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KEY STATISTICAL INDICATORS OF SMALL BUSINESS IN UZBEKISTAN AND TH EIR SIGNIFICANCE

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Abstract: Assessing the economic efficiency of small and medium-sized enterprises (SMEs) and private entrepreneurship is crucial for fostering sustainable economic development. This article examines various statistical methods employed to evaluate SME efficiency, including Data Envelopment Analysis (DEA), Stochastic Frontier Analysis (SFA), regression models, Cost–Benefit Analysis (CBA), and Total Factor Productivity (TFP) analysis. DEA is a non-parametric method that benchmarks the relative efficiency of decision-making units by constructing a frontier of best practices. It has been applied in various contexts, such as evaluating the competitiveness of Costa Rican SMEs and assessing the efficiency of Turkish SMEs.
Key words: Small enterprises, statistical indicators, statistical analyses, economic potencial, statistical methods.

Аннотация: Оценка экономической эффективности малых и средних предприятий (МСП) и частного предпринимательства имеет решающее значение для содействия устойчивому экономическому развитию. В этой статье рассматриваются различные статистические методы, используемые для оценки эффективности малого и среднего бизнеса, включая анализ совокупности данных (DEA), стохастический пограничный анализ (SFA), регрессионные модели, анализ затрат и выгод (CBA) и анализ общей факторной производительности (TFP). DEA - это непараметрический метод, который оценивает относительную эффективность подразделений, принимающих решения, путем определения границ наилучшей практики. Он применялся в различных контекстах, таких как оценка конкурентоспособности коста-риканских МСП и оценка эффективности турецких МСП.
Ключевые слова: малые предприятия, статистические показатели, инвестиционный климат, экономический потенциал, статистические методы.

Introduction

Small and medium-sized enterprises (SMEs) and private entrepreneurship are pivotal to the economic fabric of both developed and developing countries. They contribute significantly to employment, innovation, and the diversification of economic activities. In many economies, SMEs account for a substantial portion of employment and GDP. For instance, in the European Union, SMEs represent over 99% of all businesses and employ around two-thirds of the workforce.

Assessing the economic efficiency of these entities is crucial for policymakers, investors, and the entrepreneurs themselves. Efficient SMEs are more likely to survive economic downturns, expand their operations, and contribute positively to the economy. Conversely, inefficiencies can lead to resource wastage, reduced competitiveness, and eventual business failure [1].

Economic efficiency in SMEs encompasses various dimensions, including technical efficiency, allocative efficiency, and cost efficiency. Technical efficiency refers to the ability of a firm to obtain the maximum output from a given set of inputs, while allocative efficiency pertains to the optimal allocation of resources to maximize profit. Cost efficiency combines both technical and allocative efficiencies, focusing on minimizing costs for a given output level.

This article aims to explore and compare the primary statistical methods employed to evaluate the economic efficiency of SMEs and private entrepreneurship. By examining these methods, we seek to provide insights into their applicability, strengths, and limitations in assessing SME performance.

Methods. **To understand the statistical assessment of economic efficiency in SMEs, we reviewed and analyzed several prominent methodologies:**

1. **Data envelopment analysis (DEA)**

DEA is a non-parametric method used to evaluate the efficiency of decision-making units (DMUs) by comparing them to a constructed frontier of best practices. It calculates efficiency scores by solving linear programming problems that maximize the ratio of weighted outputs to weighted inputs, subject to the constraint that the same ratio for all DMUs does not exceed one.

DEA is particularly useful for assessing relative efficiency when multiple inputs and outputs are involved. It does not require a predefined functional form for the production process, making it flexible and widely applicable. Example: A study on Turkish SMEs utilized DEA to assess their efficiency, considering inputs like liabilities and equity, and outputs such as sales revenue and net profit. The results highlighted variations in efficiency across firms, providing insights into areas for improvement [2].

2. **Stochastic frontier analysis (SFA)**

SFA is a parametric approach that estimates the production frontier while accounting for random errors and inefficiencies. It involves specifying a functional form for the production process and decomposing the error term into two components: one representing random noise and the other capturing inefficiency.

SFA allows for the estimation of efficiency scores and the identification of factors influencing inefficiency. It is particularly useful when there is a need to model the production process explicitly and when data are subject to stochastic variations. Example: Research on SMEs in Mexico applied SFA to estimate technical inefficiency, finding that factors like firm age and technology adoption influenced efficiency levels.

