

# The Impact of Certification on the Performance of Micro and Small Businesses in Indonesia: Propensity Score Matching Analysis

Putra Irwandi<sup>1)\*</sup>, Ninda Novita<sup>2)</sup>

<sup>1)2)</sup>Agribusiness Study Program, Faculty of Agriculture and Forestry, Satya Terra Bhinneka University

Bakul Street, Medan City, Indonesia

<sup>1)</sup>putrairwandi@satyaterrabhinneka.ac.id

<sup>2)</sup>nindanovita@satyaterrabhinneka.ac.id

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## Article History:

Received 22 April 2026;

Revised 21 May 2026;

Accepted 2 June 2026;

Available Online 15 June 2026

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## Keywords:

Business Performance

Certification Ownership

Impact Analysis

Profit

Propensity Score Matching

## Abstract

Certification is a strategic tool for improving business performance, competitiveness, and expanding market access. Although numerous studies on certification have been conducted, these studies are limited to specific sectors and regions. Furthermore, the types of certification examined typically focus on a single specific certification. No previous study has focused on the impact of certification on business performance using nationwide data and a quasi-experimental approach via PSM while covering all types of certification. This study aims to analyze the impact of certification on the performance of Micro and Small Enterprises in Indonesia using Propensity Score Matching. The research method employs a quantitative causal approach, with data sourced from the 2019 Micro and Small Enterprise Survey conducted by the Central Statistics Agency, covering a total of 52,551 enterprises. Data analysis was conducted using Propensity Score Matching with the assistance of STATA 17 software. The business performance variables measured were Turnover and Profit. The results indicate that certification has a positive and significant impact on business performance, with a T-statistic significance value of 2.55 for the turnover variable and 1.81 for the profit variable. The ATT values obtained for the revenue variable are 34.19 and for the profit variable are 7.89, which means that certified businesses saw an increase in revenue of Rp 34.19 million and an increase in profit of Rp 7.89 million. The theoretical implication is the need to expand and provide guidance on obtaining certification, as well as to facilitate access so that certification is distributed more evenly and is accessible to all business actors. The conclusion of this study is that the implementation of certification is important for Micro and Small Enterprises and improves business performance, specifically in terms of turnover and profit.

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## I. INTRODUCTION

Micro and Small Enterprises (MSEs) in Indonesia are a strategic sector that serves as a critical pillar in the national economy. They not only impact employment absorption but also contribute to national GDP and income distribution. In several critical conditions, the MSE sector

demonstrates greater economic resilience compared to other businesses due to its flexibility and high adaptability. Therefore, the significant role, capacity, and competitiveness of MSEs have become a primary focus of the government in national economic development policies.

By definition, Micro and Small Enterprises (MSEs) are independent businesses and productive activities managed and implemented by individuals or groups. This classification is divided into several categories, including micro enterprises, small enterprises, and medium enterprises. The distinguishing factors are based on capital, annual sales, average income, and the number of employees (Costa Melo et al., 2023; Mendoza & Tadeo, 2023). 3) Supporting Micro and Small Industries is key to the success of a country's economic development and growth. The productive activities and presence of micro and small industries play an essential role, contributing to nearly 90% of the total businesses worldwide from the MSE sector (Ali et al., 2021; Bennett, 2008; Ismael & Muhamed, 2013; Omri et al., 2015). Numerous empirical studies discuss the contributions of micro and small businesses, which affect employment absorption and job creation, accounting for 50% worldwide (Aladin et al., 2021; Hasanah et al., 2022), contributing up to 40% of GDP in developing countries (Kartika, 2019; Permana, 2017; Rofida, 2018), serving as pillars of national economic development (Gunartin, 2017; Sarfiah et al., 2019), driving economic engines (Wibawa & Naya, 2019), and providing solutions for building a healthy economy during the Covid-19 pandemic (Edo, 2023; Mulyadi, 2024; Windusancono, 2021).

One of the strategies for improving the competitiveness and performance of Micro and Small Enterprises (MSEs) is through product certification ownership. Product certification is defined as a process of assessment that determines whether a product meets certain standards, either nationally or internationally. This process involves testing, inspection, and verification by certified institutions to ensure that the product complies with the safety, quality, and performance standards set. The goal is to increase consumer trust, expand market access, and improve business quality and productivity. Certification can include business licenses, halal certification, quality standards, and food safety and cleanliness certifications. Certification serves not only as evidence of compliance with regulations but also as a strong signal to enhance business quality and consumer trust.

The biggest challenge faced by Indonesian MSEs today is their low ability and opportunity to obtain certifications. Limited access to financing, low-quality human resources managing the certification process, lack of product innovation, and restricted access to markets have created limitations for MSEs to grow and enter wider and more competitive markets (Damayanti, 2021; Damhudi et al., 2023; Nalini, 2021). Various government policies have been implemented to increase certification ownership for businesses in Indonesia, such as the "1000 MSEs Go Export" program, which represents a strategic step by the government to enhance the competitiveness of Indonesian products in the global market. The government recognizes the importance of certification in the national export strategy and often provides special support for MSEs to obtain the necessary certifications. Therefore, investing in relevant certifications is a crucial strategic step for MSEs aiming to enter and succeed in the export market, not only to meet regulatory requirements but also to build trust and improve competitiveness in the global market. Despite many policies being implemented, the certification rate remains very low, with only 3.83% of MSEs having certifications. Several barriers to certification ownership include: 1) high certification costs, where the certification for a single product can reach Rp20-50 million; 2) complicated procedures; 3) low understanding of certification, which is due to a lack of

socialization and education regarding certification among MSEs; 4) limited resources; and 5) inadequate infrastructure, including difficulties accessing accredited testing laboratories.

