether a firm is operating at its optimal scale.

4.3 Variable Selection and Measurement

Data were collected through a structured questionnaire administered to owners/managers of MSMEs. The selection of inputs and outputs for the DEA model is grounded in the RBV and prior literature.

DEA Input Variables (Resources):

- 1) Financial Capital (X1): Measured as the total start-up capital invested in the business (in local currency, log-transformed for normality).
- 2) Human Capital (X2): Measured as the total number of full-time equivalent (FTE) employees, including the owner-manager.
- 3) Operational Cost (X3): Total annual operational cost, including raw materials, utilities, and rent (in local currency, log-transformed). This captures the flow of resources used in a year.

DEA Output Variables (Performance):

- 1) Annual Revenue (Y1): Total annual sales revenue (in local currency, log-transformed). This is a direct measure of market performance.
- 2) Profit (Y2): Net profit after tax for the most recent financial year (in local currency). This measures financial sustainability.
- 3) Employment Growth (Y3): Percentage growth in the number of employees over the past two years. This captures the firm's dynamism and contribution to job creation.

Determinant Variables (for Tobit Regression):

The efficiency scores from DEA become the dependent variable in a second-stage Tobit regression, as these scores are censored between 0 and 1.

The independent variables are:

- Education: Dummy variable (1=Graduate degree or higher, 0=Otherwise).
- Experience: Number of years the entrepreneur has worked in the industry.

- Digital Adoption Index: A composite index (0-10) based on the use of websites, social media for business, accounting software, and digital payments.
- Formality Index: A composite index (0-10) based on the existence of a written business plan, separate business bank account, and formal bookkeeping.
- Institutional Support: A 5-point Likert scale rating of the perceived usefulness of government/business association support.

4.4 Data Collection and Sample

A cross-sectional survey was conducted, targeting MSMEs in the manufacturing and services sectors within a major urban centre. A stratified random sampling technique was used to ensure representation across micro, small, and medium categories. A total of 220 questionnaires were distributed, and 200 usable responses were obtained, yielding a response rate of 90.9%. The sample consisted of 55% micro-enterprises (1-9 employees), 30% small enterprises (10-49 employees), and 15% medium enterprises (50-250 employees). Data collection occurred during the first quarter of the financial year to ensure accuracy of annual financial data.

5. Data Analysis and Results

5.1 Descriptive Statistics

The descriptive analysis of the input and output variables revealed a highly heterogeneous sample, with large standard deviations relative to the means, confirming the vast diversity in the size and performance of MSMEs.

5.2 EA Efficiency Results

The DEA analysis was performed using DEAP software (Version 2.1). The results are summarized in Table 1.

Table 1: Summary of DEA Efficiency Scores

Efficiency Measure	Mean	Standard Deviation	Minimum	Maximum	Number of Fully Efficient DMUs
Technical Efficiency (VRS)	0.68	0.21	0.22	1	35
Scale Efficiency	0.82	0.18	0.31	1	28

The mean technical efficiency score of 0.68 is a central finding. It implies that, on average, the sampled MSMEs could produce the same level of output using only 68% of the inputs they currently employ. Conversely, they could increase their output by approximately 47% [(1/0.68)-1] without increasing inputs if they were to operate on the efficiency frontier. This confirms the existence of a significant "productivity puzzle" and substantial managerial inefficiency within the sector.

The frequency distribution of efficiency scores (Table 2) provides further insight.

Table 2: Frequency Distribution of Technical Efficiency Scores

Efficiency Range	Frequency	Percentage
0.90 - 1.00 (Highly Efficient)	35	17.50%
0.70 - 0.89 (Moderately Efficient)	65	32.50%
0.50 - 0.69 (Low Efficiency)	72	36.00%
< 0.50 (Very Low Efficiency)	28	14.00%
Total	200	100%

Only 17.5% of firms are highly efficient. A staggering 50% of firms operate at low or very low efficiency levels (scores below 0.70), highlighting a widespread problem of sub-optimal resource utilization.

Regarding scale efficiency, the mean score of 0.82 suggests that scale inefficiencies are a less severe problem than pure technical inefficiency. However, further analysis of returns to scale revealed that 60% of the firms were operating at increasing returns to scale (IRS), meaning they are too small and could benefit from scaling up. About 25% were at decreasing returns to scale (DRS), indicating they may have grown beyond their optimal managerial capacity.

5.3 Analysis of Determinants: Tobit Regression Results

To identify the factors driving these efficiency disparities, a Tobit regression model was estimated with the VRS technical efficiency score as the dependent variable. The results are presented in Table 3.