3. **Regression-based models**

Regression analysis, including panel data models, is commonly used to examine the relationship between efficiency and various determinants. These models can control for unobserved heterogeneity and temporal dynamics, providing insights into how factors like firm size, age, and capital structure affect efficiency [3]. Example: A study on Spanish SMEs employed regression models to analyze the impact of firm characteristics on profitability, revealing that smaller firms tend to be less efficient due to scale disadvantages.

4. **Cost–benefit analysis (CBA)**

CBA is a systematic approach to evaluating the economic feasibility of projects or investments by comparing the total expected costs against the total expected benefits. It involves quantifying and monetizing all relevant costs and benefits over the project's lifespan. In the context of SMEs, CBA can be used to assess the viability of new ventures, expansion plans, or technological investments, aiding in decision-making processes. Example: A feasibility study for a proposed SME development program utilized CBA to determine its potential economic impact, concluding that the benefits outweighed the costs.

5. **Total factor productivity (TFP) analysis**

TFP measures the efficiency with which all inputs are used to produce output. It is calculated as the ratio of aggregate output to a weighted average of inputs. TFP growth indicates improvements in efficiency and technological progress. Example: An analysis of SMEs in Kazakhstan employed TFP to assess productivity changes over time, finding that technological advancements contributed significantly to productivity growth.

Results. **The application of various statistical methods has provided comprehensive insights into the economic efficiency of small and medium-sized enterprises (SMEs) and private entrepreneurship. These methodologies have highlighted both the strengths and areas for improvement within these businesses, offering valuable information for stakeholders aiming to enhance performance and competitiveness.**

a) Data envelopmenta analysis (DEA)

Data Envelopment Analysis (DEA) has been instrumental in benchmarking the relative efficiency of SMEs across different sectors. For instance, a study by Kotey and O'Donnell (2014) applied DEA to assess the efficiency of SMEs in the Australian food, beverages, and tobacco manufacturing industry. The findings indicated that, on average, firms could produce the same level of output using approximately 20% fewer inputs. Additionally, the study revealed that firms could achieve cost savings of around 32% by optimizing both the level and mix of inputs. These results underscore the potential for significant efficiency improvements through better resource utilization and management practices.

b) Stochastic frontier analysis (SFA)

Stochastic Frontier Analysis (SFA) has been employed to estimate the production frontier and identify inefficiencies within SMEs. In a study by Basurto Hernández and Sánchez Trujillo (2022), SFA was applied to data from over 28,000 SMEs in Mexico. The analysis revealed an average technical efficiency (TE) of 54.6%, indicating that, on average, SMEs operate at just over half of their potential efficiency. The study also found that SMEs with highly skilled workers and those that utilized the internet in their production processes tended to have higher levels of TE. Conversely, firms that allocated a higher proportion of their revenues to tax-related expenses exhibited lower efficiency levels. These findings highlight the importance of human capital and technological adoption in enhancing SME performance.

c) Regression models

Regression analysis has been utilized to examine the relationships between various firm characteristics and their economic efficiency. A study by Pérez-Gómez et al. (2018) employed stochastic profit frontier models to analyze SMEs in Spain. The results indicated that factors such as firm size, capital intensity, and market competition significantly influenced profitability and efficiency. Larger firms and those with higher capital intensity were found to be more efficient, while increased market competition tended to reduce profitability. These insights suggest that strategic decisions related to firm size and market positioning can impact the economic efficiency of SMEs.

d) Cost–benefit analysis (CBA)

Cost–Benefit Analysis (CBA) has been a valuable tool in evaluating the economic viability of projects and investments within SMEs. According to Investopedia, CBA involves estimating all the costs associated with a decision and comparing them to the estimated benefits. This comparison helps in assessing whether the benefits outweigh the costs, guiding investment decisions. For example, a renovation project with an upfront cost of $50,000 and expected benefits of $288,388 over three years would have a Benefit-Cost Ratio (BCR) of 5.77, indicating substantial benefits over costs. However, it's essential to consider that relying solely on BCR can be misleading, and it should be part of a broader decision-making process.

e) Total factor productivity (TFP) analysis

Total Factor Productivity (TFP) analysis has been employed to assess the efficiency with which all inputs are used to produce output. A study by Basurto Hernández and Sánchez Trujillo (2022) found that technological advancements and innovation were key drivers of productivity growth in SMEs. Firms that invested in technology and innovation experienced higher TFP, leading to improved efficiency and competitiveness. These findings emphasize the importance of continuous investment in technology and innovation for sustaining long-term productivity growth [4].