Many studies have been conducted with various methods regarding certification ownership for MSEs in Indonesia. However, comprehensive research on this topic is still scarce. Typically, studies are conducted by sector and region or focus on specific certifications. Existing studies show diverse results, often limited to specific sectors or regions. Recent studies (Nur'aeni et al., 2024; Safitri et al., 2024; Saleh et al., 2024) indicate that sales, market access, and productivity increase after obtaining certification. Other studies (Hardilawati et al., 2019; Jamilahalmutairi & Altameem, 2016) show that certification positively impacts sales, revenue, and business turnover. The research gap can be filled by more comprehensive and nationally representative studies on the impact of certification on the performance of Micro and Small Enterprises, utilizing extensive data from across Indonesia. Many studies have been conducted on certification and its impact on business performance. For example, Ochieng *et al.* (2015) found that ISO 9001 certification influenced business performance by increasing profits. This study was conducted on 20 companies listed on the Nairobi Securities Exchange (NSE) from 2010 to 2013. Similar research also found significant differences in financial performance, such as sales, profit, and return on assets, between companies with and without ISO 9001 certification in Portugal (Cândido et al., 2016). This study focused on 143 companies in Portugal, comparing those with and without certification. Another study in Indonesia on palm oil, which has SNI certification, found that the implementation of SNI certification on palm oil and its derivatives directly affected the strengthening of competitiveness as it ensures acceptance in international markets (Rahman & Monandes, 2021). This is because certification serves as a quality control mechanism for the domestic market, but it does not guarantee acceptance in foreign markets.

This study aims to address a gap in the literature by examining the relationship between certification and various performance indicators such as sales, market access, productivity, and business revenue at the national level. By utilizing comprehensive data from a wide range of MSMEs' across various sectors and regions, this study seeks to provide a more representative understanding of how certification influences the growth and competitiveness of MSMEs. The importance of this research makes it a reference for the government and stakeholders to prepare strategic steps related to easier access, increasing business ownership, and expanding market access for certified MSEs.

The purpose of this study is to provide a comprehensive analysis of the impact of product certification on the performance of Micro and Small Enterprises (MSEs) in Indonesia. The findings of this research are expected to contribute valuable insights for policymakers and stakeholders, enabling them to develop more effective strategies to facilitate MSEs' access to certification, enhance their market opportunities, and strengthen their role in driving economic growth. Moreover, the study will provide recommendations on overcoming barriers to certification, which can serve as a foundation for improving the business environment and supporting MSEs in their efforts to succeed in both domestic and international markets.

## II. LITERATURE

Certification is the process of issuing certificates by designated parties to confirm that a product or organization has met established requirements. Certification is necessary to provide assurance to all parties that the established requirements have been met. Certification in the 2019 and 2021 reports of the Central Statistics Agency refers to Indonesian National Certification, halal certification, BPOM certification, PIRT certification, and other certifications. Certification

is a vital tool for enhancing the competitiveness and performance of MSMEs in the global market. Businesses should not view certification merely as a market requirement but also as a strategic step in business development and quality improvement. Certification reflects the evolving global business landscape, which demands higher standards from businesses, particularly in Indonesia. The advancement of globalization and support for innovative technology in the Industry 4.0 era require SMEs to adopt relevant and competitive standards and practices, as well as actively participate in global competition. Furthermore, market demands necessitate that products and services meet quality, safety, and sustainability standards. This certification is also expected to enhance performance targets and competitiveness in the competitive market.

Certification plays a crucial role in improving the performance of micro and small enterprises (MSEs) in terms of consumer trust, competitiveness, and business sustainability. From the perspective of Signalling Theory, certification serves as a positive signal indicating that a product or service meets specific standards. This helps reduce consumer uncertainty regarding product quality, thereby increasing trust, customer loyalty, and opportunities for increased sales. Additionally, certification reflects business professionalism, which can open doors to business partnerships and financing.

According to the Resource-Based View (RBV), certification is a strategic asset capable of enhancing SMEs' internal capabilities. Holding certification demonstrates a better business management system, clear operational standards, and the ability to consistently maintain product quality. Certification also drives improvements in human resource competencies and operational efficiency, giving SMEs a competitive advantage over uncertified businesses. In Institutional Theory, certification is viewed as a form of compliance with norms, rules, and the demands of the business environment. Many modern markets and distribution networks require specific certifications before products can be marketed. Therefore, certification helps MSMEs gain business legitimacy, enhance their business image, expand market access, and facilitate access to government support and business development programs. Meanwhile, Quality Management Theory emphasizes that certification encourages the implementation of quality standards, SOPs, and continuous improvement in production processes. With better quality control, SMEs can improve efficiency, reduce production errors, maintain product quality consistency, and increase customer satisfaction. In the long term, these conditions lead to improved business reputation and profitability. Overall, certification has a positive impact on SME performance by enhancing consumer trust, competitiveness, operational efficiency, market access, and business sustainability.