Table 3: Tobit Regression Results for Determinants of Efficiency

Determinant Variable	Coefficient	Std. Error	p-value	Hypothesis
Constant	0.451	0.078	0.000***	-
Education (Dummy)	0.085	0.032	0.008***	H1 Supported
Experience (Years)	0.007	0.002	0.001***	H2 Supported
Digital Adoption Index	0.022	0.005	0.000***	H3 Supported
Formality Index	0.019	0.006	0.002***	H4 Supported
Institutional Support	0.031	0.014	0.027**	H5 Supported
Log-likelihood	45.21			
Pseudo R-squared	0.28			

Note: *** p<0.01, ** p<0.05

The regression model is statistically significant, and all five hypothesized determinants show a positive and statistically significant relationship with entrepreneurial efficiency.

- Education: As hypothesized (H1), entrepreneurs with a graduate degree or higher are, on average, 8.5 percentage points more efficient than their less-educated counterparts, underscoring the value of formal education in developing managerial competence.
- Experience: Each additional year of industry experience (H2) increases efficiency by 0.7 percentage points, confirming that learning-by-doing is a critical component of entrepreneurial human capital.
- Digital Adoption Index (H3) has a strong positive effect. A one-point increase in the index (e.g., adopting a new digital tool) is associated with a 2.2 percentage point

increase in efficiency. This is a powerful finding for the digital age.

- **Formality:** The Formality Index (H4) is also significant. The adoption of formal business practices brings discipline and transparency, leading to better resource management and a 1.9 percentage point efficiency gain per index point.
- **Institutional Support:** The perceived quality of institutional support (H5) has a positive impact, though its coefficient is slightly smaller. This suggests that while helpful, the current support mechanisms may not be fully meeting the needs of MSMEs or are not accessed by all.

6. Implications of the Study

The findings of this study carry several important implications for different stakeholders.

6.1 Theoretical Implications

This research strengthens the Resource-Based View by demonstrating empirically that the efficient orchestration of resources is as critical as their mere possession. It moves the theoretical discussion from "what resources matter" to "how well they are used." The study also successfully integrates human capital theory and network theory under the overarching framework of efficiency analysis, providing a more holistic model of entrepreneurial performance.

6.2 Practical Implications for Entrepreneurs and Managers

The results serve as a diagnostic tool for entrepreneurs. They should:

- **Invest in Continuous Learning:** Pursue formal education and training in business management and actively seek industry experience.
- **Embrace Digital Transformation:** Strategically invest in relevant digital tools for accounting, marketing, and sales to automate processes and reach wider markets.
- **Institutionalize Formal Practices:** Develop the discipline of writing business plans, maintaining separate finances, and keeping formal records. This is not just for compliance but for better internal control and decision-making.
- **Benchmark and Network:** Identify the efficient firms in their sector (the DEA benchmarks) and learn from them. Actively seek out and utilize institutional support from credible sources.

6.3 Policy Implications

For policymakers and support institutions, the study suggests a shift from generic support to targeted, capability-enhancing interventions:

- **Focus on "Managerial Aid" alongside "Financial Aid":** Design programs that build managerial capacity through workshops on financial literacy, strategic planning, and digital skills, rather than just providing loans.
- **Promote Digitalization:** Subsidize or provide training for the adoption of low-cost, high-impact digital technologies. Establish digital literacy campaigns for MSMEs.

- **Simplify Formality:** Reduce the cost and complexity of formal registration and compliance. Link access to benefits (like government contracts or subsidized loans) to formality, creating a virtuous cycle.
- **Improve Institutional Support Quality:** Move beyond mere awareness campaigns. Provide tailored, hands-on business development services, mentorship programs, and facilitate networking events that connect entrepreneurs with peers, suppliers, and customers.

7. Limitations of the Study

While this study provides valuable insights, it is subject to several limitations:

- **Cross-Sectional Data:** The study captures efficiency at a single point in time. A longitudinal study would be needed to understand how efficiency evolves and to establish stronger causality.
- **Geographical Scope:** The sample was drawn from a single urban centre, which may limit the generalizability of the findings to rural MSMEs, which face a different set of challenges.
- **Self-Reported Data:** Financial and operational data were self-reported by entrepreneurs, which may be subject to recall bias or intentional misreporting.
- **Model Specification:** While carefully selected, the choice of DEA inputs and outputs is ultimately a model specification decision. Alternative variable choices might yield slightly different results. The study also did not account for potentially important variables like the competitive intensity of the market or the entrepreneur's psychological traits.

8. Conclusion

This study examined entrepreneurial efficiency in the MSME sector using a DEA-based analytical framework. The findings indicate that a substantial proportion of sampled enterprises operate below optimal efficiency levels, suggesting significant scope for improved resource utilization. Entrepreneur education, industry experience, digital adoption, formal business practices, and institutional support emerged as meaningful positive determinants of efficiency. These findings reinforce the importance of managerial capability alongside resource access in shaping MSME performance. While the study offers useful practical and policy insights, its cross-sectional design and geographically limited sample suggest caution in broader generalization. Future research may employ longitudinal and multi-region designs to strengthen external validity and causal interpretation.

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