These findings underscore the multifaceted nature of economic efficiency and the need for comprehensive assessment methods to capture its various dimensions. By employing a

combination of DEA, SFA, regression models, CBA, and TFP analysis, stakeholders can gain a holistic understanding of the factors influencing SME performance and implement targeted strategies to enhance efficiency and competitiveness.

Discussion. The statistical methods discussed—Data Envelopment Analysis (DEA), Stochastic Frontier Analysis (SFA), regression models, Cost–Benefit Analysis (CBA), and Total Factor Productivity (TFP) analysis—offer complementary perspectives on assessing the economic efficiency of small and medium-sized enterprises (SMEs) and private entrepreneurship. Each method provides unique insights into different aspects of SME performance, and their combined application can yield a more comprehensive understanding of efficiency dynamics.

Complementary Strengths and Limitations

- **Data Envelopment Analysis (DEA):** DEA is a non-parametric method that evaluates the relative efficiency of decision-making units (DMUs) by constructing a frontier of best practices. It is particularly useful for benchmarking and identifying efficient firms. However, DEA does not account for statistical noise, potentially overestimating efficiency scores.
- **Stochastic Frontier Analysis (SFA):** SFA is a parametric approach that estimates the production frontier while accounting for random errors and inefficiencies. It allows for the estimation of efficiency scores and the identification of factors influencing inefficiency. However, SFA requires a specific functional form and may be sensitive to model specifications.
- **Regression Models:** Regression analysis examines the relationship between efficiency and various determinants. It can control for unobserved heterogeneity and temporal dynamics, providing insights into how factors like firm size, age, and capital structure affect efficiency. However, regression models may suffer from omitted variable bias if not properly specified.
- **Cost–Benefit Analysis (CBA):** CBA evaluates the economic feasibility of projects or investments by comparing the total expected costs against the total expected benefits. It involves quantifying and monetizing all relevant costs and benefits over the project's lifespan. However, CBA relies on accurate estimation of costs and benefits, which can be challenging in dynamic environments.
- **Total Factor Productivity (TFP) Analysis:** TFP measures the efficiency with which all inputs are used to produce output. It is calculated as the ratio of aggregate output to a weighted average of inputs. TFP growth indicates improvements in efficiency and technological progress. However, TFP analysis requires comprehensive data on inputs and outputs and may not capture all sources of productivity changes.

Integrating Methods for Comprehensive Assessment

In practice, combining these methods can provide a more holistic assessment of SME efficiency. For example:

- **DEA** can be used to identify efficient firms and establish benchmarks.
- **SFA** can quantify inefficiencies and identify factors contributing to them.
- **Regression models** can explore causal relationships between firm characteristics and efficiency.
- **CBA** can evaluate the economic feasibility of projects or investments.
- **TFP analysis** can track productivity trends over time.

By integrating these methods, policymakers and entrepreneurs can gain a more nuanced understanding of SME efficiency and implement targeted strategies to enhance performance [5].

Future Research Directions

Future research should focus on developing integrated models that combine the strengths of these methods. Incorporating factors such as environmental sustainability and social impact into efficiency assessments can provide a more comprehensive evaluation. Additionally, advancements in data collection and analysis techniques, including the use of big data and machine learning, can enhance the accuracy and applicability of efficiency evaluations [6].

For instance, integrating DEA with clustering algorithms can improve the feasibility of using big and open data to support decision-making processes in public organizations. Similarly, combining SFA with data mining techniques can enhance the evaluation of efficiency in complex environments.

Conclusion. Assessing the economic efficiency of small businesses and private entrepreneurship is essential for fostering sustainable economic development. The statistical methods reviewed in this article offer valuable tools for evaluating efficiency, each providing unique insights into different aspects of SME performance.

By employing these methods, policymakers and entrepreneurs can identify areas for improvement, allocate resources more effectively, and implement strategies that enhance competitiveness and growth. A comprehensive approach that integrates multiple assessment methods will lead to a more nuanced understanding of SME efficiency and inform better decision-making processes.

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