The availability of access and ease of obtaining certification for MSMEs will encourage businesses to expand and increase productivity in running their existing operations. Certification has become a vital tool in business development and performance improvement in an era of increasingly intense global competition. As a form of formal recognition of standards and quality, certification has significant impacts on a company's operations and growth. In the context of modern business, certification serves not only as a legal document but also as a catalyst for transforming business processes toward higher, measurable standards.

The existence of certification has multiple effects on various aspects of business performance. From an operational perspective, certification encourages companies to adopt more systematic and structured standard procedures, which in turn improves efficiency and productivity. In terms of marketing, certification serves as a differentiation tool that builds consumer trust and opens

access to broader markets, including export markets that generally require specific quality standards.

Various studies have been conducted to identify the impact of certification ownership on the operational and financial performance of businesses. The impact of certification on the performance of Micro and Small Enterprises (MSEs) has been observed in several research studies, including the following: Certification opens opportunities for MSEs to enter new markets, particularly domestic and international markets. Research by Abdi et al. (2020) in Ethiopia showed that certification helps MSEs access global markets and enhances their competitiveness. A study by Kafetzopoulos & Gotzamani (2019) revealed that MSEs with certification showed better financial performance, even during economic crises. This is supported by research in Latin America, which indicated improvements in financial indicators for certified MSEs. The Research by Trifković., (2017) found that food safety certification in Vietnam contributed to higher productivity and profitability in MSEs.

Certification Impact on Innovation and Development business, for example, research by Valdez-Juárez et al. (2016) demonstrated a positive relationship between ISO 9001 certification and increased innovation in MSEs in Mexico. Certification has been shown to have several positive impacts on Micro and Small Enterprises (MSEs), particularly in areas such as consumer trust, access to funding, and market performance. Research by Sari et al. (2023) in Indonesia indicated that certification enhances consumer trust in MSE products, which is essential for business success. Additionally, Fatoki (2019) found that certified MSEs in South Africa had better access to funding sources, a crucial factor for business growth. Fikru (2014) demonstrated the positive impact of certification on the export performance of MSEs in developing countries, while Kinzius et al. (2019) revealed that certification helps MSEs overcome non-tariff barriers in international trade. In terms of marketing performance, a study by Akoma et al. (2023) in Nigeria highlighted the positive contribution of certification to MSEs' marketing efforts. Finally, Haseeb et al. (2019) found that halal certification helped MSEs in Malaysia increase their sales and market share, thereby enhancing their competitive resilience.

### III. RESEARCH METHOD

This study uses secondary data from the 2019 Indonesian Micro and Small Industry Survey by the Central Statistics Agency (BPS). The initial dataset available contains 90,295 MSEs, which were then cleaned through data cleansing and sample elimination using the filter feature. The number of samples that met the criteria and could be analyzed for the food sector was 52,551 businesses. The justification for using the BPS Micro and Small Industry Survey data is as follows: first, it represents industries nationally with 33 classifications of KLBI and is representative of all sectors that make up MSEs in Indonesia. Second, the data used are the most recent and are of a pooled cross-sectional nature. Third, it helps avoid potential bias caused by time-related variables. Based on the 2019 Micro and Small Industry Survey questionnaires by the Central Statistics Agency (BPS) regarding distribution and certification owned by businesses, there are four categories: 1) Indonesian National Standard (SNI, SNI-ISO) certification, coded as -1, 2) Other National Certifications (halal MUI, LPJK, etc.) valued at -2, 3) International certifications valued at -4, and 4) businesses without any certification, valued at 0.

In this study, the propensity score was estimated using a logit model. The selection of this method was based on its widespread use in Propensity Score Matching (PSM) analysis to estimate the probability of respondents participating in the treatment group based on observed covariate characteristics. Information regarding the use of the logit model has been added to the

research methods section to clarify the propensity score estimation procedure applied in this study. Several factors influence whether micro and small industries obtain product certification. These factors are known as covariates. This can be analyzed using logistic regression. Logistic regression is an analytical method that explains the relationship between independent and dependent variables that have two or more categories. Logistic regression is used in this study to determine whether micro and small industries have certification or not. Model parameter estimation is performed using Maximum Likelihood Estimation (MLE). Whether a micro and small industry has certification is a binary variable with values of 0 (no certification) and 1 (has certification), which is included as a dummy variable in the estimation model commonly used as follows:

$$P_i = \ln \frac{P_i}{1-P_i} = \alpha + \beta_i X_i \quad (1)$$

In this study, the model used to analyze the factors influencing micro and small enterprises with certification consists of business characteristic variables, including:

$P_i$  = Probability that a micro or small business has certification (values 0 and 1)      $X_4$  = owner's education level ( $X_4$ )

$\alpha$  = Intercept

$X_5$  = entrepreneur's age ( $X_5$ ).

$\beta_i$  = Logit function parameter

$X_6$  = Export Activities

$X_1$  = company age

$X_7$  = Training

$X_2$  = business entity status

$X_8$  = Business Association

$X_3$  = business location status

The data analysis uses Propensity Score Matching (PSM), with observations divided into two groups: the treatment group, which consists of Micro and Small Enterprises (MSEs) that have business certifications, and the control group, which consists of those without certification. The subsequent results from the above equation are used as a reference for the matching technique through Propensity Score Matching (PSM). This PSM method is an alternative for matching treated groups to specific objects by comparing them with control groups that did not receive treatment. PSM has been widely used in impact estimation, as demonstrated in studies (Abate et al., 2016; Abebaw & Haile, 2013; Harianto et al., 2019; Joetarto et al., 2020). PSM analysis is based on the propensity scores between the two selected groups, which are chosen based on similar characteristics. Rosenbaum and Rubin (1983) introduced this method. PSM is also known as the conditional probability that a person will be in one condition rather than another based on a covariate used to predict the outcome. In this model, a dummy variable is used, where 1 indicates the treated group and 0 indicates the control group that did not receive treatment.

The PSM equation used in this study is as follows:  $Y_i$  represents the potential outcomes of MSEs in the food and non-food sectors.  $Y_{1i}$  represents the potential outcomes if MSEs in the food and non-food sectors implement certification, i.e., when the intervention  $D_i$  equals one. On the other hand,  $Y_{0i}$  represents the potential outcomes if MSEs in the food and non-food sectors do not have certification, corresponding to the control group when  $D_i$  equals zero.

This study applies a common support restriction in the Propensity Score Matching process to ensure that observations in the treatment and control groups have overlapping ranges of propensity scores. The implementation of common support aims to avoid matching observations with excessively different characteristics, thereby improving the quality of the matching process. Consequently, the estimated treatment effects become more valid and allow for a more accurate comparison between the two groups. The PSM estimation is formulated in equation 2 as follows:

$$\tau_i = Y_{1i} - Y_{0i} \quad (2)$$

Where:

$\tau$  = PSM estimation

$Y_{1i}$  = potential outcomes for MSEs, including revenue, profit, with certification

$Y_{0i}$  = potential outcomes for MSEs, including revenue and profit, without certification

Based on equation 3, there is an issue that often arises: PSM cannot measure the potential outcomes of both the treatment and control groups simultaneously. This study uses a caliper value of 0.05 in the Propensity Score Matching process to limit the maximum distance in propensity scores between the treatment group and the control group. The use of a caliper aims to improve the quality of matching by ensuring that the matched observations have an adequate level of similarity. Therefore, the matching process can reduce bias and produce more accurate and reliable estimates of the treatment effect.

As a result, only one group is observed at a time. Therefore, impact analysis using an estimation model is required to see the average treatment effect of certification ownership using the ATT (Average Treatment Effect in the Treated) approach. The ATT model is explained in equation 3 as follows.

$$\tau_{ATT} = E(Y_i(1) | D = 1) - E(Y_i(0) | D = 0) \quad (3)$$

Where:

$E[Y_{1i} | D=1]$  = treated group

$E[Y_{0i} | D=0]$  = control group

The second step is matching, using the Nearest Neighbor Matching method with Replacement. Nearest Neighbor Matching (NNM) with replacement is a matching method in Propensity Score Matching in which a single control unit can be used more than once as a match for a treatment unit with the closest propensity score. This approach aims to obtain better matching quality so that differences in characteristics between the treatment and control groups can be minimized. The use of replacement is generally chosen because it can reduce matching bias, especially when the number of control observations is relatively limited or when the distribution of characteristics between groups is unbalanced. Thus, the estimated treatment effect becomes more accurate and reliable.

This study uses the 1-nearest neighbor matching method in the propensity score matching process to match each treatment unit with a control unit that has the closest propensity score in order to minimize bias in estimating the treatment effect. In addition, this study also employs Kernel Matching as a robustness check by utilizing all control observations based on the weighting of propensity score proximity. This method is used to ensure that the estimation results remain consistent, stable, accurate, and reliable even when different matching approaches are applied.

After obtaining the balance score from the propensity score estimation, the researcher then uses these scores to match participants in the treatment group with those in the non-treatment group. With matching, participants from the non-treatment group may be reduced, so some participants may not be used at all due to the lack of a suitable match with participants from the non-treatment group. This process is often referred to as resampling. The next step is the common support, which ensures that matching between the two groups can be conducted. Finally, the quality of matching is assessed. This is done to condition all covariates in the propensity score in order to balance the distribution of relevant variables between the two groups. This step helps determine which interactions and higher-level terms can be included in a specific set of covariates ( $x$ ) (Austin, 2011; Kurniawan, 2016).

#### IV. RESULTS AND DISCUSSION

### The Impact of Certification Ownership on the Performance of Micro and Small Enterprises in Indonesia

Performance is a measure of the productivity of the business activities carried out by Micro and Small Enterprises (MSEs). Company performance consists of two main dimensions: financial and strategic (Phillipson et al., 2019). As the most important goal for a company, financial performance includes sales growth, cost levels, and, ultimately, profit realization. In contrast, strategic performance relates to the company's market position (e.g., market share, competitiveness), which in the long term impacts the company's financial well-being. Changes caused by the implementation of certification systems affect business performance.

Business performance is a complex concept that reflects the level of success and operational effectiveness of small to medium-sized enterprises in achieving their business goals. The definition of performance is not limited to financial aspects only, but also includes various other dimensions that reflect the overall health and sustainability of the business. In the context of Micro and Small Enterprises (MSEs), performance is often defined as the business's ability to survive, grow, and thrive in the face of the ever-changing market dynamics. This involves not only the ability to generate profits but also the ability to create value for customers, employees, and the surrounding community. Business performance also reflects the extent to which the business can achieve the established goals, whether they are short-term or long-term goals.

The performance of Micro and Small Enterprises is a multidimensional concept that includes both financial and non-financial aspects. It includes the business's ability to survive, grow, and develop, as well as its contribution to the economy and society. Performance also involves achieving business objectives, both short-term and long-term, and can be influenced by various internal and external factors. Performance measurement needs to consider various indicators, including sales growth, profitability, job creation, innovation, customer satisfaction, and socio-economic contributions. The concept of MSE performance refers to the measures or indicators that describe the extent to which a micro or small enterprise successfully achieves its business goals and operates effectively and efficiently.

**Table 1. Covariate Analysis of Logistic Regression**

Variable	odd ratio	Z	P Value
<b>Covariat</b>			
Company Age	0,981	-6,86	0,000***
Business Entity Status	1,205	25,82	0,000***
Business Location Status	0,254	7,69	0,000***
Education	0,184	17,33	0,000***
Age	0,002	1,36	0,000***
Export	0,552	3,26	0,001***
Training	0,189	14,69	0,000***
Business Association	0,301	3,69	0,000***
Number of obs			89.894
LR Chi2			1570.87
Prob > Chi2			0.0000
Pseudo R2			0.476
Log Likelihood			15705,203

Business characteristics influence the implementation of certification for MSMEs, including company age, legal entity status, and business location status. Company age is a crucial aspect of

business operations, reflecting operational experience, maturity, adaptability, and innovation (Aprilasani et al. 2017). The average age of MSMEs in Indonesia is 9–13 years, which is considered young; the number of MSMEs with legal entity status totals 4,594 businesses. Age has a significant impact on the implementation of certification for MSMEs in Indonesia. This is evident in Table 2, which shows that age has a significant effect at the 1% significance level with an odds ratio of 0.98. This can be interpreted to mean that for every one-year increase in a company’s age, the likelihood of an SME implementing certification decreases by a factor of 0.9, *ceteris paribus*. Furthermore, legal entity status is crucial for certification implementation as it facilitates access to financing and simplifies the process of obtaining permits. As shown in Table 2, the odds ratio for business entity status is 4.84, meaning that the probability of SMEs with a business entity implementing certification is 4.84 times higher than that of SMEs without certification, *ceteris paribus*. Another variable is business ownership status, specifically self-owned and certified.

Not only that, but owner characteristics represented by educational level and age influence the adoption of business certification. Education reflects an optimistic attitude and is closely linked to innovative capacity. On average, business owners have a high school education, with an average age range of 45–47 years. It is evident that the variables of education and age of business owners influence the implementation of certification, with an odds ratio of 1.30 for education and an odds ratio of 1.01 for age. This means that a one-year increase in the owner’s age doubles the probability of implementing certification, *ceteris paribus*.

**Table 2. Interpretation Results of the Balance Test**

<b>Diagnostic Indicator</b>	<b>Before Matching</b>	<b>After Matching</b>	<b>Interpretation</b>
Pseudo R <sup>2</sup>	0,048	0,001	The Pseudo R <sup>2</sup> value decreases substantially after matching, indicating that the covariates are increasingly unable to distinguish between the treatment and control groups. This means that the data balance has improved
LR chi <sup>2</sup>	1569,43	9,42	The LR chi <sup>2</sup> value drops sharply after matching, indicating that differences in characteristics between the groups have been successfully reduced.
Prob > chi <sup>2</sup>	0.000	0,224	Before matching, the result is significant (< 0.05), indicating that there are differences in characteristics between the groups. After matching, it becomes not significant (> 0.05), suggesting that the data is more balanced.
Mean Bias (%)	22,1	2,0	The mean bias decreases from 22.1% to 2.0%, indicating that the bias between groups has been successfully minimized and is at a very good level.
Median Bias (%)	19,1	1,3	The median bias also decreases sharply after matching, indicating an improvement in covariate balance.
Rubin’s B	58,4	6,8	The Rubin’s B value before matching exceeds the ideal threshold (<25), indicating data imbalance. After matching, it decreases to 6.8 and meets the balance criterion.
Rubin’s R	2,57	1,5	The Rubin’s R value before matching is outside the ideal range (0.5–2). However, after matching, it falls within the acceptable range, indicating that the variance between groups is more balanced.
% Variance	100	0	Before matching, all variables are outside the variance

<b>Diagnostic Indicator</b>	<b>Before Matching</b>	<b>After Matching</b>	<b>Interpretation</b>
Ratio Outside Range			balance threshold, whereas after matching, all variables meet the balance criteria.

Output of the covariate balance diagnostics from the Propensity Score Matching (PSM) method. This test aims to determine whether the characteristics between the treatment group and the control group have become balanced after the matching process. In PSM analysis, the expected condition is a reduction in the Mean Bias and Median Bias values after matching, as this indicates that differences in characteristics between groups have become smaller. In addition, the Pseudo R<sup>2</sup> value is also expected to decrease after the matching process, indicating that the covariates are no longer able to significantly distinguish between the treatment and control groups. The p>Chi<sup>2</sup> value is also expected to become insignificant or greater than 0.05, indicating that there are no systematic differences between the groups after matching.

Furthermore, Rubin’s B value should be below 25%, while Rubin’s R value is expected to be in the range of 0.5 to 2 as an indicator that variance balance between groups has been achieved. Thus, the results of this test are used to ensure that the matching process successfully reduces selection bias so that the estimated treatment effect becomes more valid and reliable. Overall, the balance test results show that the Propensity Score Matching process successfully improves the balance of characteristics between the treatment and control groups. This is indicated by the reduction in bias values, the decrease in Pseudo R<sup>2</sup>, and the fulfillment of Rubin’s B and Rubin’s R criteria after matching. Therefore, the matched data can be considered more balanced and suitable for further analysis.

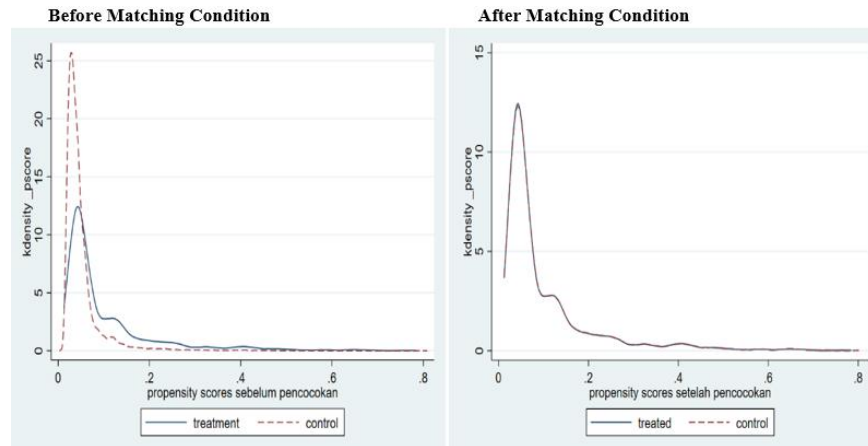
**Table 3. Common Support Region in Propensity Score Matching**

<b>Treatment Assignment</b>	<b>On Support</b>	<b>Total</b>
Non-certified MSEs	85,851	85,851
Certified MSEs	4,043	4,043
Total	89,894	89,894

Table 3 shows the results of common support in the Propensity Score Matching (PSM) method. Common support is a condition in which observations in the treated group and the untreated (control) group share an overlapping range of propensity score values, making them suitable for comparison in the matching process. The presence of common support is crucial because it ensures that each unit in the treatment group has a comparable counterpart in the control group.

Based on the results, the number of non-certified MSMEs (untreated) within the common support area is 85,851 observations, while the number of certified MSMEs (treated) is 4,043 observations. All observations from both groups fall within the common support region, resulting in a total of 89,894 units that can be used in the analysis. This indicates that no observations had to be excluded due to being outside the region of common support (off support). Therefore, the matching process can be carried out optimally because all treatment units have suitable comparison units in the control group. This condition also indicates that the resulting estimate of the treatment effect is more valid and reliable.

This study was conducted using Propensity Score Matching (PSM), dividing the treatment and control groups. The treatment group consists of participants who implement certification in their business operations, while the control group consists of those who do not implement certification in their business activities. The estimation used for each unit is logit analysis, which is then matched with the treatment group participants and the control group using the Nearest Neighbor Matching (NNM) technique. The differences in balance scores before and after matching can be seen in Figure 1 below:



**Figure 1. Propensity Score Overlap Between Certified and Non-Certified MSEs Before and After Matching**

Based on Figure 1, the plot of propensity scores falls within the range of 0 to 1. The graph on the left depicts the overlap or plot of the propensity scores of the treatment group compared to the control group, indicating the potential for bias. If further analyzed, it would directly compare performance indicator variables between the two groups without the matching process. After obtaining the propensity scores, matching is then performed by matching the propensity score of the treatment group with the corresponding control group according to the matching method used. The graph on the right illustrates the plot of both groups after matching, showing that both lines are more homogeneous compared to the graph on the left. This indicates that the matching process has minimized the potential bias.

It is necessary to present descriptive statistics comparing the characteristics of certified MSMEs and non-certified MSMEs. This table is important to show the existence of initial differences between the treatment group and the control group, thereby making the use of the Propensity Score Matching (PSM) method relevant. Based on the results before matching (unmatched), it can be seen that there are several differences in characteristics between the two groups, including variables such as business entity status, business location status, education, age, export activity, training, and business association membership.

**Table 4. Descriptive Statistics between Certified and Non-Certified MSEs**

Variable	Category	Certified MSEs	Non-certified MSEs	Mean Difference
Company Age	Unmatched	12.547	9.832	2.715
	Matched	12.547	12.301	0.246
Business Entity Status	Unmatched	0.1773	0.0451	0.1321
	Matched	0.1773	0.1803	-0.0029
Business Location Status	Unmatched	0.5137	0.4191	0.0946
	Matched	0.5137	0.5068	0.0069
Education	Unmatched	3.5273	2.9119	0.6154
	Matched	3.5273	3.5476	-0.0203
Age	Unmatched	45.814	46.511	-0.6970
	Matched	45.814	45.787	0.0270
Export	Unmatched	0.0103	0.0046	0.0057
	Matched	0.0103	0.0056	0.0047
Training	Unmatched	0.1115	0.0402	0.0713
	Matched	0.1115	0.1108	0.0007
Business Association	Unmatched	0.0479	0.0230	0.0249
	Matched	0.0479	0.0403	0.0076

Based on Table 4, it can be seen that certified MSMEs have different average characteristics compared to non-certified MSMEs. The largest differences are observed in the education and

business entity status variables, while the age variable shows a relatively small difference. This condition indicates an initial imbalance in characteristics between the two groups, so the PSM method is needed to reduce selection bias and produce a more balanced comparison group before estimating the ATT.

The performance of micro and small industries, both in the food and non-food sectors in Indonesia, is represented by the variables of revenue and profit. In this study, performance is the result of a causal relationship from a dynamic system or ongoing process. Performance measurement is carried out to provide control over the parameters that are considered to have a significant influence on a particular outcome, in this case, related to business or business processes. The impact of certification implementation using Propensity Score Matching analysis can be seen from the ATT (Average Treatment on Treated) values for each identified performance variable, namely revenue and profit. Table 5 generally illustrates how certification impacts the outcome of the performance variables as follows.

**Table 5. Impact of Certification on the Performance of Micro and Small Enterprises in Indonesia**

Outcome	Certified MSEs	Non-certified matched MSEs	ATT	Standard Error	T-statistic	Significance
Omzet (Million IDR)	100,7	66,52	34,19	13,33	2,55**	0,011**
Profit (Million IDR)	28,29	20,40	7,89	4,35	1,81*	0,070*

Noted: \*significant at the  $\alpha = 10\%$ ,  $|t| \geq 1,65$ ; \*\* significant at the  $\alpha = 5\%$ ,  $|t| \geq 1,96$ ; \*\*\* significant at the  $\alpha = 1\%$ ,  $|t| \geq 2,58$

**Impact of Certification on Revenue**

The analysis in Table 5 shows that certification has a positive impact on the performance of Micro and Small Enterprises (MSEs) in Indonesia. This is reflected in the comparison between the certified (treated) and non-certified (control) MSE groups. On the revenue indicator, MSEs with certification recorded an average of 100.7 million IDR, which is higher than the 66.52 million IDR recorded by non-certified MSEs. The difference of 34.19 million IDR shows a substantial increase, which is statistically significant at the 5% significance level (t-statistic 2.55). This means that certification has a significant contribution to the increase in MSE revenue.

Certification is one of the increasingly important institutional instruments in modern agribusiness systems because it serves as a guarantee of product standards related to quality, safety, sustainability, and traceability. In the context of agricultural enterprises and small and medium-sized enterprises, certification is not only viewed as an administrative label but also as a mechanism that can influence the economic performance of business actors, particularly in terms of revenue or income. The concept of the Impact of Certification on Revenue refers to the extent to which ownership of certification is able to generate changes in business revenue levels compared to business actors without certification. This impact can occur through various channels, such as higher selling prices, expanded market access, increased productivity, and greater consumer trust in the products produced.

Economically, certification can create added value for products because certified products are generally perceived as having higher quality and meeting certain standards recognized by the market. This condition allows producers to obtain a price premium or a higher selling price compared to non-certified products. In modern and export markets, certification is often a key requirement for entering global supply chains. Therefore, certified business actors tend to have wider market opportunities, access to more stable buyers, and stronger bargaining positions in trade transactions. This improvement in market access ultimately has the potential to increase sales volume and total business revenue.

In addition to market aspects, certification can also affect revenue through improved production efficiency and managerial capacity. In the process of obtaining certification, farmers or business actors typically receive training on good agricultural practices, efficient input use, post-harvest management, and more structured business record-keeping. These improvements in production practices can enhance productivity, reduce losses, and improve output quality. With increased productivity and product quality, business income has the potential to rise both in terms of quantity and product value.

However, the impact of certification on revenue is not always uniform across all business actors. Several studies show that the economic benefits of certification are influenced by various factors such as business size, farmers' education level, access to market information, institutional support, certification costs, and the ability to meet required standards. In some cases, relatively high certification implementation costs may reduce short-term profits, especially for small farmers with limited capital and resources. Therefore, analysis of the impact of certification on revenue needs to consider the characteristics of business actors so that the estimated effect obtained is more accurate (Kakouris & Sfakianaki, 2018; Ruhaya et al., 2024; Shahlehi et al., 2023).

### **Impact of Certification on Business Profit**

On the profit indicator, certified MSEs also show better performance, with an average of 28.29 million IDR, compared to 20.40 million IDR for non-certified MSEs. The difference of 7.89 million IDR is positive and significant but statistically weaker than its effect on revenue, as it is significant only at the 10% level (t-statistic 1.81). This shows that certification still has an impact on profits, though the statistical confidence is lower than that for revenue. Overall, this finding indicates that certification plays a vital role in improving MSE performance, particularly in increasing business revenue. The impact on profit is also positive, although not as strong as on revenue. Thus, certification can be considered a factor that supports improved competitiveness and economic performance of MSEs in Indonesia.

The results of the study indicate that certification has a positive impact on the performance of Micro and Small Enterprises (MSEs), particularly in increasing business revenue. From an economic and managerial perspective, this condition can be explained through several mechanisms. First, certification increases consumer trust in the products produced by MSEs. Certifications such as halal, BPOM, PIRT, and SNI serve as signals that products meet certain standards of quality, safety, and feasibility. Increased consumer trust encourages higher purchasing decisions and expands the customer base of businesses. Second, certification opens access for MSEs to formal and modern markets. Many modern markets, supermarkets, retail platforms, and government institutions require certain certifications before products can be marketed. Therefore, MSEs with certification have greater opportunities to reach wider market segments compared to uncertified MSEs. This condition ultimately contributes to increased sales and business revenue.

Third, certification enables MSEs to enter supply chains that require specific standards. Large companies and formal distributors generally collaborate only with businesses that meet product legality and quality standards. Thus, certification becomes an important instrument for improving the competitiveness of MSEs so they can connect with larger and more stable distribution networks. In addition, certification also enhances business legitimacy. MSEs with certification tend to be perceived as more professional, trustworthy, and compliant with regulations. This legitimacy is important not only for consumers but also for investors, financial institutions, and business partners. With a higher level of legitimacy, MSEs have greater

opportunities to obtain financial support, business partnerships, and long-term business sustainability.

However, although certification has been proven to increase business revenue, its effect on profit tends to be smaller. This can be explained by the compliance costs that MSEs must bear in obtaining and maintaining certification. These costs include administrative fees, product testing, production quality improvements, document renewal, employee training, as well as audit and certification renewal costs. As a result of these additional operational expenses, the increase in revenue is not fully followed by a proportional increase in profit. Therefore, certification can be understood as a long-term investment that enhances the competitiveness and market access of MSEs, while also requiring businesses to manage compliance costs efficiently.

## V. CONCLUSION

Based on the Propensity Score Matching (PSM) estimates, certified MSMEs are proven to have higher revenue and profits compared to comparable non-certified MSMEs. However, the impact is stronger on revenue than on profit, indicating that certification primarily improves market access and sales performance. Meanwhile, the effect on profit is smaller, which may be moderated by certification-related costs such as administration, testing, and compliance with required standards.

Based on these findings, policy implications become highly important and need to be formulated more concretely. From a policy perspective, more specific measures are required, such as subsidies for certification costs, simplification of certification procedures, technical assistance, digitalization of certification services, expansion of accredited testing laboratories, and integration of certification programs with access to MSME financing. These policies are expected to reduce cost burdens and maximize the benefits of certification in enhancing MSME competitiveness.

This study has several limitations that should be considered when interpreting the results. Because this research uses observational data with a cross-sectional design, the relationships identified cannot be directly interpreted as causal, and thus any causal claims should be made with caution. In addition, the Propensity Score Matching (PSM) method applied in this study can only reduce bias arising from observed variables, but it cannot fully eliminate bias from unobserved variables. Factors such as entrepreneurial motivation, management quality, business networks, and the innovation capacity of business owners may influence the results but cannot be fully controlled in this analysis. Therefore, the findings should be interpreted with consideration of the potential presence of hidden bias that is not captured in the model.

## VI. ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to the Central Statistics Agency of Indonesia (Badan Pusat Statistik/BPS) for providing access to the 2019 Micro and Small Industry Survey data, which served as the main data source for this study. The authors also extend their appreciation to Satya Terra Bhinneka University for its academic support throughout the research process. Special thanks are addressed to the editors and reviewers for their constructive comments and valuable suggestions, which helped improve the quality, clarity, and academic rigor of this article. The authors also acknowledge all parties who contributed directly or indirectly to the completion of this research.

## VII. SUPPORTING INFORMATION

The research was conducted using secondary data from the 2019 Micro and Small Industry Survey issued by the [Central Statistics Agency of Indonesia](#). All essential information regarding the dataset, variables, analytical procedures, Propensity Score Matching estimation, and interpretation of findings has been presented in the main sections of this article. Therefore, the results and conclusions can be understood based on the information provided within the manuscript.